2019

Factors Affecting Breastfeeding in Preterm Infants

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Abstract

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MA, Ashford University, 2007

BS, University of South Carolina, 1990

Dissertation Submitted in Partial Fulfillment

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Public Health

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Abstract

Even though initiation of breastfeeding among term and preterm infants has increased, the incidence and duration among preterm infants continues to lag because of the unique challenges of breastfeeding preterm infants. African American mothers have the lowest rates of breastfeeding initiation and duration, and their preterm infants are less likely to receive breast milk while in the neonatal intensive care unit. The objective of this cross-sectional quantitative study was to evaluate the relationship between breastfeeding and maternal sociodemographic factors as well as medical and obstetrical conditions for infants born between 32-37 weeks gestational age in South Carolina from 2009 to 2011. The health belief model provided the framework for this study. Secondary data from the South Carolina Pregnancy Risk Assessment Monitoring System included 1,752 preterm pregnancies. Results of binary logistic regression and multivariate logistic regression analysis indicated that mothers who were African American and those who had lower income, no Medicaid, and lower education level breastfed less frequently. Findings may be used to decrease neonatal, postnatal, and infant morbidity and mortality, and to increase breastfeeding knowledge and support to ensure successful breastfeeding of preterm infants beyond the hospital.

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Dedication

I dedicate this document to my three children, Donovan, Carmen, and Ekzavia, who taught me everything I know about the ultimate labor of love. I was not prepared to pursue this vision without the essential life lessons that I learned along this journey. I breastfed all three of my children spanning the course of over 8 years (27, 29, and 43 months, respectively), and all of them were healthy with strong immune systems. My last child, who was breastfed for 43 months, was also born at 32 weeks gestational age, weighing in at 3 pounds, 11.6 ounces, and 17 inches long. I know that his growth and strength are attributed to the breast milk he received from me while in the hospital and after discharge.

This dissertation is also dedicated to my husband, Jeffrey, for his unconditional support throughout this entire process even when I was not sure if breastfeeding would work for me, especially when I went back to work after our first child was born and my milk supply decreased, but I pumped for 17 months. I thank him for standing in the gap after the birth of our preemie, whom I did not see until 48 hours later because I was in the intensive care unit. Later, I learned that my breast milk was more valuable for my preterm infant than it was for my term infants. I also appreciate his many trips to the neonatal intensive care unit to sit, talk, and cuddle our baby when I could not, and for his persistence in delivering my pumped breast milk when I was not able to breastfeed him myself. I am particularly thankful that we never had to give any of our children formula. Finally, I am eternally grateful for the opportunity to stay home with our children for 9 years and 9 months to nurture and care for them the way God intended.

Acknowledgments

It is with a humble and grateful heart that I acknowledge those who stuck by me through the valleys and peaks of this journey. All the unconditional love, guidance, and support received are more than appreciated, and the experiences will never be forgotten. First, I would like to give thanks to God for intercession, grace, mercy, and for lifting me to higher ground during moments of obstacles and adversity. I am especially thankful for all the vessels that were put in place to guide me along this marathon.

I am indebted to my dissertation committee for their unyielding reassurance, guidance and support. Dr. Shingairai Feresu, your tutelage is priceless. Thank you for becoming my chair and helping me work through some of my biggest fears. Your patience and understanding provided me with the foundation I needed to complete this process. Thanks for believing in me when I did not believe in myself. Thank you, Dr. Leslie Elliott, for coming on board for the final stretch of this marathon. Your expertise and support are appreciated. Thank you, Dr. JaMuir Robinson, for consistently being the stable force of my committee from the beginning. Our persistence and endurance to complete this mission is now a reality.

Thanks to my mother and Granny for giving me a word of strength, showing me the value of tough love, and pushing me forward when I wanted to give up. Thanks to my late father who always encouraged me to do my best. Thanks to my brother for always being there with his positive spirit. Thanks to my family and friends for the role each of you played in my life. I am eternally grateful for the opportunity and this moment in time to share a part of my testimony with the world. Until next time…

Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction to the Study

Breastfeeding is beneficial for the health status of term and preterm infants. Particularly for preterm infants, breastfeeding promotes rapid motor development, provides gastrointestinal benefits (Senarath, Dibley, & Agho, 2010), and produces immunological benefits (Moritz, Manole, Bogen, & Ayus, 2005). The lack of breastfeeding remains a problem for the health and welfare of infants in the United States (Centers for Disease Control and Prevention [CDC], 2018). About 25% of children born in the United States were breastfed exclusively for 6 months, and 36% were breastfed for 12 months in 2015 (CDC, 2018). For South Carolina, the rates were 24% for 6 months and 28% for 12 months in 2015 (CDC, 2018). The problems of lack of breastfeeding preterm infants include the challenges of delivery and physiological immaturity, which can be overwhelming without support (Briere, Lucas, Mc
Grath, Lussier, & Brownell, 2015). Furthermore, when preterm infants are admitted to the neonatal intensive care unit (NICU), they miss the opportunity to breastfeed during the first hour of life because of medical complications (Briere, Lucas, McGrath, Lussier, & Brownell, 2015). After discharge, many mothers confront breastfeeding challenges such as difficulty latching on and a decreased milk supply, and without support breastfeeding ceases (Emmanuel, 2015). Therefore, it is imperative that support from the medical team be present to help mothers navigate these challenges at least until the original due date of the infant (Briere et al., 2015). Despite the positive health benefits of breastfeeding, according to the South Carolina Pregnancy Risk Assessment Monitoring System (PRAMS, 2002), non-Hispanic African American women breastfed at a rate of

58.6% and are the group that is least likely to breastfeed. Because of these statistics, it is imperative to understand the factors that contribute to increased breastfeeding for this population, who is disproportionately vulnerable to preterm deliveries and other infant-related risks such as low birth weight births (less than 2,500 grams or 5.5 pounds)[PRAMS, 2002]. Most infants born at a low birth weight are also born preterm and are susceptible to many of the same short-term and long-term adverse health outcomes(Savage, Anthony, Lee, Kappesser, & Rose, 2007). According to Savage et al. (2007), the leading cause of infant mortality among African American infants is low birth weight as an outcome of preterm delivery or intrauterine growth restriction. The U.S. Department of Health and Human Services (2013) reported in 2010 that non-Hispanic African American women delivered low birth weight infants at a rate of 13.5% compared to 7.1% for non-Hispanic White women.

A preterm birth is any birth occurring before 37 completed weeks of gestation; in 2010, preterm infants accounted for 12.0% of all births in the United States (U.S Department of Health and Human Services, 2013). Preterm infants are at increased risk for both short-term and long-term adverse health outcomes including death during the infant (6.2 per 1,000 live births), neonatal (4.1 per 1,000 live births), and postnatal (2.1 per 1,000 live births) periods (U. S. Department of Health and Human Services, 2013). Because long-term physical and neurodevelopmental complications may occur, a preterm birth is a primary cause of infant mortality and childhood disability (U.S. Department of Health and Human Services, 2013). Of the preterm births that occur in the United States, there is a high incidence among non-Hispanic African American women compared to

their White counterparts. In 2009, preterm births among the non-Hispanic African American female population were 17.5% (CDC, 2007-2009). In the current study, I examined factors associated with breastfeeding to address the risk of lack of breastfeeding among preterm infants of gestational age 32 to under 37 weeks at birth.

In the first section of Chapter 1, I provide background information from in the literature on preterm infants and the benefits of breastfeeding. Preterm infants who were breastfed are compared to preterm infants who were not breastfed. In addition, I review background information on breastfeeding, which was my dependent variable of interest, and describe the relationship between breast milk and factors affecting breastfeeding in preterm infants. Independent variables included sociodemographic factors of the mother and medical and obstetrical conditions of the mother. The second section presents the problem statement and its relevance to public health. In the third section, I state the purpose of the study and focus on the type of analysis and the intent of the study. The fourth section contains my research questions and hypotheses. I review the literature on the conceptual foundation, which was the health belief model, setting the tone for the nature of the study. I define the dependent variable, the independent variables, and applicable operational terms. Next, I identify the assumptions that were necessary in my study, and I address the scope, delimitations, and limitations of the study as they related to the problem, methodology, and population of the study. I conclude with the significance of my study, which was to help ensure that families of preterm infants receive the education and support they need to promote a favorable breastfeeding experience despite maternal factors and conditions.

Background

Breast milk is the preferred mode of nutrition recommended if the health of the infant or the mother is not compromised (CDC, 2009; Merewood, Brooks, Bauchner, MacAuley, & Mehta, 2006; PRAMS, 2002). Preterm infants need the nutritional benefits from breast milk more than term infants do (Moritz et al., 2005). The percentage of infants who breastfed increased from 60% in 1993-1994 to 77% in 2005-2006 (McDowell, Wang, & Kennedy-Stephenson, 2008). Although a low initiation and duration of breastfeeding contributes to health disparities observed among minority infants, African American women are the least likely to breastfeed their infants during the first year of life (Kaiser Family Foundation, 2008). Furman, Combs, Alexander, and O'Riordan (2008) asserted that breastfeeding rates are lower among first time mothers, non-Hispanic African American women, teenage mothers, and grade-school-educated mothers. Among South Carolina's children born in 2005, only 66.8% were ever breastfed and 11.8% were exclusively breastfed for the first 6 months of life (Kaiser Family Foundation, 2008). According to PRAMS (2002), South Carolina has one of the lowest breastfeeding rates at 58.6% and leads only three other states (Alabama 57.5%, West Virginia 55.4%, and Louisiana 50.3%). The U.S. National Immunization Survey for 2004-2008 indicated that the breastfeeding initiation rate in South Carolina among non-Hispanic African American women was 43.3% of 325 respondents; the rate at 6 months was 15.9% and 4.6% at 12 months (Scanlon, Grummer-Strawn, Li, Chen & Molinari (2010). This is in stark contrast to the United Kingdom, where Black Africans and Asians breastfeed at a higher rate than White Americans; cultural beliefs and socioeconomic

profiles must be taken into consideration before implementing breastfeeding policies (Kelly, Watt, & Nazroo, 2006).

There are physical and psychological benefits of breastfeeding for mothers and their preterm infants. Exclusive breastfeeding is beneficial for both term and preterm infants because it reduces the incidence of acute and chronic infections (Moritz et al., 2005). Breast milk is responsible for decreasing the risk of gastrointestinal infections and for preventing adverse health effects in the first year of life (Senarath et al., 2010). The longevity of exclusive breastfeeding is associated with increased protection from illness and decreased incidence and severity of otitis media, respiratory infections, and gastrointestinal illness (Freeman, Bonuck, & Trombley, 2008). Meinzen-Derr et al. (2009) suggested that breast milk might have long-term effects on the cognitive maturity of extremely premature infants.

Although the problems of lack of breastfeeding are experienced in all births, the effects disproportionately affect preterm infants (Briere et al., 2015). Preterm infants have unique challenges that their term counterparts do not have, such as being separated at birth from their mothers and being placed in special care nurseries or the NICU for medical interventions. According to the CDC (2009), 1 in 8 babies in the United States is born too small and too soon each year. Premature infants are those born at less than 37 weeks gestational age (CDC, 2010; Medline Plus, 2010), and the preterm birth rate varies by race and ethnicity (U.S. Department of Health and Human Services, 2013). The causes for premature births are multifactorial, and all women are susceptible (U.S. Department

of Health and Human Services, 2017). According to the Mayo Clinic (2009), the following conditions are associated with preterm births:

- delivering a previous preterm infant or having a preterm labor during a previous pregnancy;
- carrying two or more infants during pregnancy;
- uterus (anteverted or retroverted uterus), cervix (incompetent cervix), or placenta (placenta previa or placenta abruption) challenges;
- using illicit and licit drugs before and/or during pregnancy;
- infections of the lower genital tract (urinary tract infections) or amniotic fluid (chorioamnionitis); Group B strep can cause both urinary tract infections and chorioamnionitis; HIV, hepatitis B, and hepatitis C can also be transmitted from an infected mother to child;
- high blood pressure or diabetes before and/or during pregnancy;
- being overweight or underweight before pregnancy;
- stress that may be a result of physical or mental abuse or the death or sickness of a loved one; and
- several miscarriages or abortions.

According to the CDC (2011), to help prevent preterm births, pregnant women need more iron as they progress throughout their pregnancies. Anemia, due to lack of iron, causes fatigue and may cause pregnant women to deliver prematurely or have an infant born at very low birth weight (CDC, 2011). This condition also contributes to the possibility of other challenges for preterm infants, such as developmental delays (CDC, 2011).

Preterm infants are at an increased risk for short-term health outcomes such as respiratory distress, jaundice, anemia, and infection (U.S. Department of Health and Human Services, 2013). Preterm births also have long-term health outcomes such as learning and behavioral problems, cerebral palsy, lung problems, and vision and hearing loss (U.S. Department of Health and Human Services, 2013). According to the U.S. Department of Health and Human Services (2009), neonatal mortality rates in 2006 were 9.1 deaths per 1,000 live births for non-Hispanic African American infants, 3.7 deaths per 1,000 live births for non-Hispanic White infants, and 3.8 deaths per 1,000 live births for Hispanic infants. These rates are mostly a result of preterm births and low birth weight, in addition to congenital abnormalities, infections, or birth trauma (U.S. Department of Health and Human Services, 2009).

In South Carolina, African American women are more likely to deliver before 37 weeks gestation and are more likely to deliver infants weighing less than 5.5 pounds (South Carolina Department of Health and Environmental Control [SCDHEC], n.d.). According to the SCDHEC (n.d.), there were 549 deaths in 2005; 81 were linked to disorders related to short gestation and low birth weight, 79 were related to congenital malformations, and 48 were affected by sudden infant death syndrome. Of the 549 infant deaths, 286 were African American infants; 50 of these deaths were due to disorders related to short gestation and low birth weight, 31 were congenital malformations, and 23 were by sudden infant death syndrome (SCDHEC, n.d.). According to the March of Dimes (2007), although race and ethnicity are significant factors for predicting preterm

births and low birth weight infants, social and behavioral elements may have a more profound effect on postnatal outcome.

Table 1 displays the prevalence of preterm births in 2009 by state and maternal race/ethnicity for Alabama, Louisiana, Mississippi, and South Carolina. Mississippi has the highest prevalence of preterm births among non-Hispanic African American women and non-Hispanic White women at 22.3% and 14.5%, respectively. Alabama has the second highest preterm birth rate among non-Hispanic African American women and non-Hispanic White women at 20.6% and 13.1%, respectively. South Carolina has the lowest preterm birth percentage (19%) among this group. South Carolina and Louisiana have similar numbers for non-Hispanic African American women and non-Hispanic White women with a difference of 0.3% for non-Hispanic African American women (in favor of South Carolina having the lower percentage) and 0.4% for non-Hispanic White women (in favor of Louisiana having the lower percentage).

Table 1

Preterm Birth (Percentage) by State and Maternal Race/Ethnicity, 2009

State	Total	Non-Hispanic African American	Non-Hispanic Caucasian	Hispanic	American Indian/Alaska Native*	Asian/Pacific Islander*
Alabama	15.6	20.6	13.1	15.0	18.0	12.6
Louisiana	14.7	19.3	12.0	11.1	13.3	11.8
Mississippi	18.0	22.3	14.5	14.2	21.5	12.1
South Carolina	14.5	19.0	12.4	12.4	18.3	11.3

Note. PB: Preterm birth is considered < 37 weeks gestation.
*May include Hispanics.
Source: Centers for Disease Control and Prevention, National Center for Health Statistics.

Table 2 displays the rate of preterm births in 2009 and 2010 by maternal race/ethnicity for the United States. In 2010, there was a decrease of 0.38% fewer preterm births among non-Hispanic African American women and a decrease of 0.13% fewer preterm births among non-Hispanic White women from the previous year. The disparity between these two racial groups in both years is significant with preterm birth rates of 17.5% and 17.12% for non-Hispanic African American women and 10.9% and 10.77% for non-Hispanic White women. This resulted in a difference of 6.6% and 6.35% in consecutive years. It is imperative to breastfeed preterm infants because they benefit neurologically and physically from the nutrients found in breast milk (Briere et al., 2015).

Table 2

Preterm Birth (Percentage) by Maternal Race/Ethnicity, 2009-2010 for the United States

	Total	Non-Hispanic African American	Non-Hispanic Caucasian	Hispanic	American Indian/Alaska Native*	Asian/Pacific Islander*
2009	12.2	17.5	10.9	12.0	13.5	10.8
2010	-----	17.12	10.77	11.79	13.6	10.69

Note. PB: Preterm birth is considered <37 weeks' gestation.
*May include Hispanics.
Source: Centers for Disease Control and Prevention, National Center for Health Statistics Martin, Hamilton, Ventura, Osterman, Wilson, & Matthews. Births: Final data for 2010. National Center for Health Statistics.

Problem Statement

Breastfeeding is important for preterm infants neurologically because the brain is not fully developed, and breast milk has long-chain fatty acids and other nutrients not found in formula (Briere et al., 2015). Breastfeeding preterm infants results in improved long-term and short-term outcomes (Pinchevski-Kadir et al., 2017). Breast milk offers protection and support for brain development and enhances optimal growth physiologically for both term and preterm infants (Briere et al., 2015). Even though the initiation of breastfeeding among term and preterm infants has increased, the incidence and duration among preterm infants continues to lag because of the unique challenges of breastfeeding preterm infants. Some of these challenges include establishing a milk supply without the presence of the infant, maintaining a steady milk supply, transitioning from gavage feedings to feedings at the breast, maternal sociodemographic factors, and the medical conditions of mother and infant (Pinchevski-Kadir et al., 2017). The relationship between breastfeeding and maternal sociodemographic factors and maternal

medical and obstetrical conditions in preterm births population needed further exploration (SCDHEC, 2010). There is a connection between maternal sociodemographic factors and maternal medical and obstetrical conditions and breastfeeding as early nutritional choices for preterm infants 32 to under 37 weeks gestational age. These infants frequently have compromised immune systems (SCDHEC, 2011). Consequently, it is imperative that a study be conducted to determine the value of the relationship between breastfeeding in the NICU and factors affecting preterm infants in South Carolina.

According to SCDHEC (2010), 85% of women receiving prenatal care in South Carolina received information about breastfeeding in 2008 during their prenatal visits. However, the rate of breastfeeding initiation and duration among this group of women was low because of decreased health literacy and a lack of multilevel support (SCDHEC, 2010). Furthermore, this gap has widened and created a considerable health disparity within communities (SCDHEC, 2010).

A significant disparity exists between the factors that may affect breastfeeding in preterm infants of different races and ethnicities (U.S. Department of Health and Human Services, 2013). There is a high rate of preterm and low birth weight infants born to non-Hispanic African American women. Kawachi (1999) stressed the importance of investing in communities to reduce health disparities among their members. Time, money, and resources have been scarce when it comes to providing intervention and to support breastfeeding for parents of premature infants (Kawachi, 1999). Social networks and support are vital to the parents of preterm infants as well as their other children (Kawachi,

1999). Social support systems may buffer the challenges that accompany health disparities (Payne, Wyatt, Mosley, Dubbert, Gutierrez-Mohamed, et al., 2005).

Purpose of the Study

The purpose of this cross-sectional study was to evaluate the relationship between sociodemographic factors of the mother, as well as medical and obstetrical conditions of the mother (independent variables) and breastfeeding (dependent variable) during the first 10 weeks of life of preterm infants 32 to less than 37 weeks. Preterm infants who were breastfed were compared to those who were not breastfed. I used secondary data from the South Carolina Pregnancy Risk Assessment Monitoring System from 2009-2011 for infants born at 32 to under 37 weeks gestational age. I studied breastfeeding in the NICU to determine factors that may affect the lack of breastfeeding in preterm infants. Findings may be used to increase breastfeeding knowledge and support and to decrease neonatal, postnatal, and infant morbidity and mortality.

Nature of the Study

I conducted a quantitative cross-sectional study using secondary data and the South Carolina Pregnancy Risk Assessment Monitoring System (SCPRAMS) was the data tool of choice. The aim of this cross-sectional study was to compare the factors affecting breastfeeding in preterm infants. A quantitative design was used to examine the potential relationship between the dependent variable (breastfeeding) and the independent variables (sociodemographic factors of the mother and medical and obstetrical conditions of the mother). The target population was all preterm infants 32 to under 37 weeks

gestational age cared for in NICUs across the state of South Carolina from 2009 to 2011. Additionally, these preterm infants were compared by race.

Conceptual Framework

The health belief model (HBM) provided the conceptual framework used for this investigation. The aim of this investigation was to examine the relationship between breastfeeding and maternal sociodemographic factors and maternal medical and obstetrical conditions. The HBM is based on four parameters including perceived susceptibility, perceived severity, perceived benefits, and perceived barriers (Daddario, 2007). In the current study, the focus was on breastfeeding and its relation to maternal sociodemographics and maternal medical and obstetrical conditions in all preterm infants 32 to under 37 weeks gestational age as perceived by the mothers of these infants. The purpose was to identify factors related to lack of breastfeeding in mothers who delivered preterm infants in South Carolina between 2009 and 2011. I examined associations between breastfeeding and sociodemographic factors, and medical and obstetrical complications. This HBM was aligned with the hypotheses and research questions for this study. Preterm infants who were breastfed were compared to those who were not breastfed.

Definitions

Breastfeeding: The normal way of feeding infants for healthy growth and development (World Health Organization, 2019). Breastfeeding can be exclusive or partial and includes expressed human milk and donor human milk. The Joint Commission (2013) defined exclusive breastfeeding as "a newborn receiving only breast milk and no

other liquids or solids except for drops or syrups consisting of vitamins, minerals, or medicines" (p. 1).

Exclusive formula feeding (EFF): Infants receiving only formula feedings and no breast milk feedings.

Hypernatremia: Having a serum sodium level of ≥ 150 mg/L in breast milk (Kusuma, Agrawal, Kumar, Narang, & Prasad, 2009). This high milk sodium concentration is a result of poor milk drainage from the breasts (Moritz et al., 2005). Breastfeeding-associated hypernatremia occurs when breastfeeding is not correctly established. This commonly occurs in late preterm infants and is also known as severe hypernatremic dehydration (Moritz et al., 2005). Neonatal hypernatremic dehydration occurs when there is insufficient transfer of breast milk from mother to infant.

Late preterm (LPT) infants: Infants born between 34 and 36 completed weeks of gestation (SCDHEC, 2011; U.S. Department of Health and Human Services, 2013).

Low birth weight (LBW) Infants: Infants weighing less than 2500 grams (5 pounds 8 ounces) (U.S. Department of Health and Human Services, 2009).

Moderate preterm (MPT) infants: Infants born between 32 and 34 completed weeks of gestation (March of Dimes, 2012).

Neonatal intensive care unit (NICU): A specialized intensive care unit for premature, low birth weight, and sick newborn infants (MedlinePlus, 2010.

Preterm infants: Infants born before 37 completed weeks of gestation (U.S. Department of Health and Human Services, 2013).

Very low birth weight (VLBW) infants: Infants weighing less than 1500 grams (3 pounds 4 ounces) (U.S. Department of Health and Human Services, 2009).

Research Questions and Hypotheses

This study focused on the independent variables relating to maternal sociodemographic factors and maternal medical and obstetric conditions and the effect on the dependent variable breastfeeding. An analysis was done to find a connection between independent variables maternal age, maternal education, maternal race, income level, type of payer source, and the dependent variable breastfeeding. The second part of the analysis addressed a connection between the independent variables type of delivery, primiparity, parity, number of previous live births, number of preterm birth or low birth weight infant, and length of hospital stay for the infant and the dependent variable breastfeeding. The participants included mothers of preterm infants 32 to below 37 weeks gestational age born in hospitals across the state of South Carolina. The present study was directed by two research questions (RQs) and their corresponding hypotheses:

RQ1: Is there an association between breastfeeding and sociodemographic factors including maternal race, maternal age, income level, type of payer source, and maternal education among preterm infants 32 to below 37 weeks gestational age during 2009-2011?

H_o1: There is no association between breastfeeding and sociodemographic factors including maternal race, maternal age, income level, type of payer source, and maternal education among preterm infants born at 32 to below 37 weeks of gestation during 2009-2011.

H_a1: There is an association between breastfeeding and sociodemographic factors including maternal race, maternal age, income level, type of payer source, and maternal education among preterm infants born at 32 to below 37 weeks of gestation during 2009-2011.

RQ2: Is there an association between breastfeeding and medical and obstetrical conditions of the mother including delivery by Caesarean section, other types of delivery, primiparity, number of previous live births, parity, previous preterm birth or low birth weight infant, and length of hospital stay for the infant among preterm infants 32 to below 37 weeks gestational age during 2009-2011?

H_o2: There is no association between breastfeeding and medical and obstetrical conditions of the mother including delivery by Caesarean section, other types of delivery, primiparity, number of previous live births, parity, previous preterm birth or low birth weight infant, and the length of hospital stay for the infant among preterm infants 32 to below 37 weeks gestational age during 2009-2011.

H_a2: There is an association between breastfeeding and medical and obstetrical conditions of the mother including delivery by Caesarean section, other types of delivery, primiparity, number of previous live births, parity, previous preterm birth or low birth weight infant, and length of hospital stay for the infant among preterm infants 32 to below 37 weeks gestational age during 2009-2011.

Research Design

I used a cross-sectional design and secondary data from SCPRAMS in this population-based study. The target population was all preterm infants born at 32 to under

37 weeks gestational age from 2009 to 2011. The independent variables for the first research question were the sociodemographic factors of the mother and the dependent variable was breastfeeding. The sociodemographic factors of the mother included maternal race, maternal age, maternal education, income level, and type of health insurance payer source. The independent variables for the second research question were medical and obstetrical conditions of the mother such as delivery by Caesarean section, other types of delivery, primiparity, number of previous live births, parity, the number of preterm birth or low birth weight infants, and the length of hospital stay for the infant. The dependent variable was breastfeeding. Cross tabulations were done to determine the crude and adjusted odds ratios to examine relationships between the dependent and independent variables. Binary logistic regression and multivariate logistic regression were used for the statistical data analysis.

This research design was consistent with similar studies of factors affecting breastfeeding (Emmanuel, 2015). For example, Teti et al., 2009 sampled mothers and their premature, low birth weight infants from health care centers in Baltimore, Maryland and Washington, D.C. This methodology was appropriate for my study because I could estimate the risk of not breastfeeding in this preterm population.

The literature review focused on investigations, case studies, and protocols about potential maternal sociodemographic factors and maternal medical and obstetrical characteristics in mothers of preterm infants and the effects on breastfeeding. I used data from the South Carolina PRAMS from 2009-2011. The PRAMS is a collaboration between state health departments and the Centers for Disease Control and Prevention,

Division of Reproductive Health, to determine why some infants have better outcomes than others. This system creates a checks and balances system for states to monitor changes (positive and negative) in the health and care of mothers and their infants. This information may be used to improve maternal and infant health outcomes and to develop and/or improve intervention programs (CDC, Division of Reproductive Health, 2018). The data sets include variables such as gestational age, length of hospital stay for the infant, maternal age, maternal education, maternal race, income level, type of payer source, type of delivery, number of previous live births, parity, primiparity, and previous preterm or low birthweight infant (South Carolina Pregnancy Risk Assessment Monitoring System, 2009-2011). The data sets provide useful information for the health care team to improve patient care and provide better services. The findings from the current study may be used to inform better policies and health programs and provide a platform to make better use of the current health resources (see CDC, Division of Reproductive Health, 2018). This study focused on the attitudes and experiences of mothers breastfeeding their preterm infants 32 to under 37 weeks gestational age. The data from PRAMS not only provided information about the past and the present, but it also provided protocols for new interventions and resources.

Assumptions, Limitations, and Delimitations

This was a cross-sectional study that included existing data. I looked at all preterm infants with a focus on those born at 32 to under 37 weeks gestational age in South Carolina; these were singleton births of women of all ages. These preterm infants were compared by sociodemographic characteristics and medical maternal medical and

obstetrical factors of the mother at birth. Findings can be generalized only to this sample of mothers and infants.

This study was limited because it was difficult to distinguish between feeding and breastfeeding initiation due to data not being available in the data set, and it was also difficult to determine breast milk intake (see Meinzen-Derr et al., 2009). The SCPRAMS was used to operationalize breastfeeding and postnatal outcomes by addressing critical questions in the survey. The length of hospital stay and NICU admission questions were included in the SCPRAMS survey. The following are examples of breastfeeding and postnatal outcome questions using the exact wording (South Carolina Pregnancy Risk Assessment Monitoring System, 2008; South Carolina Pregnancy Risk Assessment Monitoring System 2009-2011):

- Did you ever breastfeed or pump breast milk to feed your new baby after delivery? Even for a short period of time?
- Are you currently breastfeeding or feeding pumped milk to your new baby?
- How many weeks or months did you breastfeed or pump milk to feed your baby?
- When was your baby born?
- After your baby was born, was he or she put in an intensive care unit?
- After your baby was born, how long did he or she stay in the hospital?

Scope

The HBM was the appropriate model for this investigation. This model aided in establishing a relationship between breastfeeding and maternal sociodemographic factors

and maternal medical and obstetrical conditions among preterm infants 32 to under 37 weeks gestational age in South Carolina from 2009 to 2011. I used these factors to compare preterm infants who were breastfed with those who were not breastfed. The following exclusions were applied to this study:

- preterm infants with chromosomal abnormalities (trisomy 21 Down Syndrome, trisomy 18 Edward's Syndrome),
- preterm infants with diagnosed Grade III or IV cerebral hemorrhage,
- preterm infants who were being ventilated,
- preterm infants with congenital anomalies that might interfere with breastfeeding (congenital heart disease, spina bifida, cleft lip and cleft palate),
- multiple births (twins, triplets, quadruplets),
- preterm infants with neurological deficits (cerebral palsy), and
- preterm infants with hypoxia or ischemia characterized by an Apgar score < 5 at 5 minutes.

Significance

This study was significant because I investigated a homogenous population of preterm infants and their mothers to determine the factors that affect breastfeeding in South Carolina. The gap between non-Hispanic African American and non-Hispanic White infant mortality rates has been shown to have decreased but still indicates a huge disparity between the two races (U.S. Department of Health and Human Services, 2009). This study focused on the comparison of preterm infants who were breastfed with preterm infants who were not breastfed, controlling for maternal sociodemographic

factors and maternal medical and obstetrical factors. The aim was to determine whether these factors were related to breastfeeding. Simpson, Schanler, and Lau (2002) found that if breastfeeding begins early in preterm infants without chronic respiratory illnesses, regular oral feedings can easily be established. According to the Office of Minority Affairs (2007), preterm babies who are breastfed develop substantially better than those who are formula fed, and they score higher on IQ tests.

A study was needed to address the factors affecting breastfeeding in preterm infants of 32 to under 37 weeks gestational age in South Carolina. Identifying factors affecting breastfeeding of preterm infants in South Carolina may allow health professionals, program planners, and policymakers to evaluate the impact of previous and current feeding and breastfeeding education programs. Also, findings may be used to recognize the areas of need associated with maternal sociodemographics and maternal medical and obstetric conditions in the preterm infant population.

Findings may be used in health education to empower more mothers to breastfeed their preterm infants. Potential social change implications also include creating local intervention centers with trained personnel to support breastfeeding parents during hospitalization of their preterm infants. This support may be enhanced beyond discharge to include the first 18 months of life . An open dialog must occur so that the needed support is equitably and readily available for all mothers regardless of demographics (Campbell & Gutman, 2007). Findings may also be used in baby-friendly hospitals to encourage exclusive breastfeeding during the first year of life, and to develop proactive

policies to address the cultural barriers of breastfeeding preterm infants in the United States.

Summary

There is a high rate of lack of breastfeeding in the United States and in South Carolina (CDC, 2018). More research was needed on the factors affecting breastfeeding preterm infants during the first two months of life. I examined this lack of breastfeeding using maternal sociodemographic factors and maternal medical and obstetrical conditions. The purpose for this study was to explore the relationship between breastfeeding and maternal sociodemographic factors and maternal medical and obstetrical conditions of preterm infants 32 to under 37 gestational weeks, from 2009 to 2011, during the first 10 weeks of life.

It was unclear how NICUs in hospitals were addressing the need for increased awareness of the importance of breast milk for preterm infants to reduce health disparities. I postulated that an increase in the prevalence of breastfeeding for preterm infants could result in reduced morbidity and mortality for this population. If this study's findings confirmed a positive relationship between breastfeeding and maternal sociodemographic factors and maternal medical and obstetrical conditions for preterm infants 32 to under 37 weeks, future studies could result.

Chapter 2 provides a detailed description of the conceptual framework. I also review the literature related to the independent variables of sociodemographic factors and medical and obstetrical conditions of the mother and the dependent variable breastfeeding among preterm infants 32 to under 37 weeks gestational age in South Carolina from 2009

to 2011. The review provides a detailed background of the sociodemographic factors and the medical and obstetrical conditions of the mother.

Chapter 2: Literature Review

The purpose of this cross-sectional study was to examine the relationship between breastfeeding and demographic attributes as well as medical and obstetrical conditions of the mother for infants born at 32 to under 37 weeks gestation in South Carolina from 2009 to 2011. In the first two sections of Chapter 2, I discuss the literature search strategy and conceptual framework. Next, I review the recent literature on the independent variables (sociodemographic factors and medical and obstetrical conditions of the mother) and then focus on the dependent variable (breastfeeding). I also review the relationship among feeding methods, short-term health outcomes, and long-term health outcomes of preterm infants. This review addresses the following inquiries:

- What is breastfeeding?
- What is the problem of breastfeeding in the preterm infant population?
- What are the adverse postnatal outcomes of preterm and low birth weight infants?
- What is the relationship between breastfeeding and maternal sociodemographics?
- What is the relationship between breastfeeding and maternal medical and obstetrical conditions?
- What are the effects of breastfeeding on the adverse postnatal outcomes of preterm infants?
- What is the relationship among feeding methods, short-term health outcomes, and long-term health outcomes of preterm infants?

Finally, I provide a summary of the existing literature on the relationship between breastfeeding and maternal sociodemographics as well as maternal medical and obstetrical conditions and the importance of secondary data for this study.

Literature Search Strategy

The peer-reviewed journals used for this review included the *Journal of Human Lactation*, *Ethnicity and Health*, *Maternal and Child Health Journal*, *International Breastfeeding Journal*, *Clinical Pediatrics*, and the *Clinics of Perinatology*. I used databases including Maternity and Infant Care, Cochrane Database, MEDLINE, CINAHL, ERIC, ProQuest, PubMed, and PsycINFO. I also used the Google Scholar search engine. The search terms included the following key words: *human milk*, *socioeconomic factors*, *preterm infants*, *low birth weight infants*, *race factors*, *ethnicity*, *breastfeeding*, *self-concept*, *pregnancy complications*, *breastfeeding barriers*, *breastfeeding practices*, *infant feeding*, *feeding outcomes*, *breastfeeding support*, *Baby-Friendly Hospital Initiative (BFHI)*, *lactation counseling*, *hospital practices*, *PRAMS (Pregnancy Risk Assessment Monitoring System)*, *social support*, *pregnancy outcomes*, *prenatal care*, *neonatal nutrition*, *breast milk fortification*, *human milk fortification*, *maternal education*, *infant health*, *infant morbidity*, and *feeding methods*. This literature review was limited to studies done in industrialized countries, written in English, and published since 2004. In this review, I concentrate on the independent variables (sociodemographic factors of the mother and medical and obstetrical conditions of the mother) and the dependent variable (breastfeeding).

Conceptual Framework

The conceptual framework for this study was the health belief model (HBM). The HBM helped me to examine the relationship between breastfeeding and sociodemographic factors of the mother as well as medical and obstetrical conditions of the mother. The HBM was created in the 1950s by a group of social psychologists (Hochbaum, Rosenstock, Kegels, and Leventhal) at the U.S. Public Health Service to predict and explain health-related behaviors of individuals by focusing on their attitudes and beliefs (LaMorte, 2018). The model was developed to understand why individuals were resistant to practicing disease prevention by taking advantage of screening tests for the early detection of disease (LaMorte, 2018). The foundation of the HBM was based on perceived susceptibility, perceived severity, perceived benefits, and perceived barriers (Daddario, 2007), as shown in Figure 1.

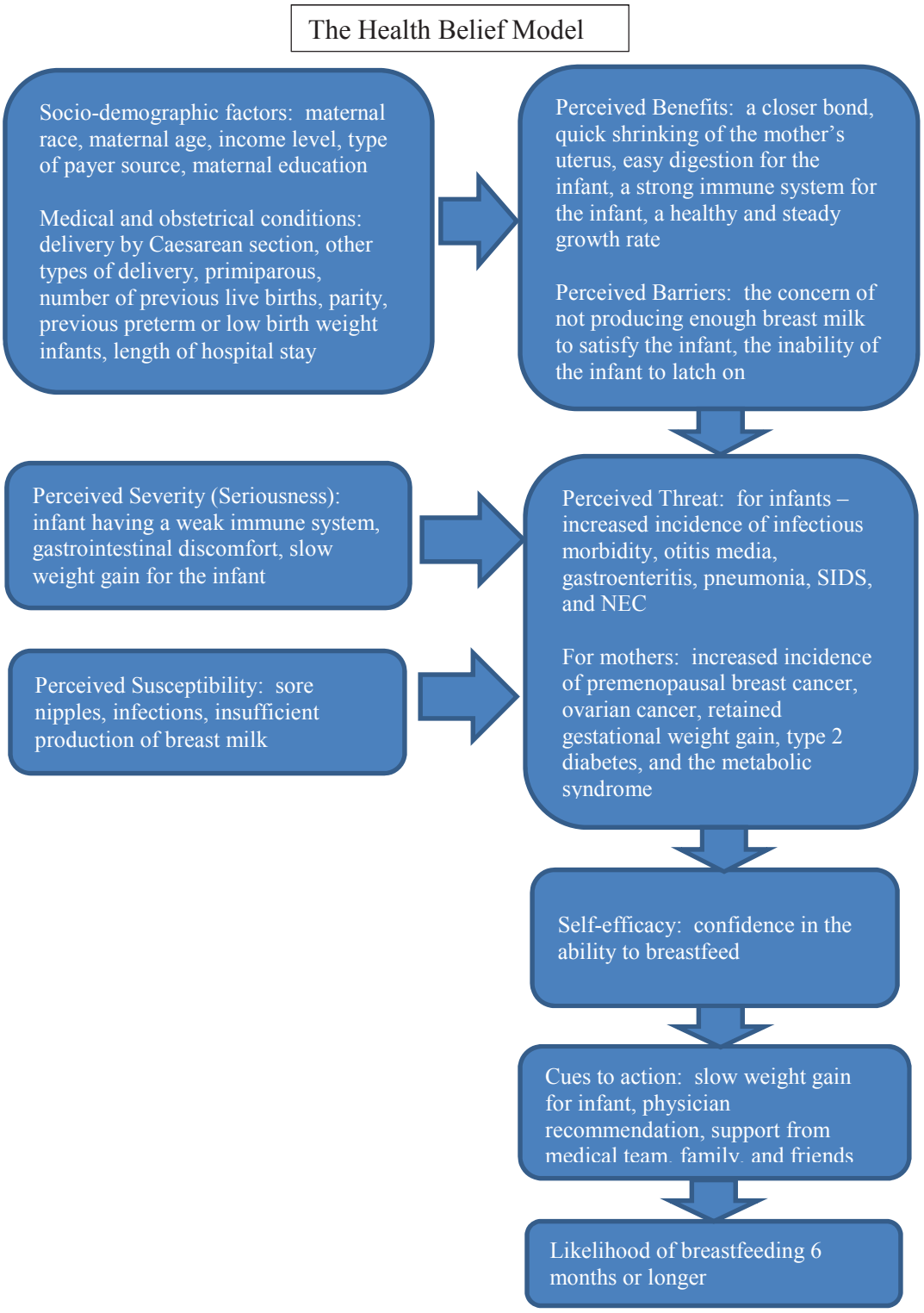

Figure 1. HBM model (adapted from Kabiru, Beguy, Crichton, & Zulu, 2011)

Perceived susceptibility refers to the mother's concerns about health risks of breastfeeding for herself or her infant. This may include sore nipples, infections, or insufficient production of breast milk for the infant. Perceived severity refers to the mother considering what would happen if she does not breastfeed. This may include the infant having a weak immune system and being sick often, having trouble digesting formula creating gastrointestinal discomfort, or slow weight gain for the infant. Perceived benefits of breastfeeding for mother and infant include a closer bond, the quick shrinking of the mother's uterus, and the infant's easy digestion and strong immune system along with a healthy and steady growth rate. Perceived barriers include the concern of not producing enough breast milk to satisfy the infant or the inability of the infant to latch on for a comfortable feeding. Self-efficacy usually occurs when a stimulus promotes the health-promoting behavior, which is exclusive breastfeeding. Support from the medical team, family, and friends could be a cue to mothers to initiate exclusive breastfeeding. This study addressed the associations between breastfeeding and maternal sociodemographic factors as well as maternal medical and obstetrical conditions for preterm infants 32 to under 37 weeks gestational age in South Carolina. Gestational age and weight are highly correlated, and birth weight strongly influences postnatal survival; infant birth weight is a predictor of infant health, child health, and adult health (U.S. Department of Health and Human Services, 2009). The goals for caring for preterm infants include attaining physiological stability; maximizing growth through nutritional management; and monitoring infant temperature, heart rate, and weight gain (Nye, 2008).

I examined whether the independent variables (sociodemographic factors of the mother as well as medical and obstetrical conditions of the mother) invoked a change in the dependent variable (breastfeeding). Dependent variables change in response to independent variables (Creswell, 2009). In this study, breastfeeding was dependent on the sociodemographic factors of the mother as well as the medical and obstetrical conditions of the mother. Sociodemographic factors of the mother included maternal race, maternal age, income level, type of payer source, and maternal education. Medical and obstetrical conditions of the mother included delivery by Caesarean section, other types of delivery, primiparity, number of previous live births, parity, previous preterm birth or low birth weight infant, and the length of hospital stay for the infant. The length of hospital stay was from the beginning of the time of birth to the time of discharge from the special care nursery.

I examined the impact of maternal sociodemographics and maternal medical and obstetrical conditions on breastfeeding of African American preterm infants because there is a high rate of African American preterm births in South Carolina and a low rate of exclusive breastfeeding among this group (see Liu, Smith, Dobre, & Ferguson, 2009; SCDHEC, 2010). Harrison (n.d.) summarized the results of an Australian study that confirmed the importance of breast milk based on duration; the earlier and longer breastfeeding took place, the more benefits. Additionally, Harrison found that it did not matter whether the breast milk was pumped or not; the benefit did not come from the vessel but from the nutrients found in breast milk. Furthermore, the HBM aligned with the following research questions and hypotheses:

RQ1: Is there an association between breastfeeding and sociodemographic factors including maternal race, maternal age, income level, type of payer source, and maternal education among preterm infants 32 to below 37 weeks gestational age during 2009-2011?

H_o1: There is no association between breastfeeding and sociodemographic factors including maternal race, maternal age, income level, type of payer source, and maternal education among preterm infants born at 32 to below 37 weeks of gestation during 2009-2011.

H_a1: There is an association between breastfeeding and sociodemographic factors including maternal race, maternal age, income level, type of payer source, and maternal education among preterm infants born at 32 to below 37 weeks of gestation during 2009-2011.

RQ2: Is there an association between breastfeeding and medical and obstetrical conditions of the mother including delivery by Caesarean section, other types of delivery, primiparity, number of previous live births, parity, previous preterm birth or low birth weight infant, and length of hospital stay for the infant among preterm infants 32 to below 37 weeks gestational age during 2009-2011?

H_o2: There is no association between breastfeeding and medical and obstetrical conditions of the mother including delivery by Caesarean section, other types of delivery, primiparity, number of previous live births, parity, previous preterm birth or low birth weight infant, and the length of hospital stay for the infant among preterm infants 32 to below 37 weeks gestational age during 2009-2011.

H_a2: There is an association between breastfeeding and medical and obstetrical conditions of the mother including delivery by Caesarean section, other types of delivery, primiparity, number of previous live births, parity, previous preterm birth or low birth weight infant, and length of hospital stay for the infant among preterm infants 32 to below 37 weeks gestational age during 2009-2011.

Literature Review

Preterm Birth

A preterm birth is a medical condition that directly influences the health and postnatal outcome of preterm infant (Isaacson, 2006). The rate of African American preterm births is continuing to increase (Alio et al., 2010). Preterm infants will be the recipient of the breast milk based on the mother's perceived benefits and barriers to breastfeeding. Moral support and educational tools from the medical staff could serve as the stimulus for action for these mothers to initiate breastfeeding their preterm infants.

Breastfeeding in African American Mothers and Preterm Births

Kelly et al. (2006) found that African American mothers were the least likely to initiate and continue breastfeeding their infants. Preterm infants are physiologically able to endure breastfeeding more than bottle-feeding (Hake-Brooks & Anderson, 2008). There have been many studies displaying the psychological, physical (Isaacson, 2006), and cognitive benefits (Wheeler, 2009) that breastfeeding provides for both mother and child during the first year of life (Hake-Brooks & Anderson, 2008). Breast milk from mothers of preterm infants given during the first 2 to 3 weeks of life provides protein that improves growth, decreases infection, protects against necrotizing enterocolitis, and

improves neurocognitive development (Arslanoglu, Moro, & Ziegler, 2009; Hake-Brooks & Anderson, 2008; Isaacson, 2006; Wheeler, 2009). However, preterm infants need the nutrients that breast milk provides to boost their immune systems more than term infants do (Edmond et al., 2006; Isaacson, 2006; Klein et al., 2008). This investigation focused on the relationship between the dependent variable breastfeeding and the independent variables sociodemographic factors of the mother as well as medical and obstetrical conditions of the mother. Table 3 provides a summary of the conceptual framework for this study.

Table 3

Applying the Key Components of the Health Belief Model (HBM) to a Mother of a Preterm Infant

Concepts of the HBM	Application of Concepts
Perceived susceptibility	What health risks do you think breastfeeding poses for you?
Perceived severity	What do you think will happen if you do not breastfeed?
Perceived benefits of action	How do you think you and your infant will benefit by breastfeeding?
Perceived barriers to action	What prevents you from breastfeeding?
Self-Efficacy (Cues to action)	What will motivate you to breastfeed?
(Self-Efficacy or confidence to make the change)	

Note. Source: Daddario, D.K. (2007). A review of the use of the Health Belief Model for weight management. *MEDSURG Nursing, 16* (6), 363-366.

Relationship Between Breastfeeding and Maternal Sociodemographics

For this investigation maternal sociodemographic factors included maternal race, maternal age, income level, type of payer source, and maternal education. In a study conducted in Israel at the Sheba Medical Center addressing births less than 32 weeks gestational age from January 2012 until August 2015, Pinchevski-Kadir et al. (2017) noted that sociodemographics contributed to breastfeeding duration among this population. This study included 162 mothers; about 28% had less than 12 years of education, the age range was from 31 to 38 years, and the income level was about equally distributed between low, middle, and high (Pinchevski-Kadir et al., 2017). Also, less than 50% of this study cohort breastfed for six months or more Pinchevski-Kadir et al., 2017). In a study done in Minas Gerais from 2010 to 2015 with 103 preterm infants more than 32 weeks gestation, Freitasa et al. (2015) focused on breastfeeding duration using a secondary referral service. This study cohort consisted of 36% of mothers with less than 12 years of education, the age range was from 25-32 years old, and the income level for about 53% of participants was low (Freitasa et al., 2015). This group averaged about five months of breastfeeding.

Relationship Between Race and Breastfeeding

Racial disparities continue to affect breastfeeding initiation and durations rates in the United States, with black mothers lagging in both (Howell, Bodnar-Deren, Balbierz, Parides, & Bickell, 2014). A study done on breastfeeding initiation and gestational weight again among Medicaid mothers in South Carolina from 2004 to 2013, found that the rate of breastfeeding for black mothers increased by about 7% compared to non-

Medicaid black mothers, suggesting that support programs for WIC could have contributed to this increase (Howell et al., 2014). These support measures included lactation consultants and breastfeeding counseling (Sonchak, 2017). There was no statistically significant difference observed among Medicaid white mothers (Howell et al., 2014). Alghamdi, Horodynski, and Stommel (2017) investigated 540 low income mothers from Michigan and Colorado focusing on breastfeeding rates of three races. This study showed that the breastfeeding rate was higher among Hispanic mothers than non-Hispanic African American mothers and non-Hispanic White mothers even though they had less maternal knowledge and self-efficacy in infant feeding than the other two groups of mothers. The authors suggested that the higher breastfeeding rate among Hispanics could be due to cultural expectations and familial support to breastfeed. Also, about 85% of the Hispanic mothers in this sample were unemployed (Alghamdi et al., 2017). Lundquist, Xu, Barfield, & Elo (2015) conducted a study using data extracted from PRAMS to compare breastfeeding rates from women of all races among military-affiliated and civilian mothers. There were 6,601 military-affiliated mothers and 306,808 civilian mothers in the study. Overall, military-affiliated mothers breastfed more than the same-race civilian mothers. Military-affiliated black mothers breastfed 14% more than black civilian mothers and military-affiliated white mothers breastfed 8% more than white civilian mothers (Lundquist et al., 2015). Among Hispanics, the rate of breastfeeding initiation and duration was about the same regardless of military or civilian affiliation. According to the authors, even though the military-affiliated mothers had positive breastfeeding initiation (17% more) and duration rates compared to civilian

mothers, the black-white gap was still present with white mothers breastfeeding for longer periods of time (Lundquist et al., 2015).

Relationship Between Race and Preterm Births

Preterm births remain prevalent among African American mothers in the United States. According to MacDorman (2011), preterm births in 2007 was higher among non-Hispanic African American, Puerto Rican, American Indian, Cuban, Central and South American, and Mexican women than non-Hispanic White women at 18.3%, 14.5%, 13.9%, 13.4%, 12.1%, and 11.9%, respectively. The preterm birth rate was lower than non-Hispanic White women (11.5%) for Asian or Pacific Islander women at 10.9%. Similar results were found in a study that used the Early Childhood Longitudinal Study – Birth Cohort, dating from January through December 2001 (Sparks, 2009). The sample size consisted of 9050 singleton births in the United States. Preterm births were higher among Native Americans and non-Hispanic African Americans at 22.86% and 15.76%, respectively. Foreign born Mexicans were 12.89%, U.S. born Mexicans 11.68%, and other Hispanics at 12.48% compared to non-Hispanic Whites at 9.79% (Sparks, 2009). It was also found that non-Hispanic African American mothers were 72% more likely to have a preterm infant than non-Hispanic White mothers. Transgenerational transmission of preterm births was observed in a Pennsylvania study consisting of 7235 linked mother infant births records from 1979 to 1998 for the mothers and from 2009 to2011 for the infants (Ncube, Enquobahrie, Burke, Ye, Marx, & Albert, 2017). The study found the most significant difference among non-Hispanic African American mothers of preterm infants. Non-Hispanic African American mothers who were born preterm were most

likely to have preterm infants. Also, compared to non-Hispanic White mothers (7.37%), non-Hispanic African American mothers (10.33%) were most likely to have a preterm infant whether they themselves were born term or preterm (Ncube et al., 2017).

Adverse Postnatal Outcomes of Preterm Infants

There are significant health consequences for preterm infants. Preterm infant health challenges include but are not limited to the following: neonatal hypoglycemia, polycythemia, feeding intolerance, fetal malnutrition, and necrotizing enterocolitis (Korkmaz, Teksam, Yurdakok, Yigit, & Tekinalp, 2011). Respiratory distress syndrome, bronchopulmonary dysplasia, and infections are additional health challenges that may affect preterm infants (Euser, deWit, Finken, Rijken, & Wit, 2008), in addition to diarrhea and sepsis (Hake-Brooks & Anderson, 2008). Late preterm infants (34-37 weeks gestational age) are susceptible to hyperbilirubinemia, and hypernatremia because of early hospital discharge and inconsistent and unestablished feeding practices (Kusuma, Agrawal, Kumar, Narang, & Prasad, 2009; Smith, Donze, & Schuller, 2007). Hypernatremic dehydration may occur during the first weeks of life because of an immature suck-swallow mechanism and increased fluid requirements (Kusuma et al., 2009). In addition, late preterm infants are subject to temperature instability and hypoglycemia (Kusuma et al., 2009). According to Hagen, Sadek-Badawi, Albanese, and Palta (2008), the major neonatal morbidity triggers are bronchopulmonary dysplasia , intraventricular hemorrhage , necrotizing enterocolitis , and retinopathy of prematurity .

Fetal malnutrition is an adverse outcome of preterm infants that should be found within the first days of life because it can cause sickness even though growth is present

(Korkmaz, Teksam, Yurdakok, Yigit, & Tekinalp, 2011). The combination of preterm births and fetal malnutrition contributes to an increase in morbidity and mortality for preterm infants (Korkmaz et al., 2011). The authors found that fetal malnutrition not only affects early and late postnatal outcomes but may also contribute to adult diseases such as insulin resistance and cardiovascular disease (Korkmaz et al., 2011). The target population was infants 28-34 weeks gestation and the study took place in a NICU in Turkey from June 2006 until December 2007 (Korkmaz et al., 2011). The instrument of choice was the clinical assessment of nutritional status score (CANSCORE); preterm infant scores <25 indicated malnourishment and scores of 25 or greater were well-nourished infants (Korkmaz et al., 2011). According to Korkmaz et al. (2011) of the 93 preterm infants included in the study 51 (54.8%) were malnourished. Furthermore, the malnourished group of preterm infants was more susceptible to other health conditions such as neonatal hypoglycemia, polycythemia, feeding intolerance, and necrotizing enterocolitis as a postnatal outcome (Korkmaz et al., 2011).

Positive neurodevelopmental outcomes decrease as preterm infants grow and develop yielding cognitive challenges and behavioral problems (Vanderveen, Bassler, Robertson, & Kirpalani, 2009). Neurodevelopmental challenges are significantly different between late preterm infants and term infants. According to Woythaler, McCormick, and Smith (2011), long-term outcomes of infants born at 34-36 weeks gestation are important because this is when significant brain development takes place. The results from their study confirmed that infants 34-36 weeks gestation have poorer neurodevelopmental outcomes and have an increased risk for physical and/or mental

developmental delays than term infants when evaluated at 24 months (Woythaler et al., 2011). In addition, these children have academic challenges and require special education (Woythaler et al., 2011).

Vanderveen et al. (2009) found that positive neurodevelopmental outcomes were in children born preterm up until 36 months old. The authors did a systematic review of randomized controlled trials of preterm infants involved with neurodevelopmental interventions at 12 months and older that included parental participation. Examples of interventions used were infant stimulation, developmental care, and parental education. Vanderveen et al. determined that positive neurodevelopmental outcomes were not present at five years of age.

Relationship Between Breastfeeding and Maternal Medical and Obstetrical Conditions

In my study maternal medical and obstetrical conditions include delivery by Caesarean section, other types of delivery, primiparity, number of previous live births, parity, previous preterm birth or low birth weight infant, and length of hospital stay for the infant. Pinchevski-Kadir et al. (2017) conducted a study at Sheba Medical Center in Israel and found that of the 162 mothers, 65% had a Caesarean delivery and this was a first child for 47% of the study cohort. The average age when infants were discharged from the NICU was 36 weeks gestational age (Pinchevski-Kadir et al.,). The Minas Gerais study consisted of 103 preterm infants ranging from 33-36 weeks gestational age, and the study cohort had a 66% Caesarean delivery rate (Freitasa et al. 2015). According

to Freitasa et al. (2015), preterm infants were discharged from the NICU as early as 34 weeks gestational age.

Racial and Ethnic Differences Regarding the Effects of Breastfeeding on the Adverse Postnatal Outcomes of Preterm Infants

For African American women, specifically, premature births are the leading cause of infant mortality (CDC, 2000). According to Kuehn (2006), preterm births among Asian and Pacific Islanders are at the low end of the range when comparing European Americans and African Americans at 10.5%, 11.5%, and 17.8%, respectively. The preterm birth rate in 2010 was 17.1% for non-Hispanic African American women, 10.7% for Asian/Pacific Islander women, 10.8% for non-Hispanic White women, 11.8% for Hispanic women, and 13.6% for American Indian/Alaska Native women (U.S. Department of Health and Human Services, 2013). Equally important, infants who are born late preterm (34-36 weeks gestation) are at increased risk for morbidity and mortality when compared to full term infants (U.S. Department of Health and Human Services, 2013). The U.S. Department of Health and Human Services (2013) confirmed that the preterm birth rate increased more than 20% from 1990 to 2006, going from 10.6% to 12.8%, but this rate declined in the four years since 2006.

Furthermore, the postnatal mortality rates in 2006 were higher for non-Hispanic African American infants (4.7deaths per 1000 live births) than for non-Hispanic White infants (1.9 deaths per 1000 live births) and Hispanic infants (1.7 deaths per 1000 live births) (U.S. Department of Health and Human Services, 2009). The infant mortality rate in 2006 was 13.8 deaths per 1000 live births for non-Hispanic African American infants,

5.6 deaths per 1000 live births for non-Hispanic White infants, and 5.5 deaths per 1000 live births for Hispanics (U.S. Department of Health and Human Services, 2009). The U.S. Department of Health and Human Services (2009) suggested that these rates were largely due to congenital anomalies (20%) and disorders related to preterm births (17%).

According to the U.S. Department of Health and Human Services (2013), the infant mortality rate represented a deficit in 2010 compared to the years 2009 and 2005. In 2010, the infant mortality rate was 6.2 deaths per 1000 live births (24,586 infants died before their first birthday) (U.S. Department of Health and Human Services, 2013). In 2009, the infant mortality rate was 3.8% more than in 2010 at 6.4 deaths per 1000 live births, and 10.5% from 2005 at 6.9 deaths per 1000 live births (U.S. Department of Health and Human Services, 2013).

The neonatal mortality rate was 4.1 deaths per 1000 live births and the postnatal mortality rate was 2.1 deaths per 1000 live births, representing 2/3 of infant deaths occurring before day 28 and 1/3 of infant deaths occurring between 28 days and 1 year (U.S. Department of Health and Human Services, 2013). The leading causes of neonatal mortality in 2010 were short gestation and low birth weight, maternal complications of pregnancy, and congenital malformations, postnatal mortality was due to Sudden Infant Death Syndrome (SIDS), congenital malformations, and unintentional injuries (U. S. Department of Health and Human Services, 2013). Likewise, the primary causes of infant mortality in 2010 were congenital malformations, disorders related to short gestation and low birth weight, and SIDS (U. S. Department of Health and Human Services, 2013).

The decline of infant mortality rates has been steady for the exception of the years 2000 to 2005; during these years, an increase in preterm births was evident (U. S. Department of Health and Human Services, 2013). The increase in infant survival is a result of improved nutrition, improved sanitation, enhanced care, improved economic growth, and advanced clinical medicine. The infant, postnatal, and neonatal mortality rates by race and ethnicity in 2008 represent a significant disparity. The overall infant mortality rate was 12.7 deaths per 1000 live births for non-Hispanic African American mothers and 5.5 deaths per 1000 live births for non-Hispanic White mothers. The post neonatal mortality rate was 4.4 deaths per 1000 live births for non-Hispanic African American mothers and 2.0 deaths per 1000 live births for non-Hispanic White mothers; the neonatal mortality rate was 8.3 deaths per 1000 live births for non-Hispanic African American mothers and 3.5 deaths per 1000 live births for non-Hispanic White mothers (U.S. Department of Health and Human Services, 2013). Thus, most of the infant mortality disparity gap between non-Hispanic African Americans and non-Hispanic Whites is due to complications related to preterm births (U.S. Department of Health and Human Services, 2013).

According to DHEC (2010), South Carolina has one of the highest rates of infants born too small and too soon in the United States. Furthermore, about 11.2% of infants born in South Carolina were born before 37 weeks gestation (SCDHEC, 2007). In South Carolina, the rate of premature births among non-Hispanic African American women is almost twice the rate of non-Hispanic White women at 14.8% and 7.2%, respectively (SCDHEC, n.d.). Non-Hispanic African American infants born in South Carolina are

almost twice as likely to weigh less than 5.5 pounds at birth than non-Hispanic White infants, and this has been the trend since 1990 (SCDHEC, n.d.).

Late preterm infants are at an increased risk for respiratory distress, temperature instability, apnea, high bilirubin levels, and high blood sugar than term infants (SCDHEC, 2011). The rate of late preterm births in South Carolina went from 5.8% of all births in 1989 to 7.9% of all births in 2005; this rate dropped to 7.1% in 2009. In South Carolina, from 2006 to 2009, more than 72% of all preterm births consisted of late preterm infants, and, more than 18% of these infants were in the NICU (SCDHEC, 2011). Even though the rate of late preterm births in South Carolina experienced a decrease since 2005, this population makes up most all preterm infants in NICUs and thus remains a significant public health problem.

Breastfeeding is significant in the growth and development of term and preterm infants during the first year of life. Non-Hispanic African American women are the least likely to breastfeed their babies during the first year of life. Among South Carolina's children that were born in 2005, only 66.8% were ever breastfed and 11.8% were exclusively breastfed for the first six months of life (Kaiser Family Foundation, 2008). Infants fed breast milk have fewer health challenges than infants that are not. Preterm infants fed breast milk have stronger immune systems and a reduced length of stay in NICUs. According to Colaizy and Morriss (2008), breastfeeding not only decreased adverse health outcomes such as necrotizing enterocolitis in preterm infants, but it also decreased hospital stays. The U.S. Department of Health and Human Services (2009) confirmed that in 2007 about 55.5% of non-Hispanic African American infants were least

likely to receive breast milk. If more preterm infants received breast milk, the incidence of adverse postnatal outcomes would decrease, and the health status of these infants would increase.

More research is necessary on racial and ethnic disparities associated with preterm deliveries. African American infants have higher mortality rates from preterm and low birth weight births than any other race in the United States (Alio et al., 2010). Although breast milk improves postnatal outcomes for preterm and term infants, African American infants are the least likely to be recipients of breast milk (Alio et al., 2010). Most infants of multiethnic origin that are the recipients of high intensity breastfeeding have mothers that are older, born outside of the United States, and are multiparous (Freeman, Bonuck, & Trombley, 2008). The effects of breastfeeding on the adverse postnatal outcomes of African American preterm infants without comparisons to other groups need further exploration. My study will examine the factors affecting breastfeeding in preterm infants.

Relationship Among Feeding Methods, Short-Term Health Outcomes, and Long-Term Health Outcomes of Preterm Infants

Breastfeeding may begin in preterm infants as early as 30 weeks gestational age (Pineda, Foss, Richards, & Pane, 2009). Early breastfeeding may result in less retinopathy of prematurity (Pineda et al., 2009). Breast milk also has a positive effect on the developmental outcomes of the brain, the eyes, and the gastrointestinal tract compared to formula, and thus breastfeeding contributes to improved cognitive development (Wheeler, 2009). In addition, Pickler, Best, and Crosson (2009) confirmed

that the amount of time spent in NICUs is one of the indicators of poor developmental outcomes in preterm infants. This is significant because the neurological system coordinates breathing, sucking, and swallowing mechanisms (Pickler et al., 2009). Furthermore, proper feeding skills are important for both short-term and long-term development (Pickler et al., 2009).

Preterm infants receiving breast milk are less likely to become obese or overweight. Ahmed and Sands (2010) evaluated breastfeeding outcomes and weight gain outcomes among premature infants 26-37 weeks gestational age from randomized controlled trials and clinical trials at various locations: United States (3), Canada (1), New Zealand (1), and Australia (1). Pre- and post-discharge interventions increased maternal satisfaction, breastfeeding exclusivity, and breastfeeding duration; there was no indication of weight gain observed (Ahmed & Sands, 2010).

Feeding methods directly affect health outcomes of preterm infants. Short-term health outcomes include fewer otitis media episodes, less allergies, fewer diarrheal illnesses (such as inflammatory bowel disease), and sudden infant death syndrome; long-term health outcomes for breastfed preterm infants include improved lipid profiles (Nye, 2008), a lower risk of blood borne cancers, diabetes, asthma (Pineda, Foss, Richards, & Pane, 2009; Wheeler, 2009), and hypercholesterolemia (Wheeler, 2009). Esophageal acid exposure is more frequent in formula fed infants than breastfed infants (Bhatia & Parish, 2009). Gastroesophageal reflux may occur in infants as vomiting and can progress to gastroesophageal reflux disease (GERD) leading to chronic respiratory disorders. A change in formula is a common protocol, but this does not benefit most infants (Bhatia &

Parish, 2009). According to Pineda et al. (2009), bottle-feeding caused more stress for preterm infants than breastfeeding.

Breast milk is more beneficial for preterm infants than formula due to its immunologically active components and it is easily digested (Pineda et al., 2009). Furthermore, feedings that include several types of formula do not significantly affect short-term or long-term health outcomes of preterm infants. In a randomized controlled trial study of infants less than or equal to 32 weeks gestation, two types of formula with different amounts of protein used to compare feeding tolerance, nutritional intake, and growth revealed no differences in the categories (Florendo, Bellflower, Zwol, & Cooke, 2009). However, differences were significant in albumin, total serum proteins, and blood urea nitrogen. Zachariassen et al. (2011) acknowledged from their prospective study that a higher protein intake in preterm infants was the result of growth and a higher serum urea nitrogen level. A cohort of 320 very preterm infants that ranged in gestational age from 24-32 weeks were randomly grouped into three categories after hospital discharge, those exclusively breastfed, those receiving breast milk with a multinutrient human milk fortifier, and those receiving only formula (Zachariassen et al., 2011). Zachariassen found that the milk fortifier added to breast milk did not improve weight, length, or head circumference significantly during the first year of life compared to the exclusively breastfed group of very preterm infants.

The earlier breastfeeding begins, the earlier preterm infants may benefit (Montgomery et al., 2008). Feeding practices in the NICU are crucial to immediate and long-term health outcomes of preterm infants because human milk feedings reduce

infections, decrease infant mortality rates, and promote earlier discharge (Montgomery et al., 2008). The effects of an intervention program at the NICU of the McKay-Dee Hospital in Ogden, Utah called the "BEST Program" (Breast Milk Early Saves Trouble) was tested by comparing feeding related outcomes before and after the implementation of the program (Montgomery et al., 2008). The target population was all infants admitted to the NICU (birth weight < 2 kg) from January 1, 2005 until December 31, 2006. This retrospective study used data form medical records which contained initial feeding methods, birth weight, gestational weight, race, gender, Apgars, length of hospital stay, discharge weight, and feeding method when discharged. Montgomery et al. (2008) concluded that the earlier and more frequent preterm infants received breast milk feedings during the first week, the earlier the infants left the hospital. More mothers decided to breastfeed their preterm infants exclusively during the first week, more infants had human banked milk, and more infants were home breastfeeding after an early discharge (Montgomery et al., 2008). The "BEST Program" was not connected with a lower incidence of necrotizing enterocolitis, bacterial or fungal sepsis, length of hospital stay or discharge weight (Montgomery et al., 2008).

Significance of Using Retrospective Secondary Analysis of Data Such as the Pregnancy Risk Assessment Monitoring System

PRAMS had its development back in 1987 to supplement state records and vital statistics data (Cubbin et al., 2008). PRAMS is an ongoing population-based surveillance tool that randomly sends surveys to women with live births within any of the participating states (Liu, Smith, Dobre, & Ferguson, 2009; Tran, Rosenberg, & Carlson,

2010; Whitehead, Callaghan, Johnson, & Williams, 2009). PRAMS is an instrument used to inform about the attitudes, behaviors, and experiences of mothers before, during, and after pregnancy; this is a collaborative effort of the CDC and the local health departments in each participating state (Colaizy & Morriss, 2008).

This study showed the correlation between breastfeeding and gestational age from 2000 to 2003 among 27 participating states. Colaizy and Morriss (2008) found that preterm infants born at 32-34 weeks gestation were 13% less likely to receive breast milk for four weeks and infants born at 35-37 weeks gestation were 22% less likely to receive breast milk for four weeks. The PRAMS survey is significant for establishing new protocols for intervention and prevention strategies for improved quality of health for mothers and infants. The goal is to decrease morbidity and mortality rates while increasing health related quality of life measures. The PRAMS survey is also useful for initiating institutional policy changes. A study using the Oregon PRAMS data from 2000-2001 found a relationship between exclusive breastfeeding and commercial hospital discharge formula packs (Rosenberg, Eastham, Kasehagen, & Sandoval, 2008). The authors did an investigation on the effect of formula packs received upon hospital discharge on breastfeeding duration. Rosenberg et al. (2008) noted that exclusive breastfeeding that began before hospital discharge ceased in less than 10 weeks after discharge because of the formula packs. Hence, Rosenberg et al. concluded that commercial discharge packs had a negative effect on the duration of exclusive breastfeeding practices.

Secondary retrospective data analysis is useful in multilevel relationships. South Carolina PRAMS surveys from 2000 to2003, used a cross-sectional design and conveyed the relationship between maternal social support, neighborhood income inequality, and birth outcomes (preterm or low birth weight) (Nkansah-Amankra, Dhawain, Hussey, & Luchok, 2010). The authors found that neighborhood deprivations due to income inequality and a lack of maternal social support gave rise to low birth weight infants and preterm births. PRAMS is also useful for relating birth outcomes to maternal smoking behavior and neighborhood context in a multilevel analysis (Nkansah-Amankra et al., 2010). The instrument of choice was the South Carolina PRAMS survey, 2000 to2003, and Nkansah-Amankra et al. (2010) found that maternal smoking consistently affected low birth weight birth outcomes more than preterm birth outcomes. In addition, Nkansah-Amankra et al. discovered that women living in African American disadvantaged neighborhoods were more likely to deliver prematurely. Interventions can be initiated that will support and educate mothers about the risks and challenges of preterm births, the risks of maternal smoking, and the affect environment has on birth outcomes (Nkansah-Amankra et al., 2010).

Summary and Conclusions

A thorough search of the literature revealed that there were numerous studies done on attitudes and experiences of mothers and breastfeeding initiation, duration, and practices of term infants, but few on factors affecting preterm infants that were breastfed in the NICU. One such study used breastfeeding as the exposure and the outcome was infant illness visits (Freeman, Bonuck & Trombley, 2008). It was a secondary analysis of

data from a randomized clinical trial of low-income, primarily Hispanic and African American women (255 mother /infant dyads) from two Bronx, NY medical center affiliated health centers. Freeman et al. (2008) did this study from August 1, 2000 until November 30, 2002, when they looked at the "dose response" relationship between breastfeeding and infant illness. There was an emphasis on postnatal outcomes after discharge, in addition, there were relevant ethnographic studies done on the feeding beliefs of African American mothers. There were also significant observations written on the practices and policies within the NICU and the Baby Friendly Health Initiative. The sociodemographic factors of mothers as well as maternal medical and obstetrical conditions and the connection to breastfeeding preterm infants needed further exploration.

The South Carolina PRAMS provided both quantitative and qualitative data on maternal behaviors and risk factors before, during, and after pregnancy that were imperative to improving the quality of life of both mother and child (Liu et al., 2009; SCDHEC, 2010). This data were representative of all births in South Carolina, whether the birth took place in a hospital or not. Data collection began 2-6 months after the birth of the infant (Nkansah-Amankra et al., 2010). There are 37 states, including South Carolina, that regularly participate in PRAMS. Chapter 3 will further explain the significance of using PRAMS for this population and will focus on how the research design, target population, research instruments, and the protocol for carrying out the investigation will interconnect together to form the methodology.

Chapter 3: Research Method

I used quantitative methodology to examine the relationship between breastfeeding and maternal sociodemographic factors as well as maternal medical and obstetrical conditions for preterm infants 32 to below 37 completed weeks gestation in South Carolina from 2009 to 2011. This cross-sectional study included secondary data extracted from the South Carolina Pregnancy Risk Assessment Monitoring System to compare preterm infants who were breastfed with preterm infants who were not breastfed, controlling for maternal sociodemographic factors and maternal medical and obstetrical conditions. These preterm infants were also compared by race. This chapter includes a description of the research design, target population, research instruments, and the protocol for carrying out the investigation. The methods sections provides an assessment of the significance of retrospective and secondary analysis. In the first two sections, I reiterate the purpose of the study and summarize the research design chosen for the study. A probability sampling design was appropriate to avoid sampling bias (see Babbie, 2010). The third section addresses the research setting and the target population, and the next section includes the research questions and hypotheses. The fifth section addresses the research instruments, data abstraction, and data analysis. The quantitative data were obtained from an existing source to form the basis for my analysis. This chapter concludes with an overview of the importance of this research design to this study.

Purpose of the Study

A quantitative approach was used to examine the association between breastfeeding and maternal sociodemographic factors as well as maternal medical and obstetrical conditions among preterm infants born at 32 to below 37 weeks gestational age in NICUs in South Carolina. These preterm infants were examined by race. The aim was to assess maternal factors that may affect breastfeeding in preterm infants. Admission to the NICU was the prime requirement for this population; other infant factors included gestational age, birth weight, and gender. Gestational age was from the last menstrual period or the clinical estimate of the last menstrual period. The comparison was based on preterm infants receiving breast milk and infants not receiving breast milk. Variables for this analysis were abstracted from the PRAMS data set.

I examined sociodemographic factors of the mother and medical and obstetrical conditions of the mother as they related to breastfeeding in preterm infants. Sociodemographic factors included maternal race, maternal age, income level, type of payer source, and maternal education. Medical and obstetrical conditions of the mother included delivery by Caesarean section, other types of delivery, primiparity, the number of previous live births the mother had, parity, previous preterm birth, previous low birth weight infant the mother delivered, and the length of hospital stay for their infant. Breastfeeding has been known to improve health for newborn infants, and more so for preterm infants who are at risk for infections (Levy et al., 2009). Breast milk offers immunity, which helps reduce infections in infants such as urinary tract infections (Levy et al., 2009), bacterial meningitis (Wheeler, 2009), and necrotizing enterocolitis (Colaizy

& Morriss, 2008; Isaacson, 2006; Puntis, 2006; Wheeler, 2009), and improves feeding tolerance and enhanced neurodevelopment (British Columbia Reproductive Care Program, 2001). Preterm infants who were breastfed in the NICU were also discharged from the hospital sooner than those who were not breastfed (Colaizy & Morriss, 2008) and had lower rates of rehospitalization after discharge (Mulready-Ward & Sackoff, 2013). Breastfeeding within the first hour after birth decreased neonatal mortality (Bhutta et al., 2008; Edmond et al., 2006; Mullany et al., 2008). According to Frost, Jilling, Lapin, Maheshwari, and Caplan (2014), breast milk contains growth factors and bioactive constituents that may provide protection from many neonatal and postnatal infections.

Research Design

This design includes a cross-sectional design and secondary data analysis from SCPRAMS. According to the SCDHEC (2010), the SCPRAMS is a population-based surveillance system used to monitor maternal experiences, behavior, and other risk factors that are imperative before, during, and after pregnancy. The survey begins 2-6 months after delivery, the obtained information is combined with data from the birth certificates, and specific weightings correspond to each mother who had a live birth in South Carolina (Nkansah-Amankra et al., 2010). This surveillance system is imperative for answering questions that researchers may ask about the associations and benefits of breastfeeding for both women and infants. The SCPRAMS was economical, convenient, and accessible, and it provided adequate data for this study. Descriptive and inferential statistics were used to analyze the data.

A retrospective or existing database cross-sectional study was appropriate for this study because the outcomes had already occurred. The aim was to examine the association between breastfeeding and sociodemographic factors of the mother as well as medical and obstetrical conditions of the mother on the target population (preterm infants 32 to below 37 weeks gestational age). Racial comparisons were made, with special emphasis on African American breastfeeding practices. The independent variables were sociodemographic factors of the mother and medical and obstetrical conditions of the mother, and the dependent variable was breastfeeding. Infant anthropometric measures such as weight, length, and head circumference were also examined as they related to breastfeeding.

Research Setting and Population

The target population for this investigation was all preterm infants. In this population, non-Hispanic African American women have a higher percentage of low birth weight infants (13.8% in 2007) compared to other races in the United States (U.S. Department of Health and Human Services, 2009). The research population in this analysis was infants born at 32 to below 37 weeks gestational age from South Carolina hospitals between January 1, 2009 and December 31, 2011. Data were compiled from seven NICUs in South Carolina. The infants, who were 2 to 6 months old, came from a stratified random sampling taken from South Carolina birth certificates, which consisted of approximately 2,300 mothers (SCDHEC, 2010). Surveys of about 77 questions were mailed to addresses provided at birth. The surveys had a 65% response rate. These data formed the Pregnancy Risk Assessment Monitoring System.

This investigation concentrated on singleton births of all women in South Carolina from 2009 to 2011. The following exclusions applied to this investigation:

- infants with chromosomal abnormalities (Down Syndrome, Edward's Syndrome),
- infants with diagnosed Grade III or IV cerebral hemorrhage,
- infants who were being ventilated,
- infants with congenital anomalies that might interfere with breastfeeding (congenital heart defect, spina bifida, cleft lip, or cleft palate),
- multiple births (twins, triplets, quadruplets),
- infants with neurological deficits (cerebral palsy), and
- infants with hypoxia or ischemia characterized by an Apgar Score < 5 at 5 minutes.

The minimum sample size for this study was dependent on three factors (see Smith, 2013):

1. population size: the total number of preterm infants born at 32 to below 37 weeks gestational age from 2009-2011 who were physically able to breastfeed;
2. margin of error (confidence interval): the percentage that the sample mean may fall higher or lower than the population mean;
3. confidence level: how close the actual mean falls within the confidence interval; and
4. standard deviation: the amount of variance in the responses received.

EPI Info version 7.2.2.2 was used to calculate the sample size. I used a total of 1,486 mothers of preterm infants 32 to under 37 weeks gestational age, with 743 mothers who breastfed and 743 mothers who did not breastfeed, and a ratio of 1:1 for control to cases. The sample size was determined using an odds ratio of 1.37, 80% study power, 95% confidence interval, and 37.0% as the prevalence of breastfeeding preterm infants 32 to under 37 weeks gestational from 2009-2011 in South Carolina (Figure 2). A literature review for similar studies revealed a sample size range from 103 to 1,488. A 25% contingency plan estimation for potential loss to follow-up was considered. Mothers were selected by stratified random sampling to create data for SCPRAMS. The aim was to examine the relationship between breastfeeding and confounding factors such as maternal sociodemographics and maternal and obstetrical conditions. Another way to determine approximate sample size was to use the data in Table 4 from SCDHEC as a reference. This table includes some of the indicators such as insurance payer source and breastfeeding information to categorize respondents by race during a specified period.

Unmatched Case-Control Study (Comparison of ILL and NOT ILL)

Two-sided confidence level:	95%
Power:	80 %
Ratio of controls to cases:	1
Percent of controls exposed:	30 %
Odds ratio:	1.37
Percent of cases with exposure:	37.0 %

	Kelsey	Fleiss	Fleiss w/ CC
Cases	715	714	743
Controls	715	714	743
Total	1430	1428	1486

Figure 2. Sample size calculation using EpiInfo 7.2.2.2 comparing breastfed preterm infants and preterm infants who were not breastfed.

Table 4

Sample Size Calculation Estimate 2004-2010

Indicator	White	Black	Other
Breastfeeding information	185406	110075	30831
NICU/LBW	5710	4578	698
Payment – other	3955	1480	2416
Champus	6726	2335	1471
Military	6463	1795	1179
Health insurance	119779	23135	8847
Self-pay	51577	5761	4266
Medicaid	101199	101993	21868
Breastfed>1 week	147649	51615	30335
Breastfed>1 month	114744	33385	24065

Note. Source: South Carolina DHEC SCPRAMS SCAN 2004-2010.

Furthermore, this study included vital maternal factors and infant factors for preterm infants. Table 5 provides the average demographics of the target population (all preterm infants) and maternal demographic features.

Table 5

Summation of Maternal and Infant Demographics

Maternal factors	Infant factors
Number of mothers	Singleton birth (n, %)
Maternal age (median years, range)	Female (n, %)
Vaginal delivery	Male (n, %)
Cesarean section delivery	Birth weight (mean kilograms, range)
Primiparity	Gestational age (mean weeks, range)
Educational level (median years, range)	Average number of weeks early
Form of health insurance payer source	

Note. Source: South Carolina Pregnancy Risk Assessment Monitoring System

A substantial number of infants born prematurely have low birth weight and are in NICUs (SCDHEC, Division of Biostatistics, PHSIS, 2011). Table 6 shows the proportion of infants weighing less than 2500 grams from 2004-2008 in South Carolina.

Table 6

Proportion of Infants Who Stayed in a Neonatal Intensive Care Unit by Birthweight, 2004-2008 (Low Birthweight = <2500 grams)

Year	Percentage of infants
2004	51.7
2005	49.9
2006	47.5
2007	46.6
2008	46.1

Note. From 2004 through 2008, the proportion of low birthweight infants who stayed in the NICU fluctuated between 51.7% and 46.1%. Source: Division of Biostatistics, PHSIS, SCDHEC

Research Questions and Hypotheses

I examined the associations between breastfeeding and maternal sociodemographic factors as well as maternal medical and obstetrical conditions for preterm infants in South Carolina born to women of all races. My study was directed by two research questions:

RQ1: Is there an association between breastfeeding and sociodemographic factors including maternal race, maternal age, income level, type of payer source, and maternal education among preterm infants 32 to below 37 weeks gestational age during 2009-2011?

H_o1: There is no association between breastfeeding and sociodemographic factors including maternal race, maternal age, income level, type of payer source, and maternal

education among preterm infants born at 32 to below 37 weeks of gestation during 2009-2011.

H_a1: There is an association between breastfeeding and sociodemographic factors including maternal race, maternal age, income level, type of payer source, and maternal education among preterm infants born at 32 to below 37 weeks of gestation during 2009-2011.

RQ2: Is there an association between breastfeeding and medical and obstetrical conditions of the mother including delivery by Caesarean section, other types of delivery, primiparity, number of previous live births, parity, previous preterm birth or low birth weight infant, and length of hospital stay for the infant among preterm infants 32 to below 37 weeks gestational age during 2009-2011?

H_o2: There is no association between breastfeeding and medical and obstetrical conditions of the mother including delivery by Caesarean section, other types of delivery, primiparity, number of previous live births, parity, previous preterm birth or low birth weight infant, and the length of hospital stay for the infant among preterm infants 32 to below 37 weeks gestational age during 2009-2011.

H_a2: There is an association between breastfeeding and medical and obstetrical conditions of the mother including delivery by Caesarean section, other types of delivery, primiparity, number of previous live births, parity, previous preterm birth or low birth weight infant, and length of hospital stay for the infant among preterm infants 32 to below 37 weeks gestational age during 2009-2011.

The health belief model (HBM) was adopted as the conceptual framework for this study. The HBM established a relationship between the sociodemographic factors of the mother as well as medical and obstetrical conditions of the mother with regards to breastfeeding. The HBM focused on perceived susceptibility, perceived severity, perceived benefits, perceived barriers, prompts to action and self-efficacy (Daddario, 2007). In this case, perceived susceptibility involved the mother's concerns about personal health risks. Perceived severity explored what will happen if she does not breastfeed. Perceived benefits of action addressed the positive outcomes of breastfeeding for mother and infant. Perceived barriers to breastfeeding of the mothers may be due to her sociodemographic status or based on her medical and obstetrical condition during pregnancy and after birth of the infant, which may lead to insufficient milk production. Perceived barriers to breastfeeding for the infant include being preterm, which could result in the failure or the inability to latch on properly. Self-efficacy was obtained through increased breastfeeding knowledge and support from mass media, the Internet, family, friends, the medical staff, and other support groups.

Research Instruments/Data Collection

SCPRAMS is a continuing, statewide, population-based surveillance system that gathers information on new mothers' practices and experiences before, during, and after pregnancy. South Carolina was a part of the CDC's multistate PRAMS program since 1991. SCPRAMS meets approval by the Institutional Review Boards at SCDHEC and the CDC, and, participating women provided informed consent. My study was not conducted until approval was received by the Institutional Review Board at Walden University. The

Institutional Review Board approval number for this study is 02-02-15-0078719. This information was instrumental in determining survival analysis among this population. Secondary data from SCPRAMS in combination with the Office of Research and Statistics at DHEC included the following maternal information:

- maternal age,
- maternal education,
- maternal race,
- income level,
- type of delivery (Caesarean section, vaginal, other),
- primiparity,
- number of previous live births,
- parity,
- previous preterm birth or low birth weight infant,
- length of hospital stay for the infant, and
- form of health insurance payer source.

Table 7 below represents significant factors for both infants and their mothers that built the foundation for a relationship between the dependent variable breastfeeding and the independent variables maternal sociodemographic factors as well as maternal medical and obstetrical conditions. The health status factors of the infant determined the feeding pattern.

Table 7

Maternal and Infant Factors of Preterm Infants

Maternal factors	Infant factors
Age	Gestational age
Race	Number of weeks early
Education	Gender
Income level	Neonatal intensive care unit
Type of health insurance payer source	Length of hospital stay
Delivery by Caesarean section	Year of birth
Other types of delivery	
Primiparity	
Number of previous live births	
Parity	
Previous preterm birth or low birth weight infant	

Note. Source: South Carolina Pregnancy Risk Assessment Monitoring System

Table 8 highlights some of the critical questions found in the SCPRAMS survey. The questions relate to the dependent variable breastfeeding with a focus on the target population.

Table 8

Critical Questions for the Study That Are Part of the SCPRAMS Survey

Variables	Exact wording of Question	Options
Length of hospital stay for the infant	After your baby was born how long did he or she stay in the hospital?	Less than 24 hours 24-48 hours 3 to 5 days 6 to 14 days More than 14 days My baby was not born in a hospital My baby is still in the hospital
Breastfeeding	Did you ever breastfeed or pump breast milk to feed your new baby after delivery? Even for a short period of time?	No Yes
Breastfeeding	Are you currently breastfeeding or feeding pumped milk to your new baby?	No Yes
Breastfeeding	How many weeks or months did you breastfeed or pump milk to feed your baby?	# of Weeks # of Months Less than 1 week

Note. Source: South Carolina Pregnancy Risk Assessment Monitoring System.

Independent Variables

Independent variables influence or correlate with dependent variables. As stated earlier, the independent variables for this study include the following:

1. Sociodemographic factors of the mother
2. Medical and obstetrical conditions of the mother

Sociodemographic factors of the mother are the independent variables for the first research question, and include maternal race, maternal age, income level, type of payer source, and maternal education among preterm infants 32 to below 37 weeks gestational

age. Medical and obstetrical conditions of the mother are the independent variables for research question two and include delivery by Caesarean section, other types of delivery, primiparity, number of previous live births, parity, previous preterm birth or low birth weight infant, and the length of hospital stay for the infant. Thus, the independent variables maternal sociodemographic factors as well as maternal medical and obstetrical conditions were hypothesized by associations to influence breastfeeding.

Dependent Variables

Dependent variables are the outcomes or results of the effects of independent variables. The research questions for my study have breastfeeding as the dependent variable. The early initiation of breastfeeding referred to the start of breastfeeding during the first 10 weeks of life. Exclusive breastfeeding referred to feedings with breast milk only, partial breastfeeding referred to breast milk plus formula, and exclusive formula feedings were not supplemented with breast milk. Breast milk feedings may be from the breasts or a bottle. This early feeding also included expressed breast milk for tubal feedings and exclusive breastfeeding also included breast milk plus vitamin D supplementation. Breastfeeding duration was the length of time breastfeeding occurred during the first 10 weeks of life.

Statistical Analysis

Binary logistic regression and multivariable logistic regression were used for inferential and statistical analysis. This analysis included data from January 1, 2009 through December 31, 2011 and required the use of SPSS software for this data set. This software was user-friendly and aided with the statistical analysis of related data from one

or more years of survey data (SCDHEC, 2010). Cross tabulations using chi square analyses was done to determine the initial statistically significant associations between the dependent and independent variables. A possible implication of the findings was to discover maternal factors that may affect breastfeeding among preterm infants by increasing knowledge and support of the mothers, while decreasing morbidity and mortality rates for infants. This data served as physical evidence to initiate appropriate and effective nutritional management interventions that were not culturally biased, but universal for all preterm infants.

Chi-square tests are for associations between groups (Creswell, 2009). Chi-square tests are for preliminary analyses of the degree of relationships between groups. Chi-square tests involve dependent and independent variables and describe the strength of a relationship. The independent variables for this study were sociodemographic factors of the mother as well as medical and obstetrical conditions of the mother. The strength of the relationship was displayed using crude odd ratios, adjusted odds ratios, and the corresponding confidence intervals for both the dependent and independent variables. Logistic regression relates the independent and dependent variables because regression is more about associations than differences (Creswell, 2009). Logistic regression defined the dependent variables and made outcome predictions while controlling for other variables. Logistic regression described the strength of the relationship between breastfeeding and maternal sociodemographic factors as well as maternal medical and obstetrical conditions.

Ethical Considerations

The goal of this study was to use secondary data from SCPRAMS contingent upon the approval of the IRB from Walden University. The aim was to use this data to promote awareness of a growing health disparity that affects breastfeeding preterm infants in South Carolina. The numeric codes originally assigned to de-identify and protect the identity of the women surveyed remained. The information obtained contributed to the statistical analysis of my study and to address the research questions. I stored and protected the data obtained from outside use on a password protected personal computer with internal and external hard drives. Thus, the intentional misuse and abuse of this information for non-scientific purposes beyond the realms of this study were not acceptable. Patient confidentiality was at the forefront of this investigation.

Summary

In conclusion, it was vital that these statistics inform policy on the state and local levels to provide needed interventions that would improve maternal and child health. These findings also communicate on a national level the perceived needs and the actual receipt of health services and other interventions to address these needs of mothers and their infants. The data used in this investigation focused on factors that may affect breastfeeding preterm infants. Preterm infants receiving breast milk were compared to those infants not receiving breast milk. The relationship of feeding methods, weight gain, and length of hospital stay were imperative to both maternal sociodemographic factors as well as maternal medical and obstetrical conditions. This data would aid in the

improvement of current interventions and the development of new ones that would provide greater nutritional management and lactation support in and out of the NICU.

Chapter 4: Results

Chapter 4 contains the results of this cross-sectional study using existing data from the South Carolina Pregnancy Risk Assessment Monitoring System (SCPRAMS). The purpose of the data analysis was to examine maternal sociodemographic factors and maternal medical and obstetrical conditions as they related to breastfeeding preterm infants. The study was guided by two research questions with corresponding hypotheses to investigate the relationship between maternal sociodemographic factors as well as maternal medical and obstetrical conditions and breastfeeding of preterm infants of all races in South Carolina. There is a high rate of preterm and low birth weight infants born to non-Hispanic African American women, and these infants frequently have compromised immune systems (SCDHEC, 2011). According to the SCDHEC (2010), 85% of women receiving prenatal care in South Carolina received information about breastfeeding in 2008 during their prenatal visits. However, the rate of breastfeeding and duration among this group of women is low because of decreased health literacy and a lack of multilevel support (SCDHEC, 2010). This has widened the gap and created a great health disparity within communities. General descriptions in composite tables, frequency distribution tables, demographic tables, and crude and adjusted odds ratio tables are included in the data collection and data analysis sections. I also provide a summary of the significant findings and a concluding overview of the data set.

Data Collection and Analysis

The target population included all preterm infants delivered at 32 to below 37 weeks gestational age in South Carolina. Preterm infants who were breastfed were

compared to preterm infants who were not breastfed of the same gestational ages admitted to NICUs in South Carolina hospitals from January 1, 2009 to December 31, 2011. These infants were also compared by race. These data were compiled from seven NICUs in South Carolina and excluded multiple births, infants with chromosomal abnormalities, infants with Grade III or IV cerebral hemorrhage, infants with congenital anomalies that may interfere with breastfeeding, infants with neurological deficits, infants with hypoxia or ischemia characterized by an Apgar Score < 5 at 5 minutes, and infants who were being ventilated.

According to the South Carolina Department of Health and Environmental Control (SCDHEC, 2011), in 2009 there was an average of 172 live births recorded with 21 infants born less than 37 weeks gestational age and 18 infants born with low birth weight (LBW; < 2,500 grams). Approximately 60 infants were born to non-Hispanic African American mothers, and 95 were born to non-Hispanic White mothers. On an average day in 2011, there were 157 live births born to South Carolina resident mothers with 18 infants born at less than 37 weeks of clinical gestation and 15 infants born with LBW (SCDHEC, 2013). About 50 infants were born to non-Hispanic African American mothers, and 90 infants were born to non-Hispanic White mothers. According to SCPRAMS (2009-2011), 5812 mothers reported birth weight, and only 9 were missing. The mean birth weight was 1974 grams with a minimum of 85 grams and a maximum of 5320 grams. The findings in this chapter are presented in three sections: (a) the general distributions of births for different categories in Tables 9 to 17, (b) Research Question 1 in Tables 18 to 21, and (c) Research Question 2 in Tables 22 to 23.

General Distributions of Deliveries in South Carolina 2004 to 2009

Distributions of birth by year and race for all deliveries occurring in South Carolina from 2004 through 2009 are presented in Table 9, preterm births under 37 weeks of gestation are presented in Table 10, and low birth weight births are presented in Table 11. According to the PRAMS data set, distribution of all births by race and for preterm births 32 to under 37 weeks of gestation are presented in Table 12, and preterm births 32 to under 36 weeks are presented in Table 13. Table 9 represents the annual live births from 2004 to 2009 in South Carolina. The table includes the number of live births from both non-Hispanic African American women and non-Hispanic White women. During this time frame, the number of live births of non-Hispanic White women was almost double the number of live births of non-Hispanic African American women.

Table 9

South Carolina Annual Live Births of Non-Hispanic African American Mothers and Non-Hispanic White Mothers 2004-2009

Year	Total Deliveries All Races	Non-Hispanic African American n (%)	Non-Hispanic White n (%)	Other n (%)
2004	56,543	18,405 (33)	36,872 (65)	1211 (2)
2005	57,538	18,793 (33)	37,367 (65)	1287 (2)
2006	62,191	20,723 (33)	39,950 (64)	1404 (2)
2007	62,933	20,868 (33)	40,641 (65)	1391 (2)
2008	63,077	20,914 (33)	40,713 (65)	1407 (2)
2009	60,682	19,838 (33)	39,348 (65)	1446 (2)

Note. Source: Division of Biostatistics, PHSIS, SCDHEC

Table 10 displays the percentage of live births with less than 37 weeks gestational age by race in South Carolina from 2004 to 2009, highlighting the percentages of non-

Hispanic African American and non-Hispanic White women. The rate of preterm births is consistently higher for non-Hispanic African American women compared to non-Hispanic White women during this time frame, even though non-Hispanic White women deliver almost twice as many infants than non-Hispanic African American women (South Carolina Department of Health and Environmental Control, Division of Biostatistics, PHSIS, 2011).

Table 10

South Carolina Percentage of Live Births Less Than 37 Weeks of Clinical Estimate of Gestational Age, of Non-Hispanic African American Mothers and Non-Hispanic White Mothers

Year	Non-Hispanic African American n (%)	Non-Hispanic White n (%)	Other n (%)	All Races n (%)
2004	2954 (16.0)	4091 (11.1)	120 (9.9)	7182 (12.7)
2005	3016 (16.0)	4181 (11.2)	127 (9.9)	7347 (12.8)
2006	3309 (16.0)	4144 (10.4)	140 (10.0)	7607 (12.2)
2007	3253 (15.6)	4282 (10.5)	137 (9.8)	7682 (12.2)
2008	3028 (14.5)	4233 (10.4)	162 (11.5)	7428 (11.8)
2009	2894 (14.6)	4066 (10.3)	137 (9.5)	7103 (11.7)

Note. Total is based on South Carolina annual live births in Table 10 above. Source: Division of Biostatistics, PHSIS, SCDHEC.

Table 11 displays the percentage of low birth weight infants by race in South Carolina, highlighting the percentages of non-Hispanic African American and non-Hispanic White women. In South Carolina, non-Hispanic African American women consistently had twice as many low birth weight infants as non-Hispanic White women from 2004 to 2009 (SCDHEC, Division of Biostatistics, PHSIS,2011). There was a slight decrease among non-Hispanic African American women from 15.3% in 2004 to 14.7% in

2009; the rate for non-Hispanic White women remained about the same during that time frame.

Table 11

South Carolina Percentage of Low Birth Weight by Race of Non-Hispanic African American Mothers and Non-Hispanic White Mothers from 2004-2009

Year	Total low birth weight deliveries n	Non-Hispanic African American %	Total low birth weight deliveries n	Non-Hispanic White %
2004	2817	15.3	2837	7.7
2005	2880	15.3	2882	7.7
2006	3156	15.2	3016	7.5
2007	3175	15.2	3104	7.6
2008	3040	14.5	3065	7.5
2009	2910	14.7	3024	7.7

Note. Total is based on South Carolina annual live births in Table 10. Source: Division of Biostatistics, PHSIS, SCDHEC.

Approximately 60% of sampled mothers completed the questionnaire. There were 5,821 observations read, but only 3,198 were used in the cross-tabulation of whether the mother had a previous live birth (yes/no) and breastfeeding initiation. In addition, there were 5,329 observations read, and 2,549 were used to determine whether a woman had a previous live birth as a predictor of initiating breastfeeding, adjusting for maternal age and limiting to only non-Hispanic White and non-Hispanic African American women. This study concentrated on preterm births 32 to under 37 weeks gestational age. This group represented 1,752 deliveries in South Carolina from 2009 to 2011. Table 12 represents the distribution of deliveries by race in South Carolina using the PRAMS, 2009-2011 data set. There were 5,812 valid responses for maternal race, in which non-Hispanic African American and non-Hispanic White mothers differed by only 3%. There

were 2,756 (47.3%) non-Hispanic African American mothers and 2,573 (44.2%) non-Hispanic White mothers. Non-Hispanic African American mothers delivered about 4% more preterm infants at 32-36 weeks gestation than non-Hispanic White mothers during the same time frame (SCPRAMS, 2009-2011).

Table 12

Distribution of Deliveries by Race, for South Carolina Pregnancy Risk Assessment Monitoring System (2009-2011) Data

Race	Total deliveries		Deliveries 32 under 37 weeks	
	n	%	n	%
Black	2756	47.3	621	48.1
White	2573	44.2	573	44.4
Other-Nonwhite	277	4.8	74	5.8
Mixed Race	100	1.7	22	1.7
Total Mothers	5706	98.0	1290	100.0

Note. Source: South Carolina Pregnancy Risk Assessment Monitoring System (2009-2011).

Table 13 shows the obstetric estimation of gestation by week for mothers 32 to under 37 weeks in the SCPRAMS, 2009-2011 data set. In this group, most deliveries occurred at 37 estimated weeks of gestation.

Table 13

Obstetric Estimation of Gestation by Week for Preterm Births 32-37 Weeks Gestational Age, for 1,752 Deliveries in South Carolina PRAMS, 2009-2011

Weeks	Number of Mothers n	Percent of Total Deliveries %
32	257	14.7
33	194	11.1
34	282	16.1
35	257	14.7
36	300	17.1
37	462	26.4

Note. Source: South Carolina Pregnancy Risk Assessment Monitoring System (2009-2011).

Table 14 provides a summary of breastfeeding initiation, duration, and the introduction of solids for preterm births of all races with gestations 32 to under 37 weeks from 2009 to 2011. There were 1,752 total preterm births 32 to under 37 weeks in this data set. When asked whether the infant was being breastfed, 973 mothers responded "yes" at a rate of almost 56%, compared to 767 negative responses at a rate of almost 44%. Breastfeeding initiation for preterm births accounted for a little over half of the total selected cases. Of the 920 (53%) valid responses, only 258 (15%) infants were ever breastfed. Breastfeeding duration for preterm births of all races ranged from 1 to 26 weeks. About 15% did not breastfeed, 2% breastfed less than a week, and 13% were currently breastfeeding at the time of the survey. The number of weeks that preterm infants of all races were first introduced to solids ranged from 2 to 34 weeks (SCPRAMS, 2009-2011).

Table 14

Breastfeeding, Breastfeeding Duration, and Solids Introduction for Preterm Births (32 to Under 37 Weeks) for All Races, South Carolina Pregnancy Risk Assessment Monitoring System (2009-2011) Data

Characteristic	Total 1752	Frequency (n)	Percent (%)
Infant being breastfed			
Yes		973	55.9
No		767	44.1
Breastfed ever			
Yes		662	72.0
No		258	28.0
Number of weeks breastfed			
1-4		193	11.0
5-8		87	5.0
9-12		87	5.0
Above 12 weeks		32	1.9
Number of weeks at first solid foods			
1-4		29	1.7
5-8		21	1.2
9-12		83	4.7
Above 12 weeks		164	9.4

Note. Source: South Carolina Pregnancy Risk Assessment Monitoring System (2009-2011).

Table 15 is a summary of maternal age, maternal race, and maternal education for preterm births of all races with gestations 32 to under 37 weeks from 2009 to 2011. The maternal age of mothers for preterm births of all races with gestations 32 to under 37 weeks was grouped into three age group categories: <20, 20-34, and >34. Preterm births occurred more frequently in the 20-34 age group at a rate of almost 74% compared to mothers over 34 who had the least preterm births at about 12%. Non-Hispanic African American women delivered about 4% more preterm infants than non-Hispanic White women during this time frame, at a rate of about 49% and 44%, respectively. Most of the

mothers in this group finished high school (29%) and/or attended some college, no degree (23%). Only about 3% had <=8th grade education. Higher maternal education was associated with less incidence of preterm births. High school graduates delivered prematurely at a rate of almost 29% compared to about 1% of those with doctoral and professional degrees (SCPRAMS, 2009-2011).

Table 15

Maternal Age, Race, and Education of Mothers for Preterm Births (32 to Under 37 Weeks), for All Races, South Carolina Pregnancy Risk Assessment Monitoring System (2009-2011)

Characteristic	Total 1752	Frequency n	Percent %
Maternal age			
<20		251	14.4
20-34		1301	74.3
>34		200	11.7
Maternal race			
Black		853	48.7
White		779	44.5
Asian		27	1.5
Other		92	5.3
Maternal education			
<= 8th Grade		56	3.2
9-12 Grade, no diploma		374	21.3
High school grad/GED		510	29.1
Some college, no degree		396	22.6
Associate Degree		108	6.2
Bachelor's Degree		204	11.6
Master's Degree		73	4.2
Doctorate/Professional Degree		20	1.1

Note. Source: South Carolina Pregnancy Risk Assessment Monitoring System (2009-2011)

Table 16 summarizes the types of delivery and birth statistics of mothers of preterm births of all races with gestations 32 to under 37 weeks from PRAMS data 2009

to 2011. Types of delivery in my study referred to first Caesarean section, repeat Caesarean section, or vaginal delivery. There were more total Caesarean section deliveries (1st C-sections and repeated C-sections) performed than vaginal deliveries with about a 2% difference. More mothers delivered infants that were small for gestational age (1,525/87%) than premature infants (459/26%) (SCPRAMS, 2009-2011).

Table 16

Delivery Type, Birth Status for Preterm Births (32 to Under 37 Weeks), of All Races, South Carolina Pregnancy Risk Assessment Monitoring System (2009-2011)

Characteristic	Total 1752	Frequency n	Percent %
Types of delivery			
C-section, 1st		679	38.8
Repeated C-section		200	11.4
Vaginal delivery		852	48.6
Birth status			
Previous livebirth		461	26.3
Previous premature		288	16.4
Small for gestational age		607	34.6
Based on 10th percentile			
Gestational age based on 2SD from mean		124	7.1

Note. Source: South Carolina Pregnancy Risk Assessment Monitoring System (2009-2011).

Table 17 is a summary of infant statistics that includes the year of birth, length of hospital stays, and the gender for preterm infants of all races with gestations 32 to under 37 weeks from 2009 to2011. There were more preterm births 32 to under 37 weeks gestation in 2009 with about a 1% decrease in 2010 and 2.5% decrease in 2011. Furthermore, most preterm infants in this category were hospitalized for one month or

less during this period. There were only 90 more preterm females born than preterm males, at a rate of 53% and 47%, respectively (SCPRAMS, 2009-2011).

Table 17

Year of Birth, Length of Hospital Stay, and Gender for Preterm Infants (32 to Under 37 Weeks), for All Races, South Carolina Pregnancy Risk Assessment Monitoring System (2009-2011)

Characteristic	Total 1752	Frequency (n)	Percent (%)
Year of birth			
2009		611	34.9
2010		593	33.8
2011		548	31.3
Length of hospital stay (weeks)			
1-4		667	70.4
5-7		281	29.6
Gender			
Male		831	47.4
Female		921	52.6

Note. Source: South Carolina Pregnancy Risk Assessment Monitoring System (2009-2011).

Research Question 1: The Relationship Between Breastfeeding and Maternal Sociodemographic Factors

RQ1: Is there an association between breastfeeding and sociodemographic factors including maternal race, maternal age, income level, type of payer source, and maternal education among preterm infants 32 to below 37 weeks gestational age during 2009-2011?

H_o1: There is no association between breastfeeding and sociodemographic factors including maternal race, maternal age, income level, type of payer source, and maternal

education among preterm infants born at 32 to below 37 weeks of gestation during 2009-2011.

H_a1: There is an association between breastfeeding and sociodemographic factors including maternal race, maternal age, income level, type of payer source, and maternal education among preterm infants born at 32 to below 37 weeks of gestation during 2009-2011.

In Table 18, about 57% (n=741) of mothers aged 20-34 breastfed their preterm infants 32 to under 37 weeks gestational age in South Carolina. I also found that non-Hispanic White mothers breastfed at a prevalence of about 65% (n=502) compared to 45% (n=382) of non-Hispanic Black mothers. I found that about 77% (n=307) of mothers with some type of college degree breastfed more often than any other educational group (SCPRAMS, 2009-2011).

Table 18

Distribution of Breastfeeding by Sociodemographic Characteristics for Infants 32 to Under 37 Weeks Gestational Age from 2009-2011

Independent Variables	Total n	%	Breastfed n	%	Not Breastfed n	%
Maternal age						
<20	251	14.4	107	42.6	144	57.4
20-34	1291	74.2	741	57.4	550	42.6
>34	198	11.4	125	63.1	73	36.9
Maternal race						
White	774	44.5	502	64.9	272	35.1
Black	849	48.8	382	45.0	467	55.0
Other*	116	6.7	88	75.9	28	24.1
Maternal Education						
<= 8th Grade	56	3.2	31	55.4	25	44.6
9-12 Grade, no diploma	373	21.6	148	39.7	225	60.3
High school grad/GED	509	29.4	247	48.5	262	51.5
Some college, no degree	391	22.6	233	59.6	158	40.4
Some college degree **	401	23.2	307	76.6	94	23.4

Note. Source: South Carolina Pregnancy Risk Assessment Monitoring System (2009-2011).

Formulations for possible associations between the dependent variable breastfeeding controlling for maternal age, maternal race, and maternal education are shown in Table 19. Maternal age (AOR-1.15; CI=0.85-1.55, AOR-1.08; CI=0.77-1.50) was not a significant variable because the confidence intervals included one. Maternal race Black (AOR=2.24; 95% CI=1.37-3.67), maternal race Other (AOR=4.26; 95% CI=2.61-6.94), 8th grade education (AOR=3.58; 95% CI=1.87-6.83), 9-12 grade education (AOR=4.23; 95% CI=3.01-5.93), high school graduate/GED (AOR=2.85; 95%

CI=2.10-3.86), and some college (AOR=1.78; 95% CI=1.30-2.45) were all associated with increased odds of not breastfeeding. Mothers under 20 breastfed their preterm infants 32 to under 37 weeks gestational age at a prevalence of 43% (total n=251). Mothers older than 34 breastfed at a prevalence of 63% (total n=198). Black mothers and teenage mothers (9-12 grade, no diploma) breastfed less frequently (SCPRAMS, 2009-2011).

Table 19

Crude and Adjusted Odds Ratios for Not Breastfeeding by Sociodemographic Characteristics for Infants 32 to Under 37 Weeks Gestational Age from 2009-2011*

Independent Variables	Crude Odds Ratio	95% CI	Adjusted Odds ratio	95% CI
Maternal age				
<20	1.81	1.38 to 2.38	1.15	0.85 to 1.55
20-34	Reference	Reference	Reference	Reference
>34	0.79	0.58 to 1.07	1.08	0.77 to 1.50
Maternal race				
Black	1.70	1.09 to 2.67	2.24	1.37 to 3.67
White	Reference	Reference	Reference	Reference
Other*	3.84	2.46 to 6.00	4.26	2.61 to 6.94
Maternal education				
<= 8th Grade	2.63	1.48 to 4.68	3.58	1.87 to 6.83
9-12 Grade, no diploma	4.97	3.64 to 6.77	4.23	3.01 to 5.93
High school grad/GED	3.46	2.59 to 4.63	2.85	2.10 to 3.86
Some college, no degree	2.21	1.63 to 3.01	1.78	1.30 to 2.45
Some college degree **	Reference	Reference	Reference	Reference

Note. Source: South Carolina Pregnancy Risk Assessment Monitoring System (2009-2011).

Table 20 presents the distribution of insurance coverage and income for mothers of preterm infants 32 to under 37 weeks gestational age. About 71% (n=274) of mothers with job insurance (PNC), 63% (n=10) of mothers with private insurance (PNC), and

85% (n=41) of mothers with military insurance (PNC) breastfed their preterm infants 32-37 weeks gestational age in South Carolina. I also found that about half of Medicaid (PNC) recipients breastfed at a rate of 51% (n=271) compared to 78% (n=29) of mothers with no insurance. Higher income was highly correlated with breastfeeding. I found that about 80% (n=186) of mothers with an annual income of $50,000 or more breastfed their preterm infants 32-37 weeks gestation compared to 48% (n=129) for those mothers with an income less than $10,000 (SCPRAMS, 2009-2011).

Table 20

Distribution of Breastfeeding by Insurance Status and Income for Infants 32 to Under 37 Weeks Gestational Age From 2009-2011

Independent Variables	Total n	%	Breastfed n	%	Breastfed No n	%
(PNC) Job insurance						
Yes	387	40.8	274	70.8	113	29.2
No	561	59.2	314	56.0	247	44.0
(PNC) Private insurance						
Yes	16	1.7	10	62.5	6	37.5
No	932	98.3	578	62.0	354	38.0
(PNC) Medicaid						
Yes	533	56.2	271	50.8	262	49.2
No	415	43.8	317	76.4	98	23.6
(PNC) Military						
Yes	48	5.1	41	85.4	7	14.6
No	900	94.9	547	60.8	353	39.2
(PNC) Other						
Yes	13	1.4	9	69.2	4	30.8
No	935	98.6	579	61.9	356	38.1
(PNC) Insurance						
Yes	37	3.9	29	78.4	8	21.6
No	911	96.1	559	61.4	352	38.6
(Delivery) Job insurance						

Yes	368	38.5	268	72.8	100	27.2
No (Delivery)	587	61.5	323	55.0	264	45.0
Private insurance						
Yes	15	1.6	10	66.7	5	33.3
No (Delivery)	940	98.4	581	61.8	359	38.2
Medicaid						
Yes	584	61.2	306	52.4	278	47.6
No (Delivery)	371	38.8	285	76.8	86	23.2
Military						
Yes	44	4.6	38	86.4	6	13.6
No (Delivery) Other	911	95.4	553	60.7	358	39.3
Yes	13	1.4	11	84.6	2	15.4
No (Delivery)	942	98.6	580	61.6	362	38.4
Insurance						
Yes	17	1.8	12	70.6	5	29.4
No	938	98.2	579	61.7	359	38.3
Income level						
Less than 10,000	271	30.0	129	47.6	142	52.4
10,000 to 14,000	90	10.0	55	61.1	35	38.9
15,000 to 19,999	64	7.1	29	45.3	35	54.7
20,000 to 24,999	77	8.5	48	62.3	29	37.7
25,000 to 34,999	85	9.4	54	63.5	31	36.5
35,000 to 49,999	81	9.0	62	76.5	19	23.5
50,000 or more	234	25.9	186	79.5	48	20.5

Note. Source: South Carolina Pregnancy Risk Assessment Monitoring System (2009-2011).

Table 21 presents the adjusted odds ratios (AOR) for type of insurance and income after adjusting for maternal age, maternal race, and maternal education. The adjusted odds ratios (AOR) for (PNC) no Medicaid (AOR=1.71; 95% CI=1.19-2.48) and (PNC) no military (AOR=3.01; 95% CI=1.31-6.94), indicated that some types of insurance were positively associated with increased odds of breastfeeding. Mothers not

receiving Medicaid after delivery (AOR=0.62; 95% CI=0.42-0.90) had decreased odds of breastfeeding than those receiving Medicaid. Overall, mothers not on Medicaid (PNC) breastfed at a prevalence of 76% (total n=415) and those mothers not on Medicaid after delivery breastfed at a prevalence of 23% (total n=371) compared to mothers using other payment sources for prenatal care and delivery. Mothers in the $15,000-$19,999 (AOR=3.61; 95% CI=1.76-7.39) income bracket and mothers earning less than $10,000 (AOR=1.93; 95% CI=1.09-3.40) per year had significantly increased odds for breastfeeding their preterm infants 32-37 weeks gestational age compared to mothers in other income brackets (SCPRAMS, 2009-2011).

Table 21

Crude and Adjusted Odds Ratios for Breastfeeding by Insurance Status and Income for Infants 32 to Under 37 Weeks Gestational Age From 2009-2011*

Independent Variables	Crude Odds Ratio	95% CI	Adjusted Odds ratio	95% CI
(PNC) Job insurance				
Yes	Reference	Reference	Reference	Reference
No	1.91	1.45 to 2.51	0.93	0.65 to 1.33
(PNC) Private insurance				
Yes	Reference	Reference	Reference	Reference
No	1.02	0.37 to 2.83	0.71	0.24 to 2.12
(PNC) Medicaid				
Yes	Reference	Reference	Reference	Reference
No	0.32	0.24 to 0.42	1.71	1.19 to 2.48
(PNC) Military				
Yes	Reference	Reference	Reference	Reference
No	3.78	1.68 to 8.52	3.01	1.31 to 6.94
(PNC) Other				
Yes	Reference	Reference	Reference	Reference
No	1.38	0.42 to 4.53	1.57	0.43 to 5.71
(PNC) No insurance				
Yes	Reference	Reference	Reference	Reference
No	2.28	1.03 to 5.05	1.26	0.49 to 3.23

(Delivery) Job insurance				
Yes	Reference	Reference	Reference	Reference
No	2.19	1.65 to 2.90	1.09	0.76 to 1.59
(Delivery) Private insurance				
Yes	Reference	Reference	Reference	Reference
No	1.24	0.42 to 3.65	1.01	0.31 to 3.23
(Delivery) Medicaid				
Yes	Reference	Reference	Reference	Reference
No	0.33	0.25 to 0.44	0.62	0.42 to 0.90
(Delivery) Military				
Yes	Reference	Reference	Reference	Reference
No	4.10	1.72 to 9.80	3.19	1.30 to 7.79
(Delivery) Other				
Yes	Reference	Reference	Reference	Reference
No	3.43	0.76 to 15.6	3.49	0.72 to 16.8
(Delivery) No insurance				
Yes	Reference	Reference	Reference	Reference
No	1.49	0.52 to 4.26	1.23	0.37 to 4.02
Income level				
Less than $10,000	4.27	2.87 to 6.34	1.93	1.09 to 3.40
$10,000 to $14,999	2.47	1.45 to 4.19	1.48	0.78 to 2.83
$15,000 to $19,999	4.68	2.60 to 8.40	3.61	1.76 to 7.39
$20,000 to $24,999	2.34	1.34 to 4.10	1.61	0.84 to 3.09
$25,000 to $34,999	2.23	1.29 to 3.83	1.50	0.81 to 2.78
$35,000 to $49,999	1.19	0.65 to 2.17	0.90	0.47 to 1.75
$50,000 or more	Reference	Reference	Reference	Reference

Note. Source: South Carolina Pregnancy Risk Assessment Monitoring System (2009-2011).

Research Question 2: The Association Between Breastfeeding and Maternal Medical and Obstetrical Conditions

RQ2: Is there an association between breastfeeding and medical and obstetrical conditions of the mother including delivery by Caesarean section, other types of delivery, primiparity, number of previous live births, parity, previous preterm birth or low birth

weight infant, and length of hospital stay for the infant among preterm infants 32 to below 37 weeks gestational age during 2009-2011?

H_o2: There is no association between breastfeeding and medical and obstetrical conditions of the mother including delivery by Caesarean section, other types of delivery, primiparity, number of previous live births, parity, previous preterm birth or low birth weight infant, and the length of hospital stay for the infant among preterm infants 32 to below 37 weeks gestational age during 2009-2011.

H_a2: There is an association between breastfeeding and medical and obstetrical conditions of the mother including delivery by Caesarean section, other types of delivery, primiparity, number of previous live births, parity, previous preterm birth or low birth weight infant, and length of hospital stay for the infant among preterm infants 32 to below 37 weeks gestational age during 2009-2011.

In Table 22, about 54% (n=583) and 56% (n=865) of mothers who did not have a Cesarean section (first or repeat) were more likely to breastfeed their preterm infants 32 to under 37 weeks gestational age in South Carolina. I also found that mothers of previous preterm infants breastfed at a rate of about 61% (n=174) compared to 56% (n=95) of mothers who did not deliver prematurely. In my study, mothers with fewer number of live births and few live born breastfed their preterm infants at a higher prevalence than mothers with more live births and live born (SCPRAMS, 2009-2011).

Female preterm infants 32 to under 37 weeks gestational age were breastfed at about the same rate as male infants at 56% (n=516) and 56% (n=457), respectively (Table 22). A shorter length of hospital stay was highly correlated with breastfeeding. I found

that about 72% (n=416) of preterm infants discharged within 1-4 weeks were breastfed more and for longer duration than infants remaining in the hospital for 5-7 weeks (SCPRAMS, 2009-2011).

Table 22

Distribution of Breastfeeding by Delivery Status for Infants 32 to Under 37 Weeks Gestational Age from 2009-2011

Independent Variables	Total n %	%	Breastfed n %		Breastfed No n %	
First C-section						
Yes	669	38.4	390	58.3	279	41.7
No	1071	61.6	583	54.4	488	45.6
Repeat C-section						
Yes	199	11.4	108	54.3	91	45.7
No	1541	88.6	865	56.1	676	43.9
Vaginal delivery						
Yes	851	48.9	463	54.4	388	45.6
No	889	51.1	510	57.4	379	42.6
# of Live born						
1 Live born	1528	87.8	848	55.5	680	44.5
2 Live born	203	11.7	118	58.1	85	41.9
3-11 Live born	9.0	0.5	7.0	77.8	2.0	22.2
# of Previous live births						

0 Live birth	730	42.0	444	60.8	286	39.2
1 Live births	496	28.5	277	55.8	219	44.2
2 Live births	290	16.7	151	52.1	139	47.9
3 Live births	137	7.9	60	43.8	77	56.2
4 Live births	51	2.9	25	49.0	26	51.0
5 Live births	22	1.3	9	40.9	13	59.1
6 Live births	9	0.5	5	55.5	4	44.4
8 Live births	2	0.1	1	50	1	50
9 Live births	2	0.1	1	50	1	50
11 Live births	1	0.1	0	0	1	100
# Previous preterm						
Yes	286	62.6	174	60.8	112	39.2
No	171	37.4	95	55.6	76	44.4
Gender						
Male	822	47.2	457	55.6	365	44.4
Female	918	52.8	516	56.2	402	43.8
Length of hospital stay (weeks)						
1-4	665	70.6	416	71.7	249	68.8
5-7	277	29.4	164	28.3	113	31.2
Year of birth						
2009	609	35.0	337	55.3	272	44.7

2010	585	33.6	325	55.6	260	44.4
2011	546	31.4	311	57.0	235	43.0

Note. Source: South Carolina Pregnancy Risk Assessment Monitoring System (2009-2011).

Table 23 presents the adjusted odds ratios (AOR) for delivery status and perinatal variable characteristics adjusting for maternal age, maternal race, and maternal education. Mothers who had two previous live births (AOR=1.11; 95% CI=1.02-1.21) had increased odds of breastfeeding their preterm infants. The adjusted odds ratios for first C-section (AOR=1.05; 95% CI=0.85-1.29), not having a vaginal delivery (AOR=1.01; 95% CI=0.82-1.24), having previous preterm pregnancies (AOR=1.17; 95% CI=0.77-1.77), and having an extended hospital stay (AOR=1.04; 95% CI=0.93-1.17) all included one, indicating a failure to reject the null hypothesis because there was not enough evidence to suggest that breastfeeding was positively associated with these variables compared to the odds of not breastfeeding (SCPRAMS, 2009-2011).

Table 23

Odds of Breastfeeding by Perinatal Variables for Infants 32 to Under 37 Weeks Gestational Age from 2009-2011

Independent Variables	Crude Odds Ratio	95% CI	Adjusted Odds ratio	95% CI
First C-section				
Yes	1.17	0.96 to 1.42	1.05	0.85 to 1.29
No	Reference	Reference	Reference	Reference
Repeat C-section				

Yes	0.93	0.69 to 1.25	0.90	0.66 to 1.24
No	Reference	Reference	Reference	Reference
Vaginal delivery				
Yes	Reference	Reference	Reference	Reference
No	1.13	0.93 to 1.36	1.01	0.82 to 1.24
# of Live born				
1 Live born	Reference	Reference	Reference	Reference
2 Live born	2.52	0.51 to 12.44	1.79	0.34 to 9.37
# of Previous live births				
1 Live birth	Reference	Reference	Reference	Reference
2 Live births	1.17	1.09 to 1.26	1.11	1.02 to 1.21
# Previous preterm				
Yes	1.24	0.85 to 1.82	1.17	0.77 to 1.77
No	Reference	Reference	Reference	Reference
Gender				
Male	1.03	0.85 to 1.24	0.98	0.80 to 1.20
Female	Reference	Reference	Reference	Reference
Length of hospital stay (weeks)				
1-4	Reference	Reference	Reference	Reference
5-7	1.15	0.86 to 1.53	1.04	0.93 to 1.17
Year of birth				

2009	1.07	0.85 to 1.35	1.11	0.87 to 1.42
2010	1.06	0.84 to 1.34	1.10	0.86 to 1.41
2011	Reference	Reference	Reference	Reference

Note. Source: South Carolina Pregnancy Risk Assessment Monitoring System (2009-2011).

Summary

The PRAMS dataset contained answers given by a stratified sample of mothers from across the state of South Carolina. African American mothers and mothers with less education breastfed their preterm infant less frequently. Higher maternal education was associated with less incidence of preterm births and a higher prevalence of breastfeeding initiation and duration. Mothers with insurance and with a higher income had increased odds of breastfeeding than mothers with no insurance and less income. The findings in this study revealed that the type of delivery was not associated with the odds of breastfeeding, but mothers who had two previous live births had increased odds of breastfeeding their preterm infants. And finally, a shorter hospital stay was highly correlated with breastfeeding, indicating more frequency and longer duration. Chapter 5 will provide a detailed examination of the findings in this study.

Chapter 5: Discussion, Conclusions, and Recommendations

Chapter 5 provides an overview of the findings from the South Carolina Pregnancy Risk Assessment Monitoring System (SCPRAMS) from 2009 to2011, including those items that did not support or only partially supported the proposed hypotheses. This cross-sectional study included existing data to answer two research questions with their corresponding hypotheses. The health belief model (HBM) provided the conceptual framework for this investigation. The purpose was to examine possible relationships between breastfeeding and maternal sociodemographic factors as well as maternal medical and obstetrical conditions of all preterm infants 32 to under 37 weeks gestational age in South Carolina, through a secondary analysis using the PRAMS and the 2009 to2011 data set. The purpose of the study was to examine the effect that each predictor had on breastfeeding of preterm infants born at 32 to under 37 weeks gestational age. I examined the relationship between breastfeeding and sociodemographic factors of the mother as well as medical and obstetrical conditions of the mother, including the length of hospital stay of all preterm infants in South Carolina born to women of all races during 2009 to2011. In this chapter I discuss the general findings and also address findings based on the research questions.

Interpretation of the Findings

Main Findings

The main findings of this study were grounded in race, education, type of insurance, income, previous live births, and shorter hospital stay. African American mothers and mothers with less education breastfed their preterm infant less frequently.

Higher maternal education was associated with lower incidence of preterm birth and higher incidence of breastfeeding initiation and duration. Mothers with insurance and mothers with a higher income had higher odds of breastfeeding than mothers with no insurance and less income. Additionally, mothers who had two previous live births had increased odds of breastfeeding their preterm infants. Finally, a shorter hospital stay for preterm infants was highly correlated with breastfeeding, indicating more frequency and longer duration (SCPRAMS, 2009-2011).

Main findings for RQ1 were based on maternal race, maternal education, type of insurance, and income. African American mothers were more likely not to breastfeed. Less educated mothers were more likely to not breastfeed their preterm infants. Finally, mothers with less income were more likely to not breastfeed. The main findings for RQ2 were based on previous live births and the length of hospital stay for the infant. Mothers who had more than two previous live births were more likely not to breastfeed their preterm infant. Infants hospitalized for longer than 4 weeks were more likely to not be breastfed after discharge.

General Findings

This study consisted mostly of mothers ages 20-34 years. It is common in the United States for mothers to be in this age group (Mulready-Ward & Sackoff, 2013). Although age was not a significant factor in this study, increasing age has been positively associated with breastfeeding initiation, as well as higher education (Demirci, Sereika, & Bogen, 2013). In the target preterm population, most infants were African American. Preterm births are quite common among African American mothers(Ncube et al., 2017).

According to Ncube et al. (2017), when compared to term infants, preterm infants were more likely to be born to non-Hispanic African American mothers and to mothers with less education. Demirci et al. (2013) found that African American mothers and mothers who had prior live births were least likely to breastfeed. In the current study, most of the mothers who did not breastfeed had a high school education or less. African American mothers breastfeed less and for a shorter time span in South Carolina due to scarce resources and a lack of support for mothers of preterm infants (CDC, 2018). Most of the preterm infants not breastfed in this study were born vaginally, and a considerable number were born by Caesarean section. However, the type of delivery was not associated with the odds of breastfeeding in this study. Demirci et al. also found that the type of delivery was not significant. A large number of small for gestational age infants were not breastfed (Demirci et al., 2013). This has also been observed in other studies. In my study, most of the preterm infants who were not breastfed stayed in the hospital 5-7 weeks. Montgomery et al. (2009) confirmed that the earlier breastfeeding is begun, the shorter the hospital stay for the infant.

Research Question 1

RQ1: Is there an association between breastfeeding and sociodemographic factors including maternal race, maternal age, income level, type of payer source, and maternal education among preterm infants 32 to below 37 weeks gestational age during 2009-2011?

H_o1: There is no association between breastfeeding and sociodemographic factors including maternal race, maternal age, income level, type of payer source, and maternal

education among preterm infants born at 32 to below 37 weeks of gestation during 2009-2011.

H_a1: There is an association between breastfeeding and sociodemographic factors including maternal race, maternal age, income level, type of payer source, and maternal education among preterm infants born at 32 to below 37 weeks of gestation during 2009-2011.

I found that maternal sociodemographic factors were associated with breastfeeding duration, particularly maternal race, maternal education, income, and type of payer source for prenatal care. Black mothers and teenage mothers in Grades 9-12 with no diploma breastfed less frequently. Mulready-Ward and Sackoff (2013) found that mothers 19 years old or less, those with less than 12 years of education, those who were non-Hispanic Black, and those who received Medicaid had short breastfeeding durations with preterm infants. I found that mothers with no Medicaid were less likely not to breastfeed. I also found that mothers earning less than $10,000 per year were more likely not to breastfeed.

Research Question 2

RQ2: Is there an association between breastfeeding and medical and obstetrical conditions of the mother including delivery by Caesarean section, other types of delivery, primiparity, number of previous live births, parity, previous preterm birth or low birth weight infant, and length of hospital stay for the infant among preterm infants 32 to below 37 weeks gestational age during 2009-2011?

H_o2: There is no association between breastfeeding and medical and obstetrical conditions of the mother including delivery by Caesarean section, other types of delivery, primiparity, number of previous live births, parity, previous preterm birth or low birth weight infant, and the length of hospital stay for the infant among preterm infants 32 to below 37 weeks gestational age during 2009-2011.

H_a2: There is an association between breastfeeding and medical and obstetrical conditions of the mother including delivery by Caesarean section, other types of delivery, primiparity, number of previous live births, parity, previous preterm birth or low birth weight infant, and length of hospital stay for the infant among preterm infants 32 to below 37 weeks gestational age during 2009-2011.

Findings showed that mothers who had two previous live births had increased odds of breastfeeding their preterm infants. Mulready-Ward and Sackoff (2013) found that primiparity was closely related to a shorter duration of breastfeeding or decreased odds of breastfeeding preterm infants. Demirci et al. (2013) found that the noninitiation of breastfeeding was associated with mothers with prior live births.

Maternal medical and obstetrical conditions included delivery by Caesarean section, other types of delivery, primiparity, number of previous live births, parity, previous preterm birth or low birth weight infant, and length of hospital stay for the infant. The findings in my study revealed that the number of previous live births was associated with the odds of breastfeeding preterm infants 32 to under 37 weeks gestational age in South Carolina from 2009 to 2011. In addition, a shorter hospital stay was highly correlated with breastfeeding, indicating more frequency and longer duration.

These findings were confirmed by the Minas Gerais study in which preterm infants were found to have been discharged from the NICU as early as 34 weeks due to the early initiation of breastfeeding (Freitasa et al., 2015).

Previous research suggested that preterm infants born by C-section were more likely to be admitted to the NICU, and they were 75% more likely to be breastfed for at least 1 month, compared with vaginal deliveries (Colaizy & Morriss, 2008). Colaizy and Morriss (2008) also found that mothers of extremely preterm infants (< 32 weeks) were more likely to breastfeed for 4 weeks or more compared to mothers of infants 32-37 weeks gestation. In another study, preterm births were associated with first births, and primiparity (37%) was linked with short breastfeeding duration (Mulready-Ward & Sackoff, 2013). Mulready-Ward and Sackoff (2013) also investigated breastfeeding duration for < 8 weeks for seven PRAMS sites (Colorado, Florida, Illinois, Louisiana, Maine, Oregon, and New York City) in 2004-2007 and found that 31% of mothers of preterm infants had a previous live birth.

The rate of breastfeeding by infant status in 2011 for Alabama, Louisiana, and Mississippi was remarkable. In Alabama, there have been increases in breastfeeding initiation for both low birth weight infants (72% in 2011) and normal birth weight infants (Alabama Department of Public Health , 2013). In Louisiana, very low birth weight, low birth weight, and normal birth weight infants were included for better program planning (Louisiana Department of Health and Hospitals, n.d.). In 2011, about 16% (n = 1,213) of infants were placed in the NICU after birth (Louisiana Department of Health and Hospitals, n.d.). Low birth weight infants were associated with preterm births, and the

study indicated that low birth weight over 65% and about 64% of normal birth weight infants were breastfed at about the same rate (Louisiana Department of Health and Hospitals, n.d.). About 16% of the mothers in Mississippi had a previous preterm birth (Office of Health Data and Research, 2015). In 2011, about 12% of infants were placed in the NICU after birth (Office of Health Data and Research, 2015). In addition, more than 8% of the infants were hospitalized for 1 week or more (Office of Health Data and Research, 2015). Most mothers of infants of all weight ranges breastfed for 1-3 weeks (Office of Health Data and Research , 2015).

The literature indicated that support and interventions before and after hospital discharge have resulted in increased breastfeeding and breastfeeding duration, in addition to maternal satisfaction; weight gain observations were not indicated (Ahmed & Sands, 2010). Breastfeeding exclusivity during the first week resulted in more infants being breastfed at home after an early discharge from the hospital (increased duration) (Ahmed & Sands, 2010). Early initiation of breastfeeding not only reduces the length of hospital stay for preterm infants in the NICU, but it also reduces infant mortality rates among this population (Colaizy & Morriss, 2008; Meinzen-Derr et al., 2009; Montgomery et al., 2008). One of the indicators of poor developmental outcomes in preterm infants is the amount of time spent in NICUs (Pickler et al., 2009). Wheeler (2009) confirmed that shorter hospital stays are a benefit of early breastfeeding initiation.

In addition, not only does regular and consistent breastfeeding prevent dehydration in preterm infants, but hind milk (the milk at the end of a feeding) is beneficial for weight gain because it has more fat than the beginning milk or foremilk

(Ogechi, William, & Fidelia, 2007). Breastfeeding should be initiated in the NICU because the digestive system of preterm infants is underdeveloped and requires breast milk to provide enzymes for digestion and absorption of nutrients (Isaacson, 2006). Furthermore, breast milk has antibacterial and antiviral antibodies (such as Immunoglobulin A) that protect the underdeveloped gastrointestinal tracts of preterm infants (Levy et al., 2009). Growth factors found in breast milk promote maturation of digestive systems of preterm infants and increase their use of minerals and nutrients such as iron and zinc (Levy et al., 2009). The early initiation of breastfeeding is important for positive neurodevelopmental outcomes (especially in boys) and improved head circumference catch-up growth (Ghods, Kreissl, Brandstetter, Fuiko, & Widhalm, 2011).

Limitations of the Study

This study is limited by the timeframe 2009-2011. It is also limited geographically to South Carolina. The foundation of this study is based on peer reviewed literature written in the English language. The HBM model does not consider mothers that did not breastfeed for social reasons or mothers that did not breastfeed because of habitual bottle-feeding methods from their past experiences (see LaMorte, 2018). In addition, I used a compilation of data from seven NICUs in South Carolina, which only included singleton births and excluded all multiple births, infants with chromosomal abnormalities, Grade III or IV cerebral hemorrhage, congenital anomalies that may interfere with breastfeeding, neurological deficits, or hypoxia or ischemia characterized by an Apgar Score <5 at 5 minutes, and those who were being ventilated.

Even though this study considered all preterm births in South Carolina from 2009-2011 at 32 to under 37 weeks gestational age, the PRAMS instrument used in this study was self-administered and anonymous, making it challenging to confirm data collected at the subject level (see Colaizy & Morriss, 2008). Recall bias is an important limitation of this study because participants were contacted two to four months after giving birth. These self-reports cannot be validated, and it is expected to have some variability in the actual time span of breastfeeding initiation and breastfeeding duration (see Mulready-Ward & Sackoff, 2013). Also, the mode used for questioning may affect how participants respond to certain questions, specifically written responses versus vocal responses. Another limitation is the difficulty with exploring the relationship between feeding and any maternal factors or conditions due to the variability in defining breast milk intake (see Meinzen-Derr et al., 2009).

Implications

The implications for social change from my study include contributing to the need for an increase in breastfeeding knowledge, promoting multilevels of support, which would in turn decrease infant morbidity and mortality for all races. This support and education would increase knowledge for physicians, nurses, lactation consultants, mothers, and their families.

Preterm infants experience fewer infections, a decrease in mortality rates, and an earlier hospital discharge because of early breastfeeding initiation and frequency (Montgomery et al., 2008). A decrease in neonatal, postnatal, and infant morbidity and mortality could be observed because of monitoring the maternal sociodemographic

factors as well as maternal medical and obstetrical conditions as it related to breastfeeding practices of all preterm infants in South Carolina 32 to under 37 weeks gestational age during a specific time frame. I found that the early initiation of breastfeeding was associated with maternal sociodemographic factors as well as maternal medical and obstetrical conditions, and the length of hospital stay among this target population . This knowledge would help meet the need for increased health literacy among mothers of preterm infants and allow health professionals, program planners, and policy makers to assess the effect of past and current breastfeeding education programs and identify any deficiencies as they pertain to this target population. The creation of neighborhood intervention centers with specialized personnel who cater to mothers while their infants are hospitalized and after discharging up to 18 months, or as needed, could provide an avenue of support and education on how to properly feed and care for preterm infants. Frequently, breastfeeding of preterm infants stops because of decreased support and being outside of the hospital environment (Lamounier, 2016). This freely assessible information will empower and encourage more mothers of preterm infants to initiate exclusive breastfeeding for the first year of life. And finally, there is a need for more proactive policies that address the cultural barriers of breastfeeding preterm infants in the United States.

Recommendations for Action

There are unique challenges that must be overcome when breastfeeding preterm infants such as maintaining an adequate milk supply, which entails a pumping schedule for the mother, rest for the mother, adequate nutrition and fluid intake of the mother, and

relaxation techniques prior to pumping. Rooming in for 3-5 days before discharge would help the parents feel comfortable attending to the basic needs of their preterm infant. It also provides an opportunity to breastfeed their preterm infant on demand using cues from the infant instead of following a strict schedule. The medical support should not stop at discharge from the hospital. Upon discharge there should be another level of support implemented that provides counseling and emotional support for the parents during the first month (2-3 times per week or as needed), until the mother is comfortable with breastfeeding and a steady growth rate is established. This support could be in the form of home visits by a lactation consultant or nurse or having access to a community breastfeeding drop-in center that would include outpatient care and support for preterm infants and their mothers. The goals for each family will vary depending on the progression of the preterm infant and the proposed breastfeeding plan.

These results are intended for the mothers of preterm infants, the medical staff involved with prenatal care and delivery, family, friends, community health centers, breastfeeding drop-in centers, and intervention centers. This information will provide a small piece to society to ignite social change by empowering women with health literacy so that they can make informed decisions about breastfeeding. These results could be a part of the curriculum of prenatal classes preparing families for unexpected outcomes. Slide show presentations of these results could be shown in classes for parents of preterm infants to prepare them on how to care for their preterm infants. Pamphlets and videos explaining these results would be a useful resource at community health centers or breastfeeding drop-in centers.

Recommendations for Future Studies

There is a need for more studies focusing on breastfeeding preterm infants of all races. A qualitative study using the HBM as the conceptual framework would provide a template for questions with a focus on the lived experiences of mothers of breastfed preterm infants. The aim would be to provide information on the post discharge experience of mothers who breastfed preterm infants. This would include mothers of all races with a focus on preterm infants physically able to digest breast milk feedings. Also, studies investigating the lived experiences of fathers and their role in supporting the mothers and their choice to breastfeed their preterm infants, would provide further insight into ways to promote and increase the early initiation of breastfeeding.

Conclusion

My study examined how breastfeeding is associated with maternal sociodemographic factors as well as maternal medical and obstetrical conditions for infants born at 32 to under 37 weeks gestational age in South Carolina from 2009 to2011. My study consisted of preterm infants of all races. Preterm infants who are breastfed have a steady growth rate, stronger immune systems, and a reduced length of stay in the NICU. The early initiation of breastfeeding is crucial for both short-term and long-term development of preterm infants born at 32 to under 37 weeks gestation. Not only is race associated with preterm births and low birth weight infants, but income inequality and a lack of maternal social support is also closely related (Nkansah-Amankra et al., 2010). In addition, I found an association with the early initiation of breastfeeding and the length of hospital stay. The earlier breastfeeding is initiated, the shorter the hospital stay because of

progressive growth and development. With additional support for mothers of preterm infants after discharge, breastfeeding success can be obtained beyond the walls of the hospital. Successful breastfeeding is a result of an increase in breastfeeding knowledge and support, and a decrease in neonatal, postnatal, and infant morbidity and mortality.

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