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DEMOGRAPHIC FACTORS THAT PREDICT BREASTFEEDING  
IN THE EARLY POSTPARTUM PERIOD  
IN UTAH WOMEN

by

Amyanne Wuthrich-Reggio

A thesis submitted in partial fulfillment  
of the requirements for the degree

of

MASTER OF SCIENCE

in

Health, Physical Education and Recreation

Approved:

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Julie Gast, PhD  
Major Professor

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Phillip Waite, PhD  
Committee Member

---

D. Kim Openshaw, PhD  
Committee Member

---

Byron Burnham, EdD  
Dean of Graduate Studies

UTAH STATE UNIVERSITY  
Logan, Utah

2008

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## ABSTRACT

Demographic Factors That Predict Breastfeeding  
in the Early Postpartum Period  
in Utah Women

by

Amyanne Wuthrich-Reggio, Master of Science  
Utah State University, 2007

Major Professor: Dr. Julie A. Gast  
Department: Health, Physical Education and Recreation

Breastfeeding is considered to be the optimal choice of infant feeding methods, yet the rates of breastfeeding are consistently lower than national recommendations despite efforts to reverse this trend. Designing effective interventions to increase breastfeeding requires a thorough understanding of the women who choose to breastfeed their infants as well as those who do not choose this infant feeding method. In order to determine which demographic factors predicted breastfeeding in the early postpartum period in Utah women, 600 “intercept interviews” were conducted in the spring and early summer of 2007. Women included in the study were 18 years or older and had an infant who was 6 weeks to 1 year old. Participants were 18-42 years old, and reported having between one and six children. Participants were recruited from public areas in Salt Lake City, such as shopping malls, parks, and civic venues. Information from 588 interviews

was included in the analysis. Data analysis was conducted using STATA 9.0. Univariate analysis was first conducted to determine if a significant relationship existed between breastfeeding at 6 weeks postpartum and the demographic factors. Univariate analysis determined that a statistically significant ( $p < 0.05$ ) relationship existed between breastfeeding in the early postpartum period and the following demographic factors: age, marital status, WIC participation, maternal education level, and maternal employment. Univariate analysis failed to find a statistically significant relationship between breastfeeding in the early postpartum period and parity. Next, simple logistic regression was conducted to determine the strength and direction of any significant relationship. Finally, multiple logistic regression with backward elimination was performed to determine whether factors differed across age strata. Multiple regression analysis found that, when stratified by age, maternal education was found to be significant in both the younger (18-25 years) age group (OR = .56; 95% CI = .43, .71) and the older (26-42 years) age group (OR = 1.54; 95% CI = 1.28, 1.86). The effects of education on breastfeeding at 6 weeks postpartum differed across age groups in a statistically significant way, as determined by a chi square test ( $p = 0.00$ ). More research is needed to fully understand the relationship between demographic factors and breastfeeding in the early postpartum period.

(114 pages)

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Amyanne Wuthrich-Reggio

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## CHAPTER I

### INTRODUCTION

#### Background of the Problem

Breastfeeding is considered to be the optimal choice of infant feeding methods among health professionals. The act of breastfeeding an infant has been proven to have a beneficial impact on the health of the child. For example, breastfeeding has been indicated to decrease the incidence of common illnesses, such as diarrhea (Howie, Forsyth, Ogston, Clark, & Florey, 1990), ear infections, respiratory infections (Beaudry, Dufour, & Marcoux, 1995; Wright, 2001) and urinary tract infections (Dewey, Heinig, & Nommsen-Rivers, 1995; Heinig, 2001), as well as decrease the incidence of less common ailments, such as Sudden Infant Death Syndrome and bacterial meningitis (Oddy, 2000). In addition, breastfeeding has been indicated to lower the risk of childhood obesity (von Kries et al., 1999), and has been associated with lower systolic blood pressure (Wilson & Forsyth, 1998).

In addition to the benefits breastfeeding affords an infant, the mother who chooses to breastfeed also benefits from the act. The Institute of Medicine (1991) has postulated that a breastfeeding mother is likely to experience a quicker recovery from childbirth; due to the action of the hormones that breastfeeding produces. She may also benefit financially, as bottle-feeding is costly, averaging \$855 for the first 6 months of an infants life (Ball & Bennett, 2001).

Despite the overwhelming benefits that breastfeeding offers a child, the rates of breastfeeding have not yet reached the level recommended by the U.S. Department of Health and Human Services in *Healthy People 2010* (United States Department of Health & Human Services [USDHHS], 2000a) or the American Academy of Pediatrics (1997). A study conducted by Ruowei, Darling, Maurice, Barker, Grummer-Strawn (2005) estimated rates of initiation and continuation of breastfeeding, utilizing data collected from the 2002 National Immunization Survey (NIS). The NIS used random-digit dialing to survey households across the United States with children 19-35 months. The NIS gathered information about vaccination, but also included items about breastfeeding. Approximately 3500 households answered the items pertaining to breastfeeding in 2002.

Using these data, Ruowei et al. (2005) found that 71.4% of the children had ever been breastfed. At 3 months, 51.5% were breastfed to some extent, with 42.5% breastfed exclusively. These rates dropped at 6 months, with 35.1% of infants being breastfed some, and 13.3% receiving breast milk as the only form of infant nutrition. At 1 year, only 16.1% of the infants in the study were receiving any breast milk.

Utilizing data from the same survey, the Centers for Disease Control and Prevention (CDC) reported that 71.9% of women initiated breastfeeding in 2005, however only 20.1% were still breastfeeding at 12 months postpartum (CDC, 2006).

Researchers have identified a multitude of factors that appear to influence a mother's decision to breastfeed her infant. To increase the rates of breastfeeding, it is essential to understand what influences a woman to choose breast milk as the primary form of infant nutrition for her child. For example, maternal age (Ford & Lobbok, 1990;;

Murtaugh, 1997; Scott & Binns, 1999; Shelton & Qi Wang, 1997 & Vogel, Hutchison), marital status (Grjibovski et al., 2005; Lande, Anderson, Baerug, Trygg, Lund-Larsen, Vierod, & Bjorneboe, 2003; MacGowan et al., 1991; Nolan & Goel, 1995; Raj & Plichta, 1997; Tarkka, Paunonen & Laippala, 1999), enrollment in WIC programs (Schwartz, Popkin, Tognetti & Zohoori, 1995; Shelton, 1997; Walker, 2002; Shelton & Qi Wang, 1997), maternal educational level (Hawkins, Nichols, & Tanner 1987; Lande et al., 2003; MacGowen et al., 1991; Nolan & Goel, 1995), maternal employment (Earland, Ibrahim & Harpin, 1997; Noble, 2001), have all been indicated as influencing factors in determining a mother's intention to breastfeed her child. These factors appear consistently through the body of literature on breastfeeding, across several different research studies, yet no one study has identified which factors serve as predictors for breastfeeding at 6-weeks postpartum for women in Utah. By increasing understanding of which demographic factors are predictors of breastfeeding, it may be possible to design more appropriate interventions and public health programs.

### Purpose of the Study

Rates of breastfeeding continue to be much lower than desired, despite efforts to reverse this trend by many agencies, such as the American Academy of Pediatrics, the World Health Organization, and the American College of Obstetrics and Gynecology. A weakness exists in the research literature however, as some factors may prove to influence certain subgroups of women to breastfeed, but not others. This "one size fits

all” approach may not be the most effective, however, if one examines the still low rate of breastfeeding through the first year of an infant’s life. Identifying which factors serve as predictors of breastfeeding among specific subgroups may provide a more useful framework for developing effective intervention programs that target each subgroup’s specific needs in order to increase breastfeeding rates. The purpose of this study was to determine which of these demographic factors (age, maternal education level, maternal employment, etc.) serve as significant predictors for breastfeeding initiation among women of different age groups.

#### Research Questions

1. Is maternal age a significant predictor of breastfeeding in the early postpartum period?
2. Is marital status a significant predictor of breastfeeding at 6-weeks postpartum?
3. Is participation in Women’s Infant’s Children program (WIC) during pregnancy a significant predictor of breastfeeding at 6-weeks postpartum?
4. Is maternal education level a significant predictor of breastfeeding at 6-weeks postpartum?
5. Is maternal employment after delivery a significant predictor of breastfeeding at 6-weeks postpartum?
6. Is parity a significant predictor of breastfeeding at 6-weeks postpartum?

7. Do the effects of demographic factors (marital status, WIC participation, education level, maternal employment, and race/ethnicity) on breastfeeding at 6-weeks postpartum differ across different age groups?

### Limitations

The limitations of this study are as follows:

1. The interview uses self-report measures, which may not accurately reflect the behaviors.

### Delimitations

The delimitations of this study are as follows:

1. The sample studied is fairly homogenous, consisting of mostly Caucasian women.
2. This study uses nonrandom sampling procedures, thus generalizability to other groups may be limited.
3. Data will be collected for this study at public venues in Salt Lake City, Utah, not all possible places. This may limit the generalizability of the results.
4. Women participating in this study will be 18 years of age or older.
5. Women participating in this study will be at least 6-weeks postpartum, and no more than one year postpartum.
6. The sample only contains English speaking women.

### Assumptions

Assumptions made in this study include:

1. The instruments utilized in this study will accurately measure what they intend to measure.
2. All interview questions will be answered honestly.
3. The instrumentation is valid and reliable.

### Definitions of Terms

Breastfeeding: The act of feeding a baby from a mother's breast rather than from a bottle (Mirriam-Webster, 2006).

Human Lactation: The process in which human milk is secreted by the mammary glands, which are located within the fatty tissue of the breast (USDHHS, 2000).

Multiparous: Having experienced one or more previous births (Mirriam-Webster, 2006).

Primiparous: Bearing a child for the first time (Mirriam-Webster, 2006).

Parity: The number of times a female has given birth, counting multiple births as one (Mirriam-Webster, 2006).

### Summary

This chapter provides a framework upon which to support the premise for this study. More research is needed to determine which factors serve as significant predictors of breastfeeding initiation among women of different ages. Also included in this chapter were the limitations and delimitations that were placed upon the study.

Empirical evidence from published research will be presented in the next chapter to further support the basis and need for this study. The methodology of the study will be discussed

in Chapter III. Chapter IV will examine the results of the data analysis and Chapter V will provide a discussion of the findings of the study, as related to the literature.

## CHAPTER 2

### REVIEW OF THE LITERATURE

#### Introduction

The literature review will provide a comprehensive overview of the current research that has been conducted regarding breastfeeding, and include: (a) the history of breastfeeding, (b) health organization recommendations, (c) the benefits of breastfeeding (d) rates of breastfeeding for specific groups, (e) previous historical trends in the practice of breastfeeding, and (f) factors that influence the initiation of breastfeeding. Although much research exists investigating the psychosocial factors influencing the practice of breastfeeding, the scope of this study is limited to demographic factors.

#### History of Breastfeeding

The practice of breastfeeding a child has been documented throughout history. In pottery and other artwork dating back to 3000 B.C., goddesses were depicted breastfeeding their children, indicating high regard for the practice (Wolf, 2003). The *Talmud* mandated a 3-year period of breastfeeding in 536 B.C., and the *Koran* enforced at least a 2-year period of breastfeeding a child (Piovanetti, 2001). Additionally, Aristotle encouraged women to breast feed their child during the period while no menstruation was occurring, usually between 1 and 2 years (Piovanetti, 2001). This trend



of breastfeeding infants continued into the beginning of the 20<sup>th</sup> century, when two-thirds of mother's chose breastfeeding as their primary infant feeding method (Wright, 2001).

The rates of breastfeeding began to fall, however, in the early 1900s, as did the length of time that children were normally breast-fed (Wright, 2001). According to Wright, there was a larger decrease in the practice after World War II, and in 1972, the breastfeeding rate reached its nadir. This decrease was partially due to an increase in the presence of women in the labor market, as well as a shift from rural-dwelling to more urban-living (Coates, 1993).

With the breastfeeding rates at an all time low, the first organized attempt to increase these rates occurred in the early 1970s (Riordan & Auerbach, 1999). Whether related to the government's encouragement to breast-feed or the growing trend to live a more "natural life", (Riordan & Auerbach, 1993), breastfeeding rates began to increase. In 1975, 33.4% of American mothers initiated breastfeeding, according to a national, cross-sectional study (Martinez & Krieger, 1985). In 1984, the breastfeeding initiation rate for American women had risen to 59.7% (Martinez & Krieger, 1985; Wight, 2001).

This resurgence towards the desired rates of breastfeeding experienced a slight decrease in the late 1980s, followed by a return in the mid-1990s to the high rate observed in the early 1980s (Wright, 2001). In 1995, the Ross Laboratory Maternal Study (RLMS) reported that 60% of new mothers initiated breastfeeding with their newborn infant, with 20% still breastfeeding at 6 months postpartum (Ryan, 1997). In 1998, the USDHHS (2000a) reported that 64% of women initiate breastfeeding while in the hospital. As noted above, Ruowei and colleagues (2005) found that 71.4% of women

in the INS study initiated breastfeeding, however only 16.1% continued to breastfeed at the 12-month mark. The Centers for Disease Control and Prevention reported that in 2005, 71.9% of women initiated breastfeeding, but only 20.1% were providing any breast milk to their child at 12 months (2006).

### Health Organization Recommendations

Many health organizations support and promote prolonged breastfeeding to increase the health and well being of the child. Among these, the American Academy of Pediatrics, published a position statement on breastfeeding which stated they believe that this infant feeding method ensures the best developmental and psychosocial outcomes for infants, and that the practice of exclusive breastfeeding for a minimum of 6 months should be supported and promoted enthusiastically by physicians (American Academy of Pediatrics [AAP], 1997).

In addition, The American Dietetics Association (1997), in their position statement on breastfeeding stated that efforts to promote breastfeeding should be encouraged and enhanced, so that an infant is privy to the nutritional, immunological, psychological, and economic benefits that breastfeeding offers. Like the American Academy of Pediatrics, the American Dietetics Association (ADA) also encourages women to breastfeed for at least 12 months.

Along with these and other professional medical organizations recommendations, the Healthy People 2010 initiative, included objectives that aim to increase breastfeeding

across three specific time periods (USDHHS, 2000a). These include the early postpartum period, 6 months of age, and 1 year of age. Objective 16-19a is directed to increase mothers who breastfeed during the early postpartum period from a 1998 reported baseline of 64% to a 2010 target of 75%. Objective 16-19b aims to increase mothers who choose to breastfeed at 6 months postpartum from 29%, the 1998 reported baseline to 50%, the 2010 target. Finally, objective 16-19c is directed at mothers who breastfeed their child at one year. The 2010 target is 25%, increased from the 1998 baseline of 16% (USDHHS, 2000a).

In 2000, the USDHHS published the *HHS Blueprint for Action on Breastfeeding*. This document addresses the low rates of breastfeeding as a public health challenge, and describes an action plan for increasing the low rates, focusing on collaboration between federal agencies, state and local governments, health professional organizations, advocacy groups, and many other organizations. The action plan states “infants should be exclusively breastfed during the first 4 to 6 months of life, preferably for a full 6 months” (p.19).

These and many other health organizations promote breastfeeding as the “gold standard” of infant feeding choices, mostly due to the health benefits it offers. These benefits, when examined closely, only serve to support the argument to encourage mothers to choose breastfeeding.

## Benefits of Breastfeeding

*Breastfeeding as protection against common illnesses*

The protective agents found in breast milk have been identified as a cause of reduction in the incidence of many common ailments afflicting infants and children. These include diarrhea, ear infections, and respiratory illnesses (Beaudry, Dufour, & Marcoux, 1995; Duncan et al., 1993; Dewey, Heinig, & Nommsen-Rivers, 1995; Howie, Wright, Bauer, Naylor, Sutcliffe, & Clark, 1998).

The relationship between infant feeding method and gastrointestinal and respiratory infections during the first 6 months of life was researched in New Brunswick, Canada, by Beaudry, Dufour and Marcoux (1995). In this study, 776 infants of primiparous women were sampled during a 1-year period. Inclusion criteria for this study stated that participants must be 36-weeks gestational age, a product of a single birth, and must weigh 2500 g or more at birth. A self-administered questionnaire was mailed to the mother of each infant one week before her infant reached 6 months of age. The study found a protective effect of breastfeeding on respiratory illnesses. A protective effect was also found for gastrointestinal illnesses. Interestingly, the protective effect of breastfeeding on respiratory illnesses was still apparent after adjustment for age of the infant, socioeconomic status, maternal age, and maternal smoking. Finally, when ear infections were distinguished from other respiratory illnesses, a separate protective effect was identified for the two specific events. The results of this study furthered the understanding that breastfeeding does indeed have a protective effect against gastrointestinal and respiratory illnesses in an infant's first 6 months (Beaudry et al., 1995).

An interesting study conducted by Wright and colleagues (1998) found that increasing breastfeed rates reduced infant gastrointestinal and respiratory illness at the community level. To determine this, the researchers examined the medical records of all children born in one Navajo community during the year before a successful breastfeeding promotion program ( $n = 977$ ) and the year following the program ( $n = 858$ ). Variables of interest included proportion of breastfeeding and/or exclusive breastfeeding, incidence of common infant illnesses during the first 12 months of life, and feeding-group specific rates of illnesses.

After the breastfeeding promotion program, the percentage of women breastfeeding exclusively for any period of time increased to 54.6%, in sharp contrast from 16.4% seen before the promotion program. The rates of infants diagnosed with pneumonia and gastroenteritis decreased in the year following the intervention, in correlation with the increase of breastfeeding rates. Feeding-group specific rates remained unchanged, leading the authors to suggest that the decline observed in gastroenteritis and pneumonia were attributable to the increased number of infants who were breastfed. Interestingly, the rates of croup and bronchiolitis, other common respiratory illnesses, increased after the intervention among those infants who received any formula from birth, suggesting a viral epidemic which was not found among those infants exclusively breastfed (Wright et al., 1998).

Another study, conducted in western Australia by Oddy et al. (2003) examined the relationship between the duration of breastfeeding and respiratory illness and infection in first 12 months of life. The Western Australia Pregnancy Cohort Study was

established between 1989 and 1992 as a prospective birth cohort study. The participants were recruited from postpartum clinic at a local hospital, or other private practice facilities in Perth, Australia. Initially, 2979 participants enrolled in the study at 18 weeks gestation. At this time, the participants were questioned about their socioeconomic status, as well as their respiratory health. The participants were again interviewed at 1 year postpartum. Of the 2979 original participants, 2602 completed the 1 year interview. The remaining portion of the original cohort was unable to be interviewed, due to stillbirth or miscarriage, moving out of the study area, or simply withdrawal from the study.

Respiratory morbidity in the first year of life was the outcome of interest. This was measured by collecting information on the number of doctor visits and hospital admissions for any respiratory illness or infection. The respiratory illnesses were grouped as upper respiratory illnesses, wheezing lower respiratory illnesses, and non-wheezing lower respiratory illnesses. Data analysis consisted of logistic regression and a series of binary explanatory covariates.

The researchers (2003) found that doctor visits for four or more upper respiratory tract illnesses were significantly greater if predominant breastfeeding was stopped before the infant was 2 months old (OR = 1.43, 95% CI: 1.02-2.01), or if partial breastfeeding was stopped before 6 months of age (OR = 1.46, 95% CI: 1.07-2.00). Predominant breastfeeding for less than six months was significantly associated with an increased risk for two or more doctor visits (OR = 2.01, 95% CI: 1.47-2.90) or hospital admissions for wheezing lower respiratory illness (OR = 2.65, 95% CI: 1.30-5.41). A significantly

increased risk of two or more doctor visits or hospital admissions because of wheezing lower respiratory illness was found when an infant was breastfed for less than 8 months (OR = 1.61, 95% CI: 1.08-2.40).

Based on these results, the authors of this study concluded that predominant breastfeeding for a minimum of 6 months, and partial breastfeeding for up to 1 year may reduce the prevalence of respiratory illness and infection in children up to one year old (Oddy et al., 2003).

Duncan and colleagues (1993) also found that breastfeeding had a protective effect against otitis media in infants. This was determined by conducting a study designed to assess the relationship between exclusive breastfeeding and acute and recurrent otitis media in the first 12 months of life, independent of identified risk factors. To conduct this study, the records of 1220 infants were reviewed. These records were selected from a sample of children who were followed during their first year of life as part of the Tucson Children's Respiratory Study, and who used a health maintenance organization. Data were obtained about the exclusiveness and duration of breastfeeding, as was information regarding potential risk factor, such as use of day care, maternal smoking, family history of allergies, gender, family size, and socioeconomic status. Outcome variables consisted of acute otitis media, defined as three or more episodes of acute otitis media in a 6-month period, and recurrent otitis media, defined as four episodes of otitis media occurring in 12 months.

One thousand and thirteen infants participated in the study for their entire first year. Of these participants, 47% ( $n = 447$ ) were reported to have had at least one episode

of otitis media and 17% ( $n = 169$ ) had recurrent otitis media. Infants who were exclusively breastfed for 4 or more months had half the mean number of acute otitis media episodes than did those who were formula fed exclusively. Exclusively breastfed infants also were reported to have 40% less acute otitis media than those children whose diets were supplemented with other foods prior to 4 months. In addition, the rate of recurrent otitis media in infants who were exclusively breastfed for 6 months or more was 10%. Recurrent otitis media was reported to occur 20.5% of the time in infants who breastfed for less than 4 months. This protection was found to be independent of the noted above risk factors (Duncan et al., 1993).

The protective factor that breastfeeding provides in regards to GI illness was studied by Howie, Forsyth, and Ogston (1990). Using data collected from a review of medical records, these researchers compared the morbidity rates among Scottish infants classified into groups based on infant feeding patterns at 13 weeks after birth. The classifications included (1) fully breastfed, those infants who were breastfed for 13 weeks or more, with no supplements, (2) partially breastfed, those who received both breast milk and other supplements, (3) early weaners, those children who weaned completely from breastmilk before the infant was 13 weeks of age, and (4) bottle fed, those infants who were fed commercial formula from birth. The results of this study indicated that during the first year of age, rates of GI illnesses were lower among the groups breastfed for any amount of time, than were infants bottle-fed from birth, regardless of whether other supplements were given to the breastfed children (Howie et al., 1990).



In addition to lower rates of gastrointestinal disease, the researchers in the Howie et al. (1990) study noted above found reductions among breastfed infants in respiratory illnesses, when compared among bottle-fed infants. These reductions were statistically significant at 0 to 13 weeks of age (Howie et al., 1990).

An interesting study was conducted by Dewey, Heinig, and Nommsen-Rivers in 1995. This study investigated whether breastfeeding is protective against infection in an affluent population. To conduct this study, morbidity data were gathered by weekly monitoring of a matched cohort of infants during the first 2 years of life. The cohorts of infants were classified as either breastfed ( $n = 46$ ) or formula fed ( $n = 44$ ). The cohorts were matched for characteristics such as birth weight and parent socioeconomic status. The use of day care was controlled for in data analysis. A mean maternal education level of 16 years was present in both groups.

Results of this study indicated that incidence of diarrhea during the first year of life among the breast-fed cohort was half that of the infants who were fed formula. This result is similar to the findings of the studies reported previously. Similarly, breastfed infants experienced 19% less otitis media than did the formula fed children, and prolonged episodes of otitis (>10 days) occurred 80% less frequently among the breastfed cohort. These results concur with the findings of the previously reported studies. This study, however, reported no significant differences in respiratory illness rates, a finding that differs from nearly all other studies of this type. The authors suggest that the socioeconomic status may account for this difference; however more research is needed to test this assertion (Dewey et al., 1995).

The previously reported studies have clearly indicated that breastfeeding, especially exclusive breastfeeding, can have a protective effect on children against common childhood ailments, such as otitis media and gastrointestinal illnesses. A protective effect has been discovered for respiratory illnesses, although some studies dispute this finding. More research is needed to clarify this issue. It is evident, however, that breastfeeding can protect the health of a child in ways that formula feeding may not.

#### *Breastfeeding and childhood obesity*

Breastfeeding may also lower the risk of childhood obesity. In a study of 9357 German children, those who had never been breast-fed had a 4.5% prevalence of obesity, compared with 2.8% of breast fed children (von Kries et al., 1999).

A study conducted by Grummer-Strawn and Mei (2004) examined the association between duration of breastfeeding and childhood obesity status. Data were drawn from the Centers for Disease Control and Prevention (CDC) Pediatric Nutrition Surveillance System, which provides aggregate data on growth and anemia from low-income children who attend public health clinics across the nation. Records from 177,304 children, born between 1988 and 1997, were included in the analysis. Logistic regression was conducted on the odds of a child being overweight by the specific breastfeeding categories. Gender, race/ethnicity, and birth weight were controlled for in the analysis.

The results of this study found a statistically significant relationship between the duration of breastfeeding and the rate of overweight in this population. Interestingly, these relationships were only found for children who were non-Hispanic white; no

significant association was found among non-Hispanic blacks or Hispanics. In this study, the rate of overweight at 4 years of age was highest among children who were never breastfed, or who were breastfed for less than 1 month. Among non-Hispanic whites, the adjusted odds ratio of overweight by breastfeeding for 6 to 12 months versus never breastfeeding was 0.70 (95% CI: 0.50-0.99) and for greater than 12 months versus never was 0.49 (95% CI: 0.25-0.95) (Grummer-Strawn & Mei, 2004).

A study conducted in Scotland also tested the hypothesis that breastfeeding is associated with reduced obesity in children. Armstrong and Reilly (2002) investigated a cohort of children ( $n = 32200$ ) born in Scotland in 1995 and 1996. These children were visited by staff of the Child Health Surveillance Programme at age 6-8 weeks of age, during which information about their infant nutrition methods was obtained. In this sample, 68% of infants were fed formula exclusively, 7% were fed breast milk and formula, and 25% were breast fed exclusively. These same children were visited at age 39-42 months, during which time their Body Mass Index (BMI) was recorded. Records were linked through a unique identifier to ensure the child had adequate data to remain in the study.

In this study, obesity was defined as having a BMI at the 95<sup>th</sup> percentile or higher. After data analysis, the unadjusted prevalence of obesity was found to be significantly lower in breastfed children, with an odds ratio of 0.78 (95% CI: 0.70-0.85). This association continued even after the researchers adjusted for socioeconomic status, gender and birthweight, with an odds ratio of 0.70 (95% CI: 0.61-0.80). The authors concluded that breastfeeding is associated with a reduced rate of childhood obesity, and

suggest that it may be potentially useful for population-based strategies to reduce childhood obesity (Armstrong & Reilly, 2002).

Breastfeeding has also been associated with a lower systolic blood pressure than formula feeding. Wilson and Forsyth (1998) conducted a study on a cohort of children in Australia, of which detailed infant feeding and demographic data were collected during the first two years of their lives. The mean age of the children who participated in the study was 7.3 years. From these 545 children, information on respiratory illnesses, weight, height, body mass index, percentage of body fat, and blood pressures were obtained. These variables were analyzed in relation to duration of breastfeeding and timing of introduction of solid foods.

After adjusting for confounding variables (e.g., maternal blood pressure, body mass index, and gender), it was discovered that children who were exclusively bottle-fed had significantly higher systolic blood pressure readings than did children who received breast milk exclusively for at least 15 weeks. The authors hypothesized that this could be attributed in part to errors in reconstitution of formula, leading to higher than optimum levels of sodium, which has been linked to high blood pressure in infants (Wilson & Forsyth, 1999).

### *Maternal Benefits of Breastfeeding*

As well as health benefits for the infant, the mother who chooses to breast-feed is likely to benefit from the act. A mother who chooses breast-milk as the primary form of infant nutrition is likely to experience a quicker recovery from the birth (Institute of

Medicine [IOM], 1991). The Institute of Medicine postulates that this is due to the actions of the hormones that breastfeeding produces. These hormones allow the uterus to clamp down to its normal size faster. Also, breastfeeding is believed to delay a women's return to ovulation, and may possibly decrease the risk of developing breast cancer (Shelton & Wang, 1997).

*Maternal weight loss.*

Another benefit that mothers may experience by breastfeeding is a more rapid weight loss, when compared with non-breastfeeding postpartum women. To evaluate this, Dewey, Heinig and Nommsen (1993) conducted a study designed to compare changes in weight and skinfold thickness of women who breastfed for at least 12 months postpartum with a matched group of women who chose not to breastfeed beyond the first 3 months postpartum. They also aimed to evaluate whether the degree of breastfeeding is related to changes in these measures during the early lactation period and later on.

Women participating in the Davis Area Research on Lactation, Infant Nutrition and Growth (DARLING) study, a longitudinal comparison of growth, nutrient intake, and morbidity of matched cohorts of breastfed and formula-fed infants, were recruited to participate in the aforementioned Dewey et al. study. Two groups of women were studied. Women who breastfed for at least 12 months were considered to be in the prolonged breastfeeding group ( $n = 46$ ) and women who breastfed for less than 3 months were included in the formula-feeding group ( $n = 39$ ). Matching procedures ensured that the groups would be similar in parental age, education, ethnic group, socioeconomic status, maternal weight and BMI before pregnancy and infant gender and birth weight.

Researchers visited the participant's homes monthly from age 1 month to 18 months, and again at 21 and 24 months. They recorded measurements of both mothers and infants at those times. Maternal weight was measured using an accurate digital scale and a caliper technique was used to measure skinfold thickness at the triceps. Maternal height was measured to the .5 centimeter. Women in the prolonged breastfeeding group were asked to record frequency and total-time breastfeeding at 3, 6, 9, 12, 15 and 18 months by using a 4 day recall record. Breastmilk was analyzed for energy content and weight, and these totals were used to calculate total energy output in breastmilk.

Data analysis was completed by the researchers using repeated measures ANOVA, paired *t*-tests, and step-wise regression techniques. Results indicate that postpartum weight loss was significantly greater in breastfeeding women than in formula feeding women from 1 to 12 months. The authors concluded that this was due primarily to weight loss in the 3 to 6 month postpartum period. Breastfeeding mothers also had a net decrease in the skinfold thickness tests, where the formula fed group showed a slight increase in body fat in the triceps area. Also, they found that breastfeeding frequency and total time breastfeeding were related to a decrease in weight in the breastfeeding group from 6-12 months. No difference was noted in the groups between 12 and 24 months. The authors concluded that breastfeeding can enhance lactation, providing the breastfeeding occurs for at least 6 months postpartum (Dewey et al. 1993).

Another study examined whether the length of exclusive breastfeeding has an impact on maternal nutrition using data from two studies in Honduras. The first study sample contained 141 infants of low-income primiparous women. The second study

sample was 199 full-term babies who were considered to be low-birth weight. In both studies, women exclusively breastfed for 4 months and were then randomized to two groups, the first which continued exclusively breastfeeding until 6 months, and the second which received hygienic, high-quality solid foods in addition to breast milk until 6 months (Dewey, Cohen, Brown, & Rivera, 2001).

For both of these studies, maternal weight was measured shortly after delivery, and again monthly for the duration of the studies. A digital scale was used to ensure accurate measurements. Maternal height was also measured. Body mass index (BMI) was calculated for each mother at each data collection point. Women were also asked to complete breastfeeding recall sheets to verify that they were, in fact, following their group's study protocols.

Data from both studies were combined for analyses. *T*-tests and ANOVA were used to compare maternal weight and BMI. Results of the analysis indicate that maternal weight loss between 4 and 6 months was significantly greater in the exclusive breastfeeding group than in the groups given solid foods in the first study. This difference did not occur between the groups in the second study. The authors concluded that, when considered with the results of their previous findings, the results of this study indicate that exclusive breastfeeding during the first 6 months is likely to result in maternal weight loss (Dewey, Cohen, Brown & Rivera, 2001).

*Breastfeeding as protection against breast cancer.*

A study conducted by Newcomb and colleagues (1994) examined the relationship between breastfeeding and risk of breast cancer, conducting a large, multicenter

population-based, case control study with a very large sample ( $n = 14094$ ). Participants ( $n = 5878$ ) were identified from statewide tumor registries in Wisconsin, New Hampshire, Maine and Massachusetts. Inclusion criteria included less than 75 years of age and having a diagnosis of breast cancer. Controls were found by randomly selecting women from lists of licensed drivers if the case subjects were less than 65 years of age, and from Medicare lists if the case subject was 65-74 years of age. Controls ( $n = 8216$ ) were required to have no history of breast cancer and to have a publicly listed telephone number (1994).

Case subjects and controls were sent a letter describing the study before they were contacted by telephone. A phone interview was then conducted during which information about the participant's reproductive history, lactation history, reasons for discontinuing breastfeeding and medications used to stop lactation was recorded. The interview also elicited information about the use of hormones, alcohol, height and weight, medical history, age of menarche, age of menopause onset, and demographic factors. At the end of the interview, questions were asked about personal and family history of breast cancer to maintain blinding. The interviewers were unaware of the participant's study status (case or control) until the end of the interview.

Data analysis was conducted using logistic regression to evaluate relative risk. After adjusting for age at first delivery, parity and other risk factors for breast cancer, lactation was found to be associated with a slight reduction in the risk of breast cancer among premenopausal women, when compared with the risk among women who had children but never lactated (RR, 0.78; 95% CI: 0.66-.91). This association was not found



among postmenopausal women (RR, 1.04; 95% CI: 0.95-1.14) enrolled in this study (Newcomb et al., 1994).

Similar results were found in a study conducted in Shandong Province, China, in 1997-1999 (Zheng et al., 2000). Researchers in this study conducted a hospital-based case-control study in which they recruited 404 cases and 404 controls to participate. Case participants were recruited histologically confirmed breast cancer patients from 4 large hospitals and several smaller hospitals. Inclusion criteria for cases were restricted to women aged 20-80 years with newly diagnosed breast cancer, but with no other previous diagnosis of cancer, except nonmelanoma skin cancer. All women who were identified from the hospitals participated in the study and their information was included in the analysis.

Control subjects were randomly selected from patients who had received medical care at the participating hospitals, but had not been given a diagnosis of cancer. Because the case subjects all had a new diagnosis of breast cancer, control participants were restricted to patients whose current hospitalizations was for a condition diagnosed within 1 year of the interview. This ensured that, as a whole, the control subjects had not modified their lifestyles and habits as a result of having a chronic disease, which might bias the results of the analysis.

Once the study participants were recruited, interviews were conducted by trained interviewers in the hospital setting. Interviewers followed a standardized, structured instrument that obtained information on demographic, lifestyle, menstrual and reproductive factors, including breastfeeding practices with all of their children. Three

hundred seventy seven cases and 366 controls reported only breastfeeding their children. They were then asked how many months, on average, they breastfed each infant.

Logistic regression was used to evaluate the relationship between lactation and breast cancer risk. Results of the analysis indicated that a significant inverse association between duration of lactation and breast cancer risk. Odds ratio of 0.46 (95% CI: 0.27-0.78) were reported for women who reported breastfeeding for more than 24 months per child. A significantly reduced risk was also found for those whose lifetime duration of lactation totaled 73-108 months (OR = 0.24; 95% CI: 0.11, 0.53) and for those women who reported breastfeeding for more than 109 months (OR = 0.24, 95% CI: 0.11, 0.53). The authors concluded that breastfeeding appears to have a protective effect against breast cancer in both pre and post menopausal women (Zheng et al., 2000).

A cohort study in Iceland found results that support the above findings. In this study, Tryggvadottir et al. (2001) used data from an Icelandic cohort of 80,219 women visiting a Cancer Detection Clinic that offered cervical and breast cancer screening during the years of 1979 - 1995.

To determine case patients for the study, a list of women diagnosed with first invasive breast cancer in the years 1979 to 1995 was generated. Record linkage procedures identified 85% of those cases in the Cancer Detection Clinic databases. A total of 1120 cases were identified from this pared-down list by only including women who visited the Cancer Detection Clinic during the years 1979-1995 and who had visited there before the initial diagnosis of breast cancer. Of these 1120 women, 993 had borne children. These women were enrolled into the study as case participants.

Ten control participants were sought for each case participant. The control participants were matched to the case participant by birth year and age when being seen at the clinic. The controls were required to have been alive at least until the diagnosis-year of their matched case participant. Information from the patient records of both case and control patients were entered into the study database as continuous variables. The variables of interest included age at menarche, age at first birth, number of children, number of children that were breastfed, amount of time spent breastfeeding each child, contraceptive use, height and weight.

Using logistic regression methods, the researchers found an inverse association between total length of breastfeeding and breast cancer risk, with an adjusted odds ratio = 0.77 (CI: 0.59, 1.00) for every 6 months increase in duration of breastfeeding. This was for women who were under 40 years of age at diagnosis. A weaker trend was observed among the remainder of the women, but was not statistically significant. The researchers also found that ever lactating was associated with decreased risk for women diagnosed at all ages (OR = 0.33; 95% CI: 0.19, 0.56) (Tryggvadottir, Tulinius, Eyfjord, Sigurvinsson, 2001).

*Financial benefits of breastfeeding.*

Financial benefits are yet another motivation for a woman to consider breastfeeding. Breast milk is a free form of infant nutrition, while formula is costly, averaging \$855 for the first six months of life (Ball & Bennett, 2001). Also adding to the financial burden is the cost of increased doctor visits, when compared with the low rate of illnesses among breast fed babies. In a study of infants who were healthy at birth, those

who were never breastfed cost health management organizations \$331 to \$475 more in medical expenses during the first year of life than did the breast fed infants (Ball & Wright, 1999). Moreover, breast-fed infants are less likely to require in-patient hospitalization from the illnesses they do contract, decreasing the financial burden to the breastfeeding parents (Heinig, 2001). The financial benefits of breastfeeding add to the growing list of reasons to breastfeed.

### Prevalence of Breast Feeding

In 1978, the Surgeon General of the United States announced a campaign to increase the practice of breastfeeding, due in part to the all time low rates seen during that decade. The early 1980's saw a national rise in the amount of women choosing to breast-feed their child, when 54% of American women chose to initiate breastfeeding (Wight, 2001); however that trend reached the high point in 1985, when rates of breastfeeding reached 59.7%. Barring a slight decrease in the late 1980s, the rates of breastfeeding initiation have remained fairly static since that time. In 1995, the reported rate of breastfeeding initiation was 59.4 percent in the United States (Shelton & Wang, 1997).

Pregnancy Risk Assessment Monitoring System (PRAMS) is a national, continuous surveillance system designed to identify and monitor selected maternal experiences (Beck et al., 2002). In the 2003 2<sup>nd</sup> quarterly report, Utah PRAMS reported that 87.7% of survey respondents reported having initiated breastfeeding; exceeding the *Healthy People 2010* Goal for initiation of breastfeeding. These data represent all live births to Utah residents in 2000. In Utah, 1655 of 2303 mothers who were asked to

participate in the study completed the survey, resulting in a 72% response rate. The results are weighted to ensure generalizability to the entire Utah population of live births (Utah Department of Health [UDOH], 2003).

In 2005, the CDC reported that 72.9% of women initiated breastfeeding and 39.1% of infant were still receiving some breast milk at 6 months of age. Only 20.1% of infants were still being breastfed at 12 months. These data were obtained from the 2005 National Immunization Survey (CDC, 2006). Although the data for the initiation rates are close to the *Healthy People 2010* goal of 75%, the rates for breastfeeding at 6 months still falls short of the 50% goal to be reached by 2010.

### Factors Associated with Breast Feeding Rates

Many different demographic factors have been found to be predictors of initiation and continuation of breastfeeding. These factors, however, differ across studies and among different populations. For example, some studies cite age as a significant predictor, while others refute this finding. A thorough review of literature identifies many predictors of breastfeeding initiation, however no research exists that determines which of these common factors serve as predictors of breastfeeding among specific subgroups of women, specifically different ages of women.

#### *Age*

Age has been associated with breastfeeding initiation and duration in many different research studies. A woman's age at the time of her child's birth has been identified as a prominent factor that may influence her decision to breast-feed her infant

(Raj & Plichta, 1998; Shelton & Min, 1997; Scott & Binns, 1999). In general, a younger maternal age, especially under the age of 18 years, is thought to be related to a significantly shorter duration of actual and intended breastfeeding. Older mothers, typically women over the age of 30 years, are reported to be more likely to initiate breastfeeding, and to continue this act for a longer period of time. (Ford & Labbok, 1990; Murtaugh, 1997).

High maternal age was proven to be protective against early weaning in a study conducted in Hawaii by Hla, Novotny, Kieffer, Mor, and Thiele (2003). This study examined factors associated with early termination of breastfeeding among Caucasian and Japanese women. Data were collected through a mailed survey to all women who delivered an infant in Hawaii between January 1, 1989 and March 31, 1989. To calculate the results of this study, only data from Japanese women ( $n = 228$ ) and Caucasian women ( $n = 439$ ) were evaluated. Results of the study indicated that maternal age was positively correlated with successful breastfeeding for longer periods of time in both the Japanese and Caucasian groups (Hla et al. 2003).

Maternal age was also an apparent factor in influencing the initiation and duration of breastfeeding in a study conducted by Vogel, Hutchison and Mitchell (1988). These researchers conducted cohort study of 350 mothers of healthy infants for a 1-year period in New Zealand to identify factors associated with breastfeeding initiation and duration. Adjusted risk ratios calculated for shorter duration of breastfeeding revealed a younger maternal age < 25 years, 2.33 (95% CI = 1.33, 4.05) ) was associated with a reduced risk for shorter duration of breastfeeding when compared to women age 25-34 1.45 (95%

CI=1.01, 2.09). In this study, mothers under the age of 25 years were found to be significantly less likely to initiate breastfeeding, or to continue breastfeeding for a 6 month duration (Vogel, Hutchison, & Mitchell, 1988).

Another study was conducted in London that by Hoddidott and colleagues (2000) that explored whether social support and demographic information collected at new birth assessments could predict early termination of breastfeeding, defined as before three months. To obtain the data, a survey of 279 women in three general practice clinics in inner-London was conducted. Researchers collected information on infant feeding methods, demographic variables, and social support at the new birth appointment, roughly 10-14 days postpartum, and again 3-4 months following the birth, at an immunization visit.

Stepwise logistic regression was performed on data from 160 women who initiated breastfeeding to identify the predictors of those who would still be breastfeeding at 3 months. A younger maternal age was found to be associated with breastfeeding practice at three months, with younger mothers significantly less likely to still be breastfeeding at three months postpartum (Hoddinott, Pill, & Hood, 2000).

Nolan and Goel (1995) conducted a study in Ontario, Canada, that examined the demographic factors that were associated with initiation and duration of breastfeeding. To complete this research, data from 3120 women participants in the 1990 Ontario Health Survey were collected. The women whose records were selected for review reported having had a child in the previous year on the Ontario Health Survey. The outcomes

measured were whether the child was breastfed, and if so, whether breastfeeding was the primary method of infant nutrition for 4 months.

Using multiple logistic regression, factors associated with breastfeeding initiation and duration were identified. Results of the study found that an older maternal age was independently associated with a longer duration of breastfeeding; however it was not independently associated with initiation of breastfeeding (Nolan & Goel, 1995).

Piper and Parks (1996) analyzed data from the 1988 National Maternal-Infant Health Survey (NMIHS) to identify predictors of duration of lactation for a sample of 2372 breastfeeding women. The NMIHS is a national study of infant births, deaths, and fetal deaths recorded in 1988, during the time of declining rates of breastfeeding initiation and duration.

Predictor variables were selected through a literature review that identified factors associated with duration of breastfeeding. Stepwise logistic regression was used to analyze data for the entire sample to determine predictors of breastfeeding duration of 6 months or greater. Results indicated that increased maternal age was a significant predictors of continued breastfeeding at > 6 months for all 2193 breastfeeding women (Piper & Parks, 1996).

A study conducted in Russia by Grijbovski et al. (2005) examined socio-demographic determinants of initiation and duration of breastfeeding in a community cohort. Data from the medical records of 1399 women, seen at local health clinics, were examined to determine breastfeeding duration, maternal characteristics and infant



characteristics. After adjusting for potential confounders, the risk of selected factors on breastfeeding discontinuation was quantified.

Of the 1399 participants, 75.0% were breastfeeding at 3 months postpartum, and 47.2% continued breastfeeding at 6 months postpartum. After data analysis, the results indicated teenage mothers to have an increased risk of breastfeeding discontinuation (OR = 1.45 95%CI: 1.06-1.99) (Grjibovski et al., 2005).

In many studies, maternal age has been found to influence a women's decision to breastfeed her child. A positive relationship has been found between maternal age and breastfeeding initiation and duration (Grjibovski et al., 2005; Hla et al., 2003; Hoddinott et al., 2000; Nolan & Goel, 1995; Piper & Parks, 1996; Vogel et al., 1988).

Conversely, some studies have shown no significant relationship between age and breastfeeding initiation or duration. For example, Shelton and Qi Wang (1997) examined demographic factors, collected from the 1989-1991 USDA Continuing Survey of Food Intakes of Individuals and the Diet Health Knowledge Survey, to determine which factors influence the length of time a mother will choose to breastfeed. The mothers ( $n = 348$ ) were divided into two categories: those that breastfed less than 5 months and those that continued to breastfeed 5 months or longer. Using chi square and logistic regression, the two groups were compared according to ten demographic factors (e.g., participation in WIC, income, geographic location, age, race, household size, education, and whether they lived in a rural or urban setting).

Of the ten factors studied, only three were found to have a significant influence on the duration in which the mothers' chose to breastfeed. These three factors were

geographic location, enrollment in WIC, and race. Age was not found to have significant influence on breastfeeding in this study (Shelton & Qi Wang, 1997).

MacGowan and associates (1991) found no relationship between the initiation of breastfeeding and maternal age in a study conducted in Georgia. This study randomly sampled 404 women from a cohort of 2010 women who attended WIC prenatal clinics in Georgia in 1986, and were expected to deliver their infant in February of 1987. Participants were interviewed at 6 months postpartum. Initiation of breastfeeding among these women was associated with being married and higher levels of maternal education. After statistically adjusting for these factors, it was discovered that the remaining variables that were identified (employment status, age, ethnicity, and parity) did not influence the initiation of breastfeeding of the women in the sample (MacGowan et al., 1991).

Similarly, a study conducted by Clements et al. (1997) examined the influences of breastfeeding in southeast England by randomly sampling 700 infants. Obstetric records were examined for 97.7% of these infants, and 73.0% of the families of these infants were interviewed. Information was collected on variables related to sociodemography, pregnancy, and the infant and postnatal factors. Data were obtained through chart review and parent interview.

The results of this study found no association between maternal age and either the initiation or duration of breastfeeding. The authors, however, suggest that there may be a selection bias that may affect the generalizability of the results, as data were only collected from responders (Clements et al., 1997).

Previous research has found that maternal age is significantly associated with increased breastfeeding rates (Hla et al., 2003, Hoddinott et al., 2000; Nolan & Goel, 1995; Piper and Parks, 2000; Vogel et al., 1988), however other research has failed to support this conclusion (Clements et al., 1997; MacGowan et al., 1991; Shelton & Qi Wang, 1997). Research that examines whether the demographic factor of age is a predictor of breastfeeding initiation or continuation at 6-weeks postpartum has not yet been conducted.

### *Marital Status*

Marital status is another demographic factor that has been shown to influence the decision to breastfeed. Research conducted in Norway by Lande et al. (2003) utilized data obtained from the Norwegian Infant Nutrition Survey to examine infant feeding practices in relation to maternal and infant characteristics. Data were collected from 2383 infants by self-administered quantitative questionnaires measuring feeding practices at 6 months of age, as well as retrospectively. Results of the study indicated a significant negative correlation between unmarried mothers and breastfeeding as primary infant feeding method at 4 months of age (Lande et al., 2003).

In the Nolan and Goel (1995) study noted above, being married was found to be significantly associated with increased rates of breastfeeding initiation, although not with breastfeeding duration. After controlling for confounding factors (e.g., education level, maternal age, ethnicity and employment status) the Canadian study determined that single women were only half as likely to initiate breastfeeding as married women (OR = 0.57,

95% CI = 0.40-0.81). Similarly, The MacGowan study conducted in Georgia in 1985 found that women who were married or cohabitating (defined as “living as married”) were 3.0 times (95% confidence interval, 1.7- 5.3) more likely to breastfeed their child than were women who were not married or living as married (MacGowan et al., 1991).

Although many studies have identified an association between marital status and breastfeeding (Lande et al., 2003; MacGowan et al., 1991; Nolan & Goel, 1995) some recent studies have failed to do so. In the Clements et al. study discussed earlier, obstetric records for 700 randomly selected infants were examined to determine factors associated with a failure to breastfeed at discharge from the obstetrics hospital. Marital status was one of the factors the authors examined. Interestingly, there was no significant association noted between marital status and breastfeeding initiation (Clement et al., 1997).

Likewise, the study conducted by Piper and Parks (1996) discussed previously resulted in a similar finding. To determine significant predictors of breastfeeding at 6 months postpartum, the researchers analyzed data collected from the 1988 National Maternal-Infant Health Survey. Marital status, although hypothesized to be a significant predictor of breastfeeding at 6 months postpartum, was, in fact, not found to be.

The aforementioned study conducted by Grjibovski and colleagues (2005) in northwest Russia produced conflicting findings or in this case conflicting findings since you are discussing studies that found no such association. After examination of the medical records of 1399 postpartum women, the researchers determined that unmarried

women carried an increased risk of breastfeeding discontinuation (OR = 1.19, 95% CI: 1.03-1.38) (Grjibovski et al., 2005).

Marital status has been found to be a significant predictor of breastfeeding in several research studies (Grjibovski et al., 2005; Lande, Anderson et al., 2003; MacGowan et al., 1991; Nolan & Goel, 1995; Raj & Plichta, 1997; Tarkka, Paunonen & Laippala, 1999). Conversely, some research studies have not found evidence to support these findings (Clement et al., 1997, Piper & Parks, 1996). Determining whether this factor is influential in Utah women may be important in developing appropriate health education strategies. Further research is needed to determine the influence of marital status on breastfeeding habits in Utah women.

#### *Women's, Infants, and Children's Program Participation*

There is a large body of literature on how enrollment in the Women's, Infant's and Children's (WIC) program affects the practice of breastfeeding. Interestingly, being enrolled in this program has been correlated with a low breastfeeding duration rate, although women in this group have similar rates of initiation of breastfeeding (Shelton, 1997). Since the introduction of the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), much controversy has developed in regards to its effects on breastfeeding among its clients. Experts have suggested that the program provides incentives for mothers to feed their child either formula or a mixture of breast milk and formula (Walker, 2002). Others have questioned whether the program provides adequate education on breastfeeding or incentives to encourage breastfeeding (Popkin,

Akin, & Kaufman, 1981). The most common criticism, however, has been that by providing infant formula to low-income families, WIC discourages breastfeeding, despite formal attempts to promote breastfeeding to the participants (Schwartz, Popkin, Tognetti & Zohoori, 1995).

WIC, a program that serves low-income women by providing their child and themselves with healthy foods, provides breastfeeding education through classes and literature to their clients. In several studies, however, enrollment in WIC has been found to be negatively correlated with breastfeeding as the chosen infant feeding method (Shelton & Qi Wang, 1997).

For example, Shelton and Qi Wang (1997) conducted a study that examined demographic factors to determine which factors influence the duration of a mother's breastfeeding practice. Using data collected from the 1989-1991 USDA Continuing Survey of Food Intakes of Individuals and the Diet Health Knowledge Survey, a sample of 348 mothers who indicated that they breastfed their children was drawn. Mothers' ages ranged from 15 to 45 years. The study participants were divided into two categories: those that breastfed less than 5 months, and those that continued to breastfeed 5 or more months. To compare the two categories, logistic regression and chi square were utilized. The two groups were compared according to ten demographic factors, which included occupation, use of food stamps, enrollment in WIC, poverty, urban or rural dwelling, age, race, household size, and education. Of these factors, only three were found to have significant influences ( $p < .05$ ) on the duration in which mothers' breastfeed. Enrollment in WIC was found to negatively influence the mother's initiation

and duration of breastfeeding. In fact, only 22% of mothers enrolled in the WIC program breastfed longer than 5 months, compared to 42% of those not enrolled in WIC (Shelton & Qi Wang, 1997).

Research conducted by Schwartz and colleagues (1995) studied women who participated in WIC during pregnancy, as well as those who were eligible to participate, according to their income but chose not to participate. This study yielded some interesting insight on the relationship between breastfeeding and WIC participation. Using a multivariate statistical procedure, the researchers evaluated the effects of WIC on breastfeeding practices, factoring in other confounding factors, such as parity, income, and participation in WIC during the pregnancy. They utilized existing data from the National Maternal and Infant Health Survey, conducted by the National Center for Health Statistics in 1988.

The authors reached the conclusion that the effect of WIC participation on breastfeeding can only be understood when viewing it as a net result of two conditions: the first being participation in WIC itself, the second being the condition that the mother received breastfeeding advice as a result of WIC participation. Mothers who participated in WIC and did receive breastfeeding advice were more apt to breast-feed than did participants who did not receive similar advice (Schwartz et al., 1995). The results of this study indicate that perhaps more research is needed to control for factors that may influence a women's decision to breast-feed her infant when determining the effects of WIC participation on breastfeeding initiation and duration.

The Ross Laboratories Mothers Survey, a national study that examined the patterns of both breast and formula feeding during infancy, obtained data that shows a negative correlation between WIC participation and breastfeeding. Participants in the Ross study were asked to report whether they fed their infant breastmilk, formula, or a combination of both, in the hospital and during each month postpartum. Logistic regression analyses were conducted to identify significant predictors of breastfeeding in 2003.

The results from the analyses indicated that participating in the WIC program was the strongest determinant of breastfeeding. Mothers who were not enrolled in the WIC program were more than twice as likely to breastfeed at 6 months of age than women who did participate in WIC (Ryan & Zhou, 2006).

Although WIC provides classes and literature to their clients that encourage breastfeeding, no studies that indicate that WIC participation positively effects breastfeeding initiation or duration were found in a literature review. More research is needed to determine whether WIC participation is a predictor of breastfeeding in Utah women.

### *Education Level*

The level of education that the new mother has attained also plays a large role in influencing a woman to breastfeed her child. It has been found that mother's with a higher education level tend to initiate breastfeeding more often, and also tend to breast-



feed their child for a longer period of time than do their less educated counterparts (Shelton & Qi Wang, 1997). In a study conducted by Hawkins, Nichols, and Tanner (1987), researchers interviewed 47 Caucasian mothers who were enrolled in WIC program, who had chosen to breastfeed their infants. Through a comprehensive literature review, the researchers had previously identified 32 independent variables that were thought to influence breastfeeding initiation and duration. They determined that the most salient effect on the duration of breastfeeding was education. They concluded that for each year of education beyond 11.5 years, the duration of breastfeeding increased by 3 weeks.

Greater maternal education level was associated with the initiation of breastfeeding in the MacGowen et al. study (1991) discussed previously. This study, which randomly surveyed 404 women who attended WIC prenatal clinics in Georgia in 1987, concluded that level of education was positively associated with breastfeeding initiation. Results of this study indicated that mothers with more than 12 years, 12 years, or 10 - 11 years of education were, respectively, 5.2, and 2.5 times more likely to breastfeed than mothers with 9 or fewer years of education (MacGowan et al., 1991).

The study conducted in Canada by Nolan and Goel (1995) produced further support that maternal education level is associated with breastfeeding initiation. In this study, data from 3120 women in the 1990 Ontario Health Survey was analyzed using multiple logistic regression methods. This strategy was used to identify factors associated with the initiation and duration of breastfeeding.

Findings from this study indicate that greater maternal education level was significantly associated with breastfeeding initiation. Of the mothers enrolled in the study, 52.9% of mother who had not completed a secondary education initiated breastfeeding, while mothers who had completed secondary education initiated breastfeeding 59.7% of the time. In addition, mothers who had completed post-secondary education initiated breastfeeding 80.6% of the time. This study further corroborates the evidence that the level of education a mother achieves will influence her choice of infant nutrition (Nolan & Goel, 1995).

A previously noted study using data from the Norwegian Infant Nutrition Survey conducted by Lande et al. (2003) produced findings that indicated that a higher level of maternal education was significantly associated with exclusive breastfeeding at 4 and 6 months of age.

Results from this study indicated an adjusted odds ratio of 1.31 for exclusive breastfeeding at 4 months for women who had achieved 11-12 years of formal education as well as an adjusted odds ratio of 2.07 at 4 months for women with 13 or more years of education. Women with less than 10 years of education were assigned an odds ratio of 1.00. These results were drawn from analysis of data collected from 2383 infants by self-administered quantitative questionnaires measuring feeding practices at 6 months of age, as well as retrospectively,

The Lande et al. (2003) study noted similar data for exclusive breastfeeding at 6 months of age. For example, compared to an odds ratio of 1.00 for with 10 years or less of education, an adjusted odds ratio of 1.46 was recorded for women with 11-12 years of

education. A women possessing 13 or more years of education was calculated as having an adjusted odds ratio of 2.43. These findings support the previously noted research indicating that maternal education greatly correlates with initiation and length of breastfeeding.

Taveras and associates (2005) conducted a study to evaluate the association between breastfeeding discontinuation at 2 and 12 weeks postpartum and factors they considered to be “amenable to intervention” (p. 108). This study, conducted at Kaiser Permanente Health Maintenance Organization facilities in northern California, was a prospective cohort study of low-risk mothers and infants who enrolled in a randomized controlled trial of home visits. To gather data for this study, interviews were conducted with the mother at 1- 2 days postpartum, and again by telephone at 2 and 12 weeks postpartum.

One thousand one hundred and sixty three pairs of mothers and infants were enrolled in the study, and of that 1163, 87% ( $n = 1007$ ) reported initiating breastfeeding. 75% ( $n = 872$ ) were breastfeeding at the 2 week interval, and 55%r reported breastfeeding at 12 weeks postpartum.

After adjusting for confounding variables, such as sociodemographic variables, Logistic regression modeling was done to assess the effects of the variables of interest to the researchers. Results of the study indicated that a lower maternal education was associated with breastfeeding discontinuation at the 2 week mark (OR = 1.5; 95% CI: 1.2-1.9).

The Grjibovski et al. (2005) study also found maternal education level to positively influence breastfeeding. In this study of 1399 women, participants with a “basic” education, the equivalent of a high-school education, were found to be at an increased risk of early breastfeeding discontinuation (OR = 1.68, 95% CI: 1.06-2.66).

Although many research studies have identified a consistent and strong association between maternal education level and the decision to breastfeed an infant, some investigators have found no association between level of maternal education and initiation or duration of breastfeeding after controlling for confounding factors.

For example, the Piper and Parks study (1996), which analyzed data from the 1988 National Maternal-Infant Health Survey (NMIHS) to identify predictors of duration of lactation for a sample of 2372 breastfeeding women failed to find a significant association between maternal education level and breastfeeding initiation or duration. The NMIHS is a national study of infant births, deaths, and fetal deaths recorded in 1988, during the time of declining rates of breastfeeding initiation and duration. Stratified sampling was used to select samples from the 1988 vital statistic records from 48 states, New York City, and the District of Columbia. Live birth data were drawn according to six sampling strata based on race and weight at birth. Stepwise logistic regression was conducted to determine predictor variables for the dependent variables, initiation and duration of breastfeeding. Information on maternal education level was taken from birth certificate records, which the researchers deemed to be the most reliable source for this data. As noted above, maternal education level was not determined to be significantly

associated with breastfeeding for any group of women within the study (Piper & Parks, 1996).

Maternal Education level has indeed been found to play a large role in influencing a mother's decision to breastfeed her child (Hawkins, Nichols, & Tanner 1987; Lande et al., 2003; MacGowen et al., 1991; Nolan & Goel, 1995). Other research, however, fails to confirm these findings (Piper & Parks, 1996).

### *Maternal Employment*

Maternal employment is a factor that has received much acknowledgement in influencing a mother's decision to breastfeed her child (Fein & Roe, 1998). Previous studies have indicated that women who continue employment after the birth of their child are more likely to discontinue breastfeeding early, or to never initiate breastfeeding in the first place (Earland, Ibrahim, & Harpin, 1997). In addition, the type of occupation a woman returns to after her pregnancy also influences the initiation and duration of breastfeeding. Women in professional occupations have been shown to breastfeed longer than a woman working in a "blue collar" environment (Raj & Plichta, 1997; Shelton & Win, 1997).

A study conducted by Earland et al. (1997) in Sheffield, England consisted of 55 women with infants aged 10-12 months were interviewed in their homes. The mothers were divided into two groups based on employment status. Of the 55 women, 27 were unemployed and 28 were employed. Information was collected on past and present infant feeding, and weaning practices. The study findings indicated that employed mothers

stopped breastfeeding earlier. This difference became reached significance at 4 months. Results of the study also suggested that employed mothers introduced foods earlier and relied more on commercial food products. The study researchers concluded that maternal employment does influence infant feeding practices. Consequently, this relationship may have repercussions on future health of the infant (Earland, Ibrahim & Harpin, 1997).

Another study, conducted using data from the 1988 NMIHS, found similar results. Visness and Kennedy (1997) used national data from the 1988 NMIHS to explore factors associated with breastfeeding initiation and duration. These factors included age, return to employment, and maternal education level. Multiple logistic regression was used to model the determinants of breastfeeding initiation among 9087 U.S. women who were identified to meet all inclusion criteria of the study. To model the duration of breastfeeding among these women who had initiated breastfeeding, multiple linear regression was used.

Results of this study indicated that 53% of mothers who participated in the study initiated breastfeeding in 1988, and the decision to breast-feed their infant was not associated with maternal employment. Among the women who chose to breast-feed, returning to work by one year postpartum was significantly associated with a shorter duration of breastfeeding, after controlling for other factors. Among employed mothers in the study, the duration of maternity leave was positively associated with the duration of breastfeeding. The authors of the study concluded that low rates of breastfeeding initiation in the U.S. are not attributable to maternal participation in the work force,

however, early weaning is associated with returning to work among women who chose to breast-feed their infant (Visness & Kennedy, 1997).

The Infant Feeding Practices Study conducted by Fein and Roe (1998) examined the effect of work status on breastfeeding initiation and duration. The researchers drew a sample based on 5 characteristics: geographic region, income, population density, household size, and age. To maintain balance, the sample was drawn from a consumer mail panel, based on the United States Census. For a 6-month inclusion period, mail panel members who were in their third trimester of pregnancy were asked to participate in the study. A total of 2615 of the 3155 women who completed prenatal questionnaires were considered eligible and subsequently were enrolled in the study. Respondents of this group were required to complete the first 2 questionnaires and at least of the second 2 questionnaires. The postnatal questionnaires were administered twice during the first month and then once per month in months 2, 3, 4, 5, 6, 7, 9 and 12 (Fein & Roe, 1998).

Several employment variables were analyzed, such as hours per week the mother worked prenatally, hours per week the mother expected to work postpartum, and total leave available. In order to analyze breastfeeding duration, hours per week the mother worked at 3 months postpartum and unused leave were entered as variables. Four work status categories were also analyzed. These included not working, working less than 20 hours, 20-34 hours, and 35 or more hours. Four leave categories were entered as well: none, 6-weeks or less, more than 6-weeks, and not working. Covariates that were analyzed were demographics, parity, delivery and hospital experiences, social support, health promotion and mother's embarrassment (Fein & Roe, 1998).

Results of the study indicated that expecting to work part-time neither decreased nor increased the probability of breastfeeding, relative to expecting not to work. The authors also found that expecting to return to full-time work postpartum decreased the probability of breastfeeding. Mothers who worked full time at 3 months postpartum decreased breastfeeding duration by an average of 8.6-weeks relative to not working, however, it was reported that part-time work of 4 or fewer hours per day did not affect duration, and part-time work of more than 4 hrs per day decreased duration less than full-time work. Results of the study led the authors to conclude that working part-time postpartum is a valuable strategy to help mothers combine employment and breastfeeding (Fein & Roe, 1998).

A similar study was conducted in England by Noble (2001) using data from the ALSPAC study. ALSPAC, or the Avon Longitudinal Study of Pregnancy and Childhood was a prospective, population based study which examined whether planning to return to work postpartum has an effect on initiation of breastfeeding. The 10530 mothers who participated in the survey gave information during pregnancy on their intentions to work postpartum and their initial choice of infant feeding method. Data were also gathered on 7642 mothers regarding the timing of their postpartum employment plans.

To analyze the data, adjusted logistic regression was performed to identify associations between any plans to work after the birth of their child and the initiation of breastfeeding, as well as the timing of the return to work postpartum and the initiation of breastfeeding. Of the 4837 mothers who indicated that they planned to work postpartum, 4037 initiated breastfeeding, compared with 4279 of the 5693 mothers who



did not plan to work postpartum. This difference was statistically significant. It was also found that the decision to breastfeed was not associated with “any” plans to work postpartum. However, women who indicated that they planned to begin work prior to 6-weeks postpartum were significantly less likely to initiate breastfeeding compared with those who indicated that they did not intend to work after the birth of their child. The author of this study concluded that returning to employment before 6-weeks postpartum reduces the probability of initiation breastfeeding, and indicated that these results may have implications for increasing the level of breastfeeding (Noble, 2001).

Maternal employment has long been cited as a significant predictor of decreased breastfeeding initiation and shorter duration, and previous research has corroborated these thoughts (Earland, Ibrahim & Harpin, 1997; Noble, 2001). Other research studies, however, have found no association between the two variables (Visness & Kennedy, 1997) and have also reached the conclusion that returning to work part-time is a useful strategy for balancing breastfeeding with maternal employment (Fein & Roe, 1998). Determining the effect that maternal employment has on breastfeeding in Utah women is an important step in determining how to use scarce resources most effectively.

### *Ethnicity*

In the United States, major differences in the incidence of breastfeeding are evident among various ethnicities. Many studies have consistently reported lower rates of breastfeeding among women of minority groups, such as African American and Hispanic women. For example, Ford and Labbock (1990), in the study described above,

found that Hispanic women and African American women were less likely than Caucasian women to breastfeed. In fact, their findings indicated the probability that the child would be breast-fed decreased by 0.18 for black women.

Ryan et al. (1991) reported similar findings in a national survey conducted in 1989. The authors of this study reported that 58.5% of Caucasian mothers initiated breastfeeding compared with 23% of African American mothers and 48% of Hispanic mothers. Similarly, only 6% of African American mothers and 14% of Hispanic mothers were breastfeeding at 6 months, when compared to 21% of Caucasian mothers.

A study conducted by Forste, Weiss and Lippincott (2001) aimed to examine the relationship between breastfeeding practices and racial differences in the United States. The study utilized data from the Nation Survey of Family Growth (NSFG). These data include a national sample of women of childbearing age and were collected by the Centers for Disease Control and Prevention. The participants were limited to women with a child 18 months or younger at the date of the interview. For this study, single live births from the NSFG 1988 to 1995 were analyzed to determine the predictors of breastfeeding.

After controlling for birth characteristics and socioeconomic factors, Forste et al. found race to be an important predictor of breastfeeding initiation. The results of this study indicate that women of African-American Descent were less likely to breastfeed than were Caucasian women.

Similarly, In the 2003 study discussed above, Taveras et al. found an association between breastfeeding discontinuation at 2 weeks postpartum and women who reported to be of Asian race/ethnicity (OR = 2.6; 95% CI: 1.1-5.7).

Although many studies have reported a negative relationship between ethnic minorities and breastfeeding practice, some studies fail to confirm these findings. For example, MacGowan and colleagues (1991) in their research regarding the initiation of breastfeeding in women attending Women, Infants, and Children (WIC) clinics in Georgia, found that ethnicity did not influence the initiation of breastfeeding. To determine this, breastfeeding practices were determined among a sample of 404 women who were randomly selected from WIC clinics in Georgia. Demographic variables were collected from the participants, and were analyzed to determine which variables served as factors which influenced the initiation of breastfeeding practices of the participants. After adjustment was made for marital status and education, it was determined that ethnicity did not influence breastfeeding practices (MacGowan et al., 1991).

Piper and Parks (1996) also reported finding no significant relationship between breastfeeding and race in their study which utilized data from the 1988 National Maternal-Infant Health Survey (NMIHS). This study, which aimed to identify predictors of duration of lactation for a sample of 2372 breastfeeding women, found no significant relationship between race and breastfeeding initiation or duration.

Ethnicity has been cited in some studies to be a factor in breastfeeding practices (Ford and Labbock, 1990; Ryan et al.1991) and other studies fail to confirm these findings (MacGowan et al. 1991; Piper and Parks, 1996). Determining the role ethnicity

plays in Utah women's decision to breastfeed is an important step in finding appropriate and effective promotion strategies.

### *Parity*

Parity, or the number of children borne by one woman, has been studied as a predictor of breastfeeding in a very small amount of studies. While a handful of studies have shown breastfeeding to be influenced by parity, others have not found the same association.

In 1998, a national study was conducted by the Dutch National Federation of well-baby clinic doctors to evaluate changes in infant feeding methods in children aged 0-4 months. This study, a survey with a follow-up survey, was conducted because there were no previous longitudinal studies about infant nutritional practices in the Netherlands (Bulk-Bunschoten, van Bodegom, Reerink, Pasker-de Jong, & de Groot, 2001).

From April 1, 1998 to July 1, 1998, 4438 infants were enrolled in the study when they received their first well-baby checkup in participating clinics. During the first visit, demographic information about both the mother and child was recorded. Data were collected on the age, parity, native language, education, marital status and place of residence of the mother, and date of birth, gender, gestational age, and birthweight of the child. Additionally, information on the type of feeding the infant received on the day of birth and at 2 weeks postpartum. On subsequent visits, the data were checked for any changes, and infant nutritional practices were recorded. If any changes in infant nutrition

were noted, the mother was asked to describe the reason for the change. These data were recorded until the child was 4 months of age.

At birth, 71% of children in this cohort were exclusively breastfed, decreasing to 59% at 2 weeks postpartum. By 3 months of age, the percentage was 26% and this number further decreased to 21% at 4 months postpartum.

Multivariate, logistic analyses were conducted to correct for mutual confounding of factors. The duration of exclusive breastfeeding was plotted univariately, while changes in prevalence of breastfeeding over time were calculated using Cox's proportional hazards regression model. After analyses, higher parity was found to be the most decisive factor for the initiation of exclusive breastfeeding (Bulk-Bunschoten et al., 1998).

In the Piper and Parks (1996) study discussed previously, data from the 1988 National Maternal-Infant Health Survey were analyzed to examine predictors of breastfeeding for a sample of 2372 breastfeeding women. Using logistic regression, comparisons were conducted between women who exclusively breastfed and those who partially breastfed.

Results of this study found that mothers with higher parity were more likely to breastfeed for a longer period of time. Interestingly, they found that each increase in parity by one birth resulted in a 1.7 times greater likelihood of sustaining breastfeeding beyond 6 months postpartum (Piper & Parks, 1996).

A study conducted by Hill and colleagues (1997) examined patterns of breastfeeding, duration of breastfeeding, parity, breastfeeding experience, and reasons for

termination of breastfeeding. To conduct this study, a convenience sample of 120 breastfeeding women were recruited from local physician offices in Chicago, Illinois. The sample consisted of 69 first-time mothers, 40 women who had had children before who indicated that they had some breastfeeding experience, and 11 mothers with other children who indicated that they had no prior experience with breastfeeding (Hill, Humenick, Argubright & Aldag, 1997).

After enrolling participants in the study, basic demographic information was collected on both the mother and infant. Researchers followed up with home visits and telephone interviews for 20 weeks after delivery. Results of the study indicated that, although there was a trend toward a difference made by previous breastfeeding of other children, parity was not significantly associated with breastfeeding duration (Hill et al., 1997).

Another study, conducted by Scott, Aitkins, Binns, and Aroni in Perth, Australia (1999), examined the factors associated with the duration of breastfeeding in 556 women who gave birth at 2 local maternity hospitals. From September 1993 to April 1993, women were recruited to participate in this longitudinal study by researcher's visits in the 3 days following their delivery. All women who delivered at each hospital considered potential participants, and efforts were made to contact all eligible women.

Once a woman agreed to participate in this study, she completed a survey to obtain baseline information on hospital breastfeeding rates, as well as information on factors thought to be associated with breastfeeding practices. Women who indicated that

they were breastfeeding in the hospital were contacted again by telephone at 2, 6, 10, 14, 18 and 24 weeks postpartum, or until they discontinued breastfeeding.

Variables that were reported to have an effect on the duration of breastfeeding in a literature review were examined in a regression using Cox's proportional hazards model. After analyses of the data using this method, the authors determined that parity was not a significant predictor of breastfeeding initiation or duration (Scott et al., 1999).

A similar study was conducted in Thailand to determine the effects of parity on breastfeeding. This study, conducted by Amatayakul (1999) and colleagues, was conducted to evaluate whether or not previous successful breastfeeding has any influence on future breastfeeding behavior.

To conduct this study, 60 women were randomly selected and stratified by parity from the population in a large area of rural Thailand. To participate in the study, women had to report breastfeeding at 15 days postpartum, and their child must be free of chronic diseases, inherited conditions, or congenital abnormalities.

Nurse researchers recorded detailed information by working in shifts in the participants home. Home visits consisted of two consecutive 24-hr periods, during which data regarding quantity, feeding frequency, duration, and time of day were recorded. These visits occurred when infants were 15, 45, 90, 180, 270 and 360 days old. All 30 multiparous women in the study reported breastfeeding their previous children.

After the data collection was completed, a t-test was conducted to determine whether the multiparous women differed from the primiparous women in their breastfeeding practices. Although the researchers postulated that the multiparous women

would have a higher rate of breastfeeding, in fact, no difference was found between the two groups. According to this study, parity had no effect on women's breastfeeding practices (Amatayakul et al., 1999).

The demographic factor of parity has been briefly investigated in the literature as a predictor of breastfeeding. Some research has indicated that parity is an important predictor (Bulk-Bunschoten, van Bodegom, Reerink, Pasker-de Jong & de Groot, 2001; Piper & Parks, 1996), while others fail to arrive at the same conclusion (Amatayakul, et al., 1999; Scott, Aitkins, Binns & Aroni, 1999). Clearly, more research is needed to determine whether breastfeeding is a predictor of breastfeeding in the population of Utah women.

### Summary

Previous research has identified many demographic factors associated with the initiation and maintenance of breastfeeding. It has been shown that demographic factors such as age, maternal education level and WIC participation, often predicts breastfeeding initiation and duration among recently pregnant women, however, these factors are not found to be consistent across studies. To develop effective intervention programs, it is necessary to identify which factors serve as predictors of breastfeeding at 6-weeks postpartum for Utah women, and to determine if these demographic factors differ among women of different ages.



## CHAPTER 3

### METHODS

#### Overview

This chapter will provide an overview of the procedures used to guide the design of the proposed research project. The information provided will explain the design of the study, as well as sample, setting, and instrumentation. In addition, data collection procedures will be discussed.

#### Research Design

This study used a cross-sectional, non-random design utilizing “intercept interviews” as the data collection method.

#### *Intercept Interviews*

Data were collected for this study utilizing “intercept interviews” as the data collection method. Intercept interviews, sometimes also referred to as “street-intercept interviews” (Miller, Wilder, Stillman & Becker, 1997) are brief interviews that take place in a setting where the respondent is active, such as shopping malls, civic activities, and sporting events. In order to complete an intercept interview, the researcher interrupts the activity of the respondent, and asks a very structured set of questions (Neutens & Rubison, 1997).

Intercept interviews are considered by some to be “the most popular form of the face-to-face interview” (Frey, 1989, p. 34). Traditionally used in the marketing and advertising disciplines, the social and health sciences have embraced the intercept interview as a useful data collection method (Neutens & Rubison, 1997). A study by Miller and colleagues (1997) investigated the feasibility of using an intercept interview to gather data in an African-American community. The intercept interview was compared with a random digit-dial telephone survey conducted in the same geographical area among African-American adults aged 18 years or older.

The intercept interview response rate was 80.2% and had a completion rate of 97.9%. The interviewers were able to complete, on average, 2.5 interviews per interviewer per hour. The intercept method was found to produce more representative distributions of age and gender than did random-digit-dial surveys. Based on this information, the authors concluded that street-intercept interview method is a valid alternative to traditional survey methods, such as phone interviews. It is also suggested that this method may safely reach the portions of the urban population that are traditionally harder to access (Miller et al. 1997).

Intercept interviews have been used as a data collection method in several health related studies. Besides the Miller et al. study noted above, this method was used in a study aimed at exploring young women’s perceptions of smoking (Lennon, Gallois, Owen, & McDermott, 2005). Intercept interviews were also used in a study investigated the difference between lay beliefs about hypertension and current medical understanding

of hypertension in a low-to-middle-income African-American community (Wilson et al., 2002).

Using the intercept interview method has both benefits and drawbacks. The brevity of the interview can be a positive factor when trying to recruit participants, however it also limits the amount of information the researcher can collect during an interview (Neutens & Rubison, 1997). Additionally, the responses in the interview are generally fixed. This can serve as a benefit, as the fixed responses simplify data analysis, because responses can be compared and easily aggregated. Potential drawbacks of having fixed responses, however, include the respondent feeling the interview is impersonal or irrelevant, and the respondent feeling his or her experience is distorted because they have to fit into the researcher's categories (Patton, 2002).

### Sample Description and Setting

Participants recruited for this study were women age 18 and older who have a biological child age 6-weeks to one year. Participants were recruited from public areas, such as parks, shopping centers, free civic events and community activities in Salt Lake City, Utah. In order to obtain as representative a sample as possible, the student researcher emphasized areas that contain a large selection of diverse women, such as shopping centers, local civic activities and public playgrounds. Additionally, because non-probability sampling methods were used, the student researcher continually monitored data collection results, in order to ensure a representative sample. Based on 2000 Census data for Utah, it was anticipated that the racial distribution of the sample

would be: 5% non- Hispanic White, 10.9% Hispanic or Latino, 1.0% Black or African American, 1.3% American Indian/Alaskan Native, 1.9% Asian, 0.7% Native Hawaiian /Other Pacific Islander, and 2.6% two or more races. The student researcher utilized data from the 2000 Census to guide recruiting, especially regarding race and ethnic groups. If a particular race or ethnic group was underrepresented, the student researcher paid special attention to recruiting this group. Table 1 depicts targeted versus actual recruiting based on Census 2000 projections.

Table 1

*Targeted versus. actual enrollment based on Census 2000 race/ethnicity projections*

| Race                             | Targeted   |          | Actual     |          |
|----------------------------------|------------|----------|------------|----------|
|                                  | Percentage | <i>N</i> | Percentage | <i>N</i> |
| White                            | 83.5       | 501      | 73.47      | 432      |
| Black/African American           | 1.0        | 6        | 1.36       | 8        |
| Native American                  | 1.3        | 8        | 2.21       | 13       |
| Asian                            | 1.9        | 12       | 2.38       | 14       |
| Native Hawaiian/Pacific Islander | 0.7        | 4        | 4.42       | 26       |
| Hispanic or Latino               | 10.9       | 65       | 12.76      | 75       |
| 2 or more races                  | N/A        | N/A      | 3.40       | 20       |
| TOTAL                            | 100.00     | 600      | 100.00     | 588      |

*Sample Size Determination*

In order to determine an appropriate sample size, a power analysis was performed using the NCSS/PASS software (Hintze, 2001). Using age as the dichotomous covariate, the logistic regression in PASS was chosen since the outcome variable, breastfeeding at 6-week post-partum, is binary. The assumptions entered into the power analysis include approximately 20% of the mothers are adolescent, odds ratio of breastfeeding at 6-week post-partum for mothers 18years of age or older, compared to mothers less than 18 years old is about 2 - 2.5, and R-squared of age regressed on other socioeconomic factors ranges from 0.1 - 0.3. The estimated sample size varies between 298 - 692, for a two-sided comparison, with 80% power and at 0.05 significance level.

Another consideration of the sample size invokes the “rule of 10”, which states that the number of independent variables in the multiple regression should be less than or equal to the smallest sample of events divided by  $10^2$  (Stiell & Wells, 1999; Hosmer & Lemeshow, 2000) Otherwise, “overfitting” may occur. Because there are 6 variable of interest, with about 12 categories, assuming the events (breastfeeding at 6-week or longer) comprise approximately 20% of the sample, the minimum sample required would be 600. From the above analyses, it was concluded a sample size of 600 would be sufficient to avoid the “overfitting” problem, and was suitable for the purposes of this study.

Intercept interviews were conducted with 600 adult women in the Salt Lake City geographic area. After inspecting the dataset for errors or discrepancies, 12 respondents’ answers were not used in the analysis, for a final sample size of 588. Four respondents stated that the infant they had was not their biological infant, 1 respondent stated that she

was 17 years of age, and therefore ineligible for participation in the study, and it was reported that one respondent had 22 children, which was perceived to be a data entry error. The remaining 6 respondents' data were discarded from the analysis because they were missing data elements. This was determined to be either due to interviewer error or refusal by the participant to answer certain interview questions. Table 2 describes the characteristics of study participants according to breastfeeding practice in the early postpartum period.

Table 2

*Characteristics of study participants*

| Breastfeeding at<br>6-weeks postpartum | Yes      |       | No       |       | Total    |
|--|----------|-------|----------|-------|----------|
|  | <i>N</i> | %     | <i>N</i> | %     | <i>N</i> |
| <b>Age (years)</b>                     |          |       |          |       |          |
| 18-25                                  | 119      | 38.39 | 191      | 61.61 | 307      |
| 26-42                                  | 95       | 33.45 | 189      | 66.55 | 281      |
| <b>Marital Status</b>                  |          |       |          |       |          |
| Single                                 | 12       | 29.27 | 29       | 70.73 | 41       |
| Married                                | 230      | 50.66 | 224      | 49.34 | 454      |
| Separated                              | 22       | 91.67 | 2        | 8.33  | 24       |
| Divorced                               | 24       | 80.00 | 6        | 20.00 | 30       |
| Widowed                                | 0        | 0     | 0        | 0     | 0        |
| Cohabiting                             | 20       | 51.28 | 19       | 48.72 | 39       |

## WIC participation

|     |     |       |     |       |     |
|-----|-----|-------|-----|-------|-----|
| Yes | 120 | 46.33 | 139 | 53.67 | 259 |
| No  | 188 | 57.14 | 141 | 42.86 | 329 |

## Education level

|                  |     |       |     |       |     |
|------------------|-----|-------|-----|-------|-----|
| Some high school | 21  | 45.65 | 25  | 54.35 | 46  |
| High school grad | 18  | 15.25 | 100 | 84.75 | 118 |
| Some college     | 132 | 59.19 | 91  | 40.81 | 223 |
| College graduate | 75  | 59.01 | 52  | 40.09 | 127 |
| Post graduate    | 62  | 83.78 | 12  | 16.22 | 74  |

## Return to work

|     |     |       |     |       |     |
|-----|-----|-------|-----|-------|-----|
| Yes | 214 | 48.10 | 231 | 51.90 | 445 |
| No  | 49  | 34.26 | 94  | 65.74 | 143 |

## Parity

|             |     |       |     |       |     |
|-------------|-----|-------|-----|-------|-----|
| 1 child     | 113 | 47.08 | 127 | 52.92 | 237 |
| 2+ children | 195 | 55.08 | 159 | 44.92 | 351 |

## Instrumentation

An intercept interview script (see Appendix A) was developed by the student researcher to guide the interviewer through the intercept interview using a standardized format. A thorough literature review produced no similar instrument, making development of this instrument necessary for this study. The instrument was examined for content validity by a team of various experts, including a biostatistician, a nurse

researcher, as well as Dr. Julie Gast, the Principal Investigator of this study. Any concerns or questions raised by the team of consultants were discussed verbally, and integrated into the format of the instrument by the student researcher.

The actual interview items (items 3-10 on the written script), as well as the filter questions “is this your biological child?” were programmed into a PDA based data collection program. Using this program helped to eliminate data entry errors because all data were entered at the time of the interview, and were uploaded into an Access database automatically, so no separate data entry was required. In addition, the use of a PDA helped facilitate data collection through the intercept interview approach, because it is small, portable and unobtrusive, and easily used to collect data while conducting an intercept interview.

#### Institutional Review Board Approval

Approval for pilot testing and study procedures was obtained from the Utah State University Institutional Review Board (IRB) before any study actions began (Appendix B). Because study data does not include any personal identifiers and the study actions present minimal risk to the participants, a waiver of informed consent was requested and granted from the Utah State University IRB. The researcher distributed a letter of information (see Appendix B) to each of the study participants, which provided information on the purpose of the study, the reason they were selected for participation in the study, the potential benefits of the study, and contact information for the principal



investigator and student researcher. Because the study was deemed to be minimal risk, an expedited IRB review was possible.

### Pilot testing procedures

Once IRB approval was obtained, pilot testing was conducted to ensure the written script for the interview was sufficient for recruiting participants into the study. To complete the pilot testing phase, 30 intercept interviews were conducted utilizing the written script and PDA data collection tool. This represented 5% of the targeted sample of 600 participants. Conducting these interviews allowed the interviewer to hone her interview skills prior to conducting the study intercept interviews, and also provided an opportunity to ensure the PDA data collection tool was working appropriately and to troubleshoot any unexpected technical glitches. Another reason to conduct the pilot test was to ensure that the intercept interview questions were easily understood by the target population. Finally, the pilot test was used to determine if the intercept interview was an appropriate length for this method of data collection.

Results of the pilot study indicated that no substantial change was necessary to either the interview script or the data collection tool. The interview was found to take between 1 - 3 min, depending on whether the respondents asked questions or requested clarification from the interviewer. Some respondents seemed to be confused by the term “biological child” when asked the filter question “is this your biological child?” This was easily remedied by rephrasing the questions for those who appeared confused or stated that they did not understand to “did you give birth to this child?” All other questions

seemed to be easily understood by the respondents and it was determined that the intercept interviews could be used to collect the entire sample without any major alterations.

### Data Collection Procedures

To complete an intercept interview, the student researcher approached a woman who had an infant with her and requested her participation in the study. If she agreed, a Letter of Information (see Appendix A) was given to her, according to Utah State University IRB approved procedures, and the researcher briefly explained the contents of the letter. The respondent was allowed the opportunity to ask any questions before the interview began. The student researcher then proceeded with the interview (see Appendix A). Filter questions, such as “is this your biological child?” and “is your child under one year old?” were asked to ensure the woman met inclusion criteria for the study. Data were entered at the time of the interview into a PDA-based data collection program by the student researcher. No identifiers were collected or recorded during the interview. Immediately following every data collection session, these anonymous data were downloaded into an Access-based data storage program for further analysis at the conclusion of the data collection portion of the study, and erased from the PDA program. Only one copy of the data-set was stored permanently.

Data collection began on April 24, 2007. The first 30 interviews, which comprised the pilot data set, were collected by May 2, 2007. The remaining interviews

were collected between May 5, 2007 and June 12, 2007. The collection of data occurred at 24 unique locations and took approximately 112 hrs.

### Statistical Analysis

Analysis of data was conducted using the STATA 9.0 statistical analysis software package. The software is programmed to automatically determine, based on the format of the data, whether to use Chi Square or Fisher Exact test procedures to ascertain whether a statistically significant relationship existed between demographic factors and breastfeeding at 6-weeks postpartum. Simple logistic regression analysis was also conducted to determine which demographic variables were significant predictors of breastfeeding at 6-weeks postpartum. This method was chosen because the outcome variable (breastfeeding at 6-weeks postpartum) is dichotomous. Whether the mother reported breast-feeding at the 6-weeks postpartum was entered as the dependent variable, and age, marital status, education level, employment status, WIC participation, and parity were entered as independent variables. In order to answer research question #7, multiple logistic regression was performed on different strata of age, to determine if the effects of the socioeconomic factors on breast feeding at 6-week post-partum differ across different age groups.

Table 3

*Research Questions, Instrument Items, and Data Analysis Procedure*

| Research Questions |  | Instrument Item  | Analysis Procedure                     |
|--------------------|--|------------------|--|
| 1.                 | Is maternal age a significant predictor of breastfeeding at 6-weeks postpartum?  | 3,4              | Chi Square,<br>Logistic regression     |
| 2.                 | Is marital status a significant predictor of breastfeeding at 6-weeks postpartum?  | 3,5              | Fisher's exact,<br>Logistic regression |
| 3.                 | Is participation in WIC during pregnancy a significant predictor of breastfeeding at 6-weeks postpartum?   | 3,8              | Chi Square,<br>Logistic regression     |
| 4.                 | Is maternal education level a significant predictor of breastfeeding at 6-weeks postpartum?  | 3,6              | Chi Square<br>Logistic regression      |
| 5.                 | Is postpartum employment a significant predictor of breastfeeding at 6-weeks postpartum?   | 3,7              | Chi Square<br>Logistic regression      |
| 6.                 | Is parity a significant predictor of breastfeeding at 6-weeks postpartum?  | 3,9              | Chi Square<br>Logistic regression      |
| 7.                 | Do the effects of demographic factors (marital status, WIC participation, education level, maternal employment, race/ethnicity) on breastfeeding at 6-weeks postpartum differ across different age groups? | 3,4,5,6,7,8,9,10 | Multiple Logistic<br>Regression        |

The purpose of this chapter was to discuss the methodology of the study. This information includes the research design, sample, setting, instrumentation and statistical analysis.

## CHAPTER IV

### RESULTS

To determine which demographic variables were significant predictors of breastfeeding in the early postpartum period, a cross-sectional, non-random study using intercept interviews was conducted with 600 adult women in the Salt Lake City geographic area. After inspecting the dataset for errors or discrepancies, 12 respondent's answers were not used in the analysis; therefore Five hundred eighty eight interviews were included in the final analysis. Data collected during the interviews were utilized to address 7 research questions. Table 3 describes the characteristics of study participants according to breastfeeding practice in the early postpartum period.

Statistical calculations were performed with STATA 9 for Windows (College Station, TX: Stata Corporation). The selection of predictors was based on an analysis of the literature. Potential predictors were maternal age, marital status, maternal education level, return to employment after the birth of a child, WIC participation during pregnancy and parity. All possible predictors were screened first univariately through Chi Square, Fisher exact and simple logistic regression techniques to identify whether each variable was associated individually with breastfeed 6-weeks. A multiple logistic regression analysis with a backward elimination was performed to whether the variables that were determined to be significant predictors of breastfeeding in the early postpartum period differed across age strata. An alpha level of  $< 0.05$  was considered statistically significant.



| Age (years) |     |       |     |       |     |
|-------------|-----|-------|-----|-------|-----|
| 18-25       | 119 | 38.39 | 191 | 61.61 | 307 |
| 26-42       | 95  | 33.45 | 189 | 66.55 | 281 |

Simple logistic regression results found that age is a statistically significant predictor ( $p = 0.00$ ) of breastfeeding in the early postpartum period. Mothers in the older age group were found to be more than 3 times more likely to breastfeed than were mothers in the younger age group (OR = 3.25, 95% CI = 2.31-4.55).

Research Question 2: Is marital status a significant predictor of  
breastfeeding at 6-weeks postpartum?

To gather data on respondent's marital status, the women were asked "what is your marital status" and the interviewer read them the 2000 Census categories as the possible choices. Of the Five hundred eighty eight respondents, 77.21% reported that they were married ( $n = 454$ ), 6.97% reported their marital status as single ( $n = 41$ ), 5.10% stated they were divorced ( $n = 30$ ), 4.08% reported to be separated ( $n = 24$ ) and 6.63% reported they were cohabitating, or living as married ( $n = 39$ ). No respondent reported to be widowed. Table 2 describes the breakdown of responses according to 2000 Census data.

A Fisher's exact test was performed on the data, as indicated by Stata 9.0. The results suggest that there is a statistically significant relationship between marital status and breastfeeding at 6-weeks postpartum ( $p = 0.00$ ).



Table 5

*Marital Status and Breastfeeding at 6-weeks postpartum*

| Breastfeeding at 6-weeks<br>postpartum | Yes |       | No  |       | Total |
|--|-----|-------|-----|-------|-------|
|  | N   | %     | N   | %     |       |
| <b>Marital Status</b>                  |     |       |     |       |       |
| Single                                 | 12  | 29.27 | 29  | 70.73 | 41    |
| Married                                | 230 | 50.66 | 224 | 49.34 | 454   |
| Separated                              | 22  | 91.67 | 2   | 8.33  | 24    |
| Divorced                               | 24  | 80.00 | 6   | 20.00 | 30    |
| Widowed                                | 0   | 0     | 0   | 0     | 0     |
| Cohabiting                             | 20  | 51.28 | 19  | 48.72 | 39    |

A simple logistic regression was also performed to determine if marital status was a significant predictor of breastfeeding in the early postpartum period. To complete the regression, married status was entered as the comparison variable. A combined p value = 0.00 was derived from the logistic regression, indicating that marital status is a statistically significant predictor of breastfeeding in the early postpartum period. When compared to married women in the sample, single women were less likely to breastfeed at 6-weeks (OR = .403, 95% CI = .201, .810). Divorced women were almost 4 times more likely to breastfeed at 6-weeks postpartum (OR = 3.8, 95% CI = 1.56, 9.71) and separated women were over 10 times more likely to breastfeed at 6-weeks postpartum (OR = 10.71, CI = 2.4, 46.09) compared to married women in the sample.

Research Question 3: Is participation Women's Infant's Children program (WIC) during pregnancy a significant predictor of breastfeeding at 6-weeks postpartum?

Respondents were asked whether they participated in the Women Infant Children program (WIC) during their most recent pregnancy to assess the relationship between WIC participation and breastfeeding at 6-weeks postpartum. Five hundred eighty eight responses were considered in the analysis. Of the 588 women, 44% ( $n = 259$ ) of the respondents reported participating in WIC for this pregnancy, while 56% ( $n = 329$ ) of the sample reported that they did not participate in the WIC program.

A Chi Square analysis was used to test the relationship between WIC participation and breastfeeding at 6-weeks postpartum. A statistically significant relationship ( $p = 0.009$ ) was found between the two variables.

Table 6

*WIC participation and breastfeeding at 6-weeks postpartum*

| Breastfeeding at 6-weeks<br>postpartum | Yes |       | No  |       | Total |
|--|-----|-------|-----|-------|-------|
|  | N   | %     | N   | %     | N     |
| <i>WIC participation</i>               |     |       |     |       |       |
| Yes                                    | 120 | 46.33 | 139 | 53.67 | 259   |
| No                                     | 188 | 57.14 | 141 | 42.86 | 329   |

Additionally, a simple logistic regression was performed which indicated that WIC participation was a significant predictor of breastfeeding in the early postpartum



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| Education level  |     |       |     |       |     |
|------------------|-----|-------|-----|-------|-----|
| Some high school | 21  | 45.65 | 25  | 54.35 | 46  |
| High school grad | 18  | 15.25 | 100 | 84.75 | 118 |
| Some college     | 132 | 59.19 | 91  | 40.81 | 223 |
| College graduate | 75  | 59.01 | 52  | 40.09 | 127 |
| Post graduate    | 62  | 83.78 | 12  | 16.22 | 74  |

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A Chi Square test with four degrees of freedom was conducted on the data. Results from the Chi Square indicate that there is a statistically significant relationship between maternal education level and breastfeeding in the early postpartum period ( $p = 0.00$ ). A simple logistic regression was also performed on the data, utilizing women with some college education as the comparison variable. A combined  $P$  value of 0.00 indicated that education level is a statistically significant predictor of breastfeeding in the early postpartum period. When compared to women in the sample who attended some college, women who were high school graduates were less likely to breastfeed at 6-weeks postpartum (OR = .12; 95% CI: .07-.22). In addition, the logistic regression found that women with postgraduate education were 3.5 times more likely to breastfeed when compared to others in the sample (OR = 3.5, 95% CI = 1.81-6.98).

Research Question 5: Is Maternal Employment a Significant Predictor of  
breastfeeding at 6-weeks postpartum?

Information on mothers return to employment was obtained by the researcher asking the respondents whether she had returned or would return to paid employment after the birth of her child. Of the Five hundred eighty eight women, 24.32% stated that they had not returned to work after their child's birth ( $n = 143$ ) while 75.68% of women stated that they had ( $n = 445$ ). A chi square analysis and simple logistic regression were calculated to determine if a relationship existed between the two variables, and whether returning to work was a significant predictor of breastfeeding in the early postpartum period. Results of the Chi Square analysis indicated that there was a statistically significant negative relationship between return to paid employment and breastfeeding in the early postpartum period.

Table 8

*Maternal Employment and Breastfeeding at 6-weeks postpartum*

| Breastfeeding at 6-weeks<br>postpartum | Yes |       | No  |       | Total<br>N |
|--|-----|-------|-----|-------|------------|
|  | N   | %     | N   | %     |            |
| <hr/> Return to paid employment        |     |       |     |       |            |
| Yes                                    | 214 | 48.10 | 231 | 51.90 | 445        |
| No                                     | 49  | 34.26 | 94  | 65.74 | 143        |

The simple logistic regression indicated that returning to paid employment was a statistically significant predictor of breastfeeding at 6-weeks postpartum, and mothers

who returned to paid employment after their child's birth were less likely to breastfeed at 6-weeks postpartum (OR = .48, 95% CI = .32, .71).

Research Question 6: Is Parity a Significant Predictor of  
breastfeeding at 6-weeks postpartum?

Information on the respondent's parity was assessed by asking how many children the woman had given birth to. Answers were recorded as stated, but were later collapsed into two categories, the first being comprised of primiparous mothers (women who had only given birth to one child), and the second group were women who had given birth to two or more children (multiparous mothers). Collapsing into the categories follows logic from Donath & Amir (2000) stating that first time mothers have very different behavior patterns regarding breastfeeding than women with more than one child.

A chi square test failed to find a significant relationship between parity and breastfeeding in the early postpartum period ( $p = 0.055$ ).

Table 9

*Parity and Breastfeeding at 6-weeks postpartum*

| Breastfeeding at 6-weeks<br>postpartum | Yes |       | No  |       | Total |
|--|-----|-------|-----|-------|-------|
|  | N   | %     | N   | %     | N     |
| <b>Parity</b>                          |     |       |     |       |       |
| 1 Child                                | 113 | 47.08 | 127 | 52.92 | 237   |
| 2+ children                            | 195 | 55.08 | 159 | 44.92 | 351   |

The simple logistic regression analysis showed that while multiparous mothers are 1.37 times more likely to breastfeed at 6-weeks postpartum than primiparous mothers, the results ( $p = 0.55$ ) were not found to be statistically significant at the  $p > .05$  level.

## Research Question 7:

Do the effects of demographic factors (marital status, WIC participation, Education level, maternal employment, and parity) on breastfeeding at 6-weeks postpartum differ across different age groups?

To determine the effects of the variables in a multiple regression model, variables that were found to be significant predictors of breastfeeding in the early postpartum with univariate analysis (employment, marital status, and education level) were entered in a multiple logistic regression model with backward elimination. Breastfeeding at 6-weeks postpartum was entered as the independent variable. Beginning with a full model

containing all demographic factors, those that were not found to be statistically significant in univariate analysis were excluded from the model. Married women with some college education were entered as the explanatory variables. Table 10 depicts the results of the multiple regression analysis on the included demographic variables.

Table 10

*Results of Multiple Regression Analysis*

| Demographic factors             | Odds Ratio | Z     | P value | 95% Conf Interval |
|---------------------------------|------------|-------|---------|-------------------|
| Marital status-separated        | 23.18      | 4.12  | 0.00    | 5.19, 103.54      |
| Marital status-divorced         | 6.04       | 3.49  | 0.00    | 2.20, 16.57       |
| Employment                      | .33        | -4.70 | 0.00    | .209, .525        |
| Education- high school graduate | .13        | -6.22 | 0.00    | .067, .244        |
| Education- college graduate     | 1.80       | 2.50  | 0.012   | 1.13, 2.87        |
| Education- post graduate        | 7.42       | 5.67  | 0.00    | 3.71, 14.84       |

Results of the multiple regression analysis produced some interesting findings. Holding everything else constant, separated mothers in the current sample were 23 times more likely to report breastfeeding at six weeks postpartum than were married respondents' with some college education (OR = 23.17, 95% CI = 5.18, 103.53). The wide confidence interval, however, indicates variability in the estimate of the effect and a small sample size ( $n = 588$ ). The analysis results also indicate that divorced mothers were 6 times more likely to breastfeed (OR = 6.04, 95% CI = 2.20, 16.57).



Respondents in the sample who reported that they did return to paid employment after the birth of their child were less likely to breastfeed (OR = .33, 95% CI = .20, .52) than were those respondents who reported that they did not return to paid employment after their child's birth.

When compared with respondents who indicated they had some college education, women in the sample who were college graduates were almost twice as likely to breastfeed their child in the early postpartum period (OR = 1.8, 95% CI = 1.13, 2.87). Women in the sample who reported having a post graduate education were more than 7 times more likely to breastfeed in the early postpartum period (OR = 7.42, 95% CI = 3.71, 14.84) when compared with respondents with some college education. High school graduates in the sample were less likely to breastfeed at 6-weeks postpartum (OR = .12, 95% CI = .066, .24) than were women with some college education.

To ascertain whether the demographic factors had differing effects on women of different ages, variables that were found to be significant predictors of breastfeeding in the early postpartum period using a univariate analysis, with backward elimination (employment, marital status, and education level) were entered into a multiple logistic regression model. Then the seemingly unrelated estimation "SUEST" was used to combine the parameter estimates of the age stratified logistic regressions.

Table 11

*Results of Multiple Regression Analysis Stratified by Age Group*

|  | Age Group 1 (18-25 years) | Age Group 2 (26-42 years) |
|--|---------------------------|---------------------------|
|  |                           |                           |

|                | OR   | 95% CI     | OR   | 95% CI     |
|----------------|------|------------|------|------------|
| Employment     | .62  | .34, 1.14  | .28  | .13, .59   |
| Marital Status | 1.31 | 1.11, 1.55 | 1.19 | .94, 1.52  |
| Education      | .56  | .43, .71   | 1.54 | 1.28, 1.86 |

Education was found to be significant in both the younger (18-25 years) age group (OR = .56, 95% CI = .43, .71) and the older (26-42 years) age group (OR = 1.54, 95% CI = 1.28, 1.86). The results of the age stratified multiple logistic regression analysis found that after controlling for employment and marital status, the effects of education on breastfeeding at 6-weeks postpartum differs across age groups in a statistically significant way utilizing a Chi Square test ( $p = 0.00$ ).

### Summary

This chapter presented the results of the analysis of the data collected during intercept interviews. During univariate analysis, maternal age, marital status, maternal education, returning to paid employment, and WIC participation were found to be related to breastfeeding in the early postpartum period, while parity was not found to be significantly related to breastfeeding in the early postpartum period. Simple logistic regression determined that maternal age, marital status, maternal education, returning to work, and WIC were significant predictors of breastfeeding in the early postpartum period. Again, parity was not found to be a significant predictor of breastfeeding in the early postpartum period using simple logistic regression. All variables were entered into

a multiple regression model, with backward elimination. Analysis of this model found that the effect of education on breastfeeding at 6-weeks postpartum differs across age groups significantly, after controlling for employment and marital status.

## CHAPTER V

## DISCUSSION

The study of demographic factors as predictors of breastfeeding in the early postpartum period was designed to add to the literature about breastfeeding practices. Though much has been written about the various demographic factors and their relationship to breastfeeding practice in the early postpartum period, no study has been done in a population of Utah women. The data derived from this research study were compared with that of several national and international studies which also investigate the relationship between demographic variables and breastfeeding in the early postpartum period. This chapter discusses the results of the current study and examines how these results are related to other national and international studies reported in the literature.

Table 12

*Analysis of Data and Conclusions*

| Research Question   | Data analysis results   | Conclusions   | Relevant Literature   |
|---|---|---|---|
| 1. Is maternal age a significant predictor of breastfeeding in the early postpartum period? | Chi Square results indicate that there is a statistically significant relationship between age and breastfeeding at 6-weeks postpartum. | Many other studies have found maternal age to be related to breastfeeding initiation and duration. This study concludes that maternal age is positively associated to breastfeeding in the early postpartum period and is a significant predictor | Agreeing:<br>Grjibovski et al. (2005)<br>Hla et al. (2003)<br>Hoddinott et al. (2000)<br>Nolan & Goel (1995)<br>Piper & Parks (1996)<br>Vogel et al. (1988)<br>Dissenting:<br>Clements et al. |

|   |   |  |   |
|---|---|--|---|
|   |   | of breastfeeding in the early postpartum period.   | (1997) MacGowan et al. (1991) Shelton & Qi Wang, (1997)   |
| 2. Is marital status a significant predictor of breastfeeding in the early postpartum period?                     | Fisher's Exact test results indicate that a statically significant relationship exists between breastfeeding in the early postpartum period and marital status. Simple logistic regression found that marital status is a significant predictor of breastfeeding at 6-weeks postpartum. | Marital status is related to breastfeeding in the early postpartum period and is also found to be a significant predictor of breastfeeding in the early postpartum period. | Agreeing: Grjibovski et al. (2005) Lande et al. (2003) MacGowan et al. (1991) Nolan & Goel (1995) Raj & Plichta (1997) Tarkka, Paunonen & Laippala (1999) |
| 3. Is WIC participation during pregnancy a significant predictor of breastfeeding in the early postpartum period? | There is a statistically significant negative relationship between WIC participation and breastfeeding at 6-weeks postpartum. WIC was also found to be a significant predictor of breastfeeding in the early postpartum period.   | Women who were enrolled in WIC are less likely to breastfeed in the early postpartum period.   | Agreeing: Ryan & Zhou (2006) Schwartz et al. (1995) Shelton & Qi Wang (1997) Walker (2002)  |
| 4. Is maternal education level a significant predictor of breastfeeding in the early postpartum period?           | There is a statistically significant positive relationship between maternal education level and breastfeeding in the early postpartum period. Simple  | A statistically significant positive relationship exists between maternal education level and breastfeeding in the early postpartum period. Maternal education level is    | Agreeing: Hawkins, Nichols, & Tanner (1987) Lande et al. (2003) MacGowan et al. (1991) Nolan & Goel, (1995) Dissenting:                                   |

|  |   |  |   |
|--|---|--|---|
|  | logistic regression found maternal education level to be a significant predictor of breastfeeding at 6-weeks postpartum.  | found to be a statistically significant predictor of breastfeeding in the early postpartum period.   | Piper & Parks (1996)  |
| 5. Is maternal employment after a child's birth a significant predictor of breastfeeding in the early postpartum period? | A significant negative relationship exists between maternal employment and breastfeeding at 6-weeks postpartum. Returning to work was found to be a significant predictor of breastfeeding in the early postpartum period.  | Mothers who returned to paid employment after their child's birth are less likely to breastfeed.   | Agreeing:<br>Earland, Ibrahim & Harpin (1997)<br>Noble (2001)<br>Dissenting:<br>Visness & Kennedy (1997)  |
| 6. Is parity a significant predictor of breastfeeding in the early postpartum period?                                    | Results indicate that there is not a statistically significant relationship between parity and breastfeeding in the early postpartum period. Logistic regression failed to determine that parity was a significant predictor of breastfeeding in the early postpartum period. | There is no relationship between parity and breastfeeding in the early postpartum period. Parity was not found to be a predictor of breastfeeding at 6-weeks postpartum. | Agreeing:<br>Amatayakul, et al. (1999)<br>Scott et al. (1999)<br>Dissenting:<br>Bulk-Bunschoten, van Bodegom, Reerink, Pasker-de Jong & de Groot, 2001; Piper & Parks, 1996 |
| 7. Do the effects of the demographics factors (marital status, employment, etc. ) on breastfeeding in the                | After controlling for employment and marital status, the effect of education on breastfeeding in the early postpartum   | This study concludes that the effects of the various demographic factors are significantly   |   |

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|  |   |   |
|--|---|---|
| early postpartum<br>period differ across<br>different age<br>groups? | period differs across<br>different age groups<br>in a statistically<br>significant way. | different across<br>different age groups. |
|--|---|---|

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## Discussion

### *Research Question 1*

The first research question that the current study addressed was whether maternal age is a significant predictor of breastfeeding in the early postpartum period. Many national and international studies have found maternal age to be associated with breastfeeding practices in the early postpartum period (Grjibovski et al., 2005; Hla et al., 2003; Hoddinott et al., 2000; Nolan & Goel, 1995; Piper & Parks, 1996, Vogel et al., 1988), however some studies have failed to reach the same conclusions (Clements et al., 1997; MacGowan et al., 1991; Shelton & Qi Wang, 1997). Analysis of data generated by the present study revealed that age was found to be a significant predictor of breastfeeding in the early postpartum period among women in the study sample.

During statistical analysis, the previous categories did not have sufficient variability for analysis, therefore the data were split at the median to produce two groups for analysis. It was found that the percent of mothers who breastfed in the early postpartum period was greater in the group comprised of older mothers (age 26-42), and that this group was 3 times more likely to breastfeed in the early postpartum period when compared to the group of younger mothers (OR = 3.19, 95% CI: 2.28-4.47). These data support the findings in the literature by Grjibovski et al. (2005), Hla et al. (2003), Hoddinott et al. (2000), Nolan and Goel (1995), Piper and Parks (1996), and Vogel et al.

(1988) who have found a positive relationship between breastfeeding in the early postpartum period maternal age.

Although a significant positive relationship was found between maternal age and breastfeeding at 6-weeks postpartum in univariate analysis, it is likely that older maternal age is predictive of breastfeeding in the early postpartum period because of the relationship it may have to other demographic variables which are likely to be predictive of breastfeeding in the early postpartum period. For example, it is reasonable to conclude that mothers of a more advanced age are more likely to be married, have achieved a higher level of education and, if they do return to paid employment, have a job that allows more flexibility to breastfeed or pump breast milk during the workday, when compared to younger women. Grjibovski and colleagues (2005), as well as Hoddinott and Hood (2000), suggested a similar relationship between age, education levels, and employment.

### *Research Question 2*

The second research question of this study investigates whether a woman's marital status is a significant predictor of breastfeeding in the early postpartum period. Marital status has been found to be associated with breastfeeding in the early postpartum period in some studies (Grjibovski et al., 2005; Lande, Anderson et al., 2003; MacGowan et al., 1991; Nolan & Goel, 1995; Raj & Plichta, 1997; Tarkka, Paunonen & Laippala, 1999) while other studies have failed to substantiate this relationship (Clement et al., 1997, Piper & Parks, 1996). The results of the current study found a statistically



significant relationship between marital status and breastfeeding using Fisher's exact techniques and found marital status to be a predictor of breastfeeding in the early postpartum period using simple logistic regression.

The Fisher's exact test results suggest that there is a statistically significant relationship between marital status and breastfeeding at 6-weeks postpartum ( $p=0.00$ ). Interestingly, there are remarkable similarities between the percentages of married women who reported breastfeeding at the 6 week mark (50.66%), and the percentages of cohabitating women who also report breastfeeding at 6-weeks postpartum (51.28%). These results support the findings of Tarkka and colleagues (1999) who reported that being married or living as married (cohabitating) made a woman more likely to choose breastfeeding as the primary infant nutrition method. It has been suggested in several previous studies that breastfeeding behavior is closely linked with a high level of social support (Raj & Plichta, 1997, Matich & Sims, 1992). Other studies have indicated that a high level of support from the mother's romantic partner is the most critical if the mother is going to successfully breastfeed (Giugliani, Caiaffa, Vogelhut, Witter, and Perman, 1994; Ryan, 1997). Although the scope of the current study does not consider social variables, such as the level of social support for a breastfeeding woman, it may be reasonable to suggest that women who are cohabitating or married experience higher levels of social support from their partners than do those who are single, separated, divorced or widowed. This may account for the higher levels of breastfeeding among the married and cohabitating women in the sample. More research is needed to substantiate this hypothesis.

A similarity existed between divorced and separated mothers who reported breastfeeding at 6-weeks postpartum in this study. Eight percent of divorced women in the sample reported breastfeeding at 6-weeks postpartum and 91.67% of participants who stated they were separated reported breastfeeding in the early postpartum period. These results are in direct opposition to the results reported by Tarkka et al. (1999), who found that being divorced or separated resulted in a woman being less likely to breastfeed. Possible reasons for the high rate of breastfeeding in these groups could be related to the financial benefits of breastfeeding (Ball & Bennett, 2001), or perhaps stem from feelings of loneliness for the mother, who uses the bond of mother and baby during breastfeeding to assuage these emotions. More research is needed to substantiate these findings and to explain the discrepancies between the national results and the Utah based results.

### *Research Question 3*

The third research question investigates whether WIC participation during pregnancy is a significant predictor of breastfeeding in the early postpartum period. Participation in the Women Infants Children (WIC) program has been indicated to be negatively related to breastfeeding in the early postpartum period (Ryan & Zhou, 2006) although some studies have not shown this association (Schwartz et al., 1995). Results of the current study found a statistically significant negative relationship between WIC participation and breastfeeding in the early postpartum period ( $p = 0.009$ ) using the Chi Square test, and simple logistic regression techniques found that women in the sample who were enrolled in WIC during pregnancy were less likely to breastfeed their child in

the early postpartum period (OR = .65, 95% CI = .47-.90). It can be concluded, then, that WIC participation is a significant predictor of breastfeeding status in the early postpartum period in Utah women.

It is interesting to note that WIC, a federally funded program that serves low-income women by providing healthy food for both mother and infant, provides breastfeeding classes and literature to their clients, and has an official stance which encourages breastfeeding. Other studies that have noted results similar to the current study (Shelton, 1997; Popkin, et al., 1981; Walker, 2002) have postulated on the reasons for the negative correlation between breastfeeding and WIC participation. Some have suggested that, by providing formula or formula vouchers to WIC participants, the program provides an incentive to choose formula feeding as the primary infant feeding methods and discourages breastfeeding, despite the formal attempts to promote it (Walker, 2002; Schwartz et al., 1995).

The current study only investigated whether or not participants were enrolled in the WIC program during their pregnancy, and did not investigate the deeper levels of this question, such as whether they took part in the breastfeeding classes WIC offered or read the literature that encourages breastfeeding published by WIC. More research on the level of participation in WIC is necessary to fully understand the reasons that the current study found a negative relationship between WIC participation and breastfeeding in the early postpartum period.

In addition, participation in WIC may be representative of other factors that may influence breastfeeding in the early postpartum period, such as lower income level or

lower education level. For example, WIC is a program only offered to women who qualify based on low income. Low income is often thought to accompany a lower education level, therefore it could be assumed that WIC participation is actually serving as a proxy for a lower education level in this sample. More research that explores the association between WIC participation, socioeconomic status and education level is needed to fully understand these relationships.

#### *Research Question 4*

Research question 4 questions whether maternal education level is a significant predictor of breastfeeding in the early postpartum period. Maternal education level has been shown to be positively associated with breastfeeding in the early postpartum period (Hawkins, Nichols, & Tanner 1987; Lande et al., 2003; MacGowen et al., 1991; Nolan & Goel, 1995) although one study found differing results (Piper & Parks, 1996). The results of the Chi Square test conducted on data from the current study indicate that there is a statistically significant relationship between breastfeeding in the early postpartum period and maternal education level ( $p=0.00$ ). The simple logistic regression conducted for the analysis of the current study entered women with some college education as the explanatory variable. When compared to this group, women who were high school graduates were less likely to breastfeed at 6-weeks postpartum (OR = .12; 95% CI = .07-.22). In addition, the simple logistic regression found that women with postgraduate education were 3.5 times more likely to breastfeed (OR = 3.5, 95% CI = 1.81-6.98) when compared to women in the sample with some college education. These results indicate

that maternal education is a significant predictor of breastfeeding in the early postpartum period ( $p = 0.00$ ) in Utah women and confirm the findings of Hawkins et al. (1987), Lande et al. (2003), MacGowen et al. (1991) and Nolan and Goel (1995) who found a positive association between maternal education and breastfeeding.

Again, the question is raised about the association between maternal education level and other confounding variables that have been shown to be predictive of breastfeeding behavior in previous studies, such as WIC participation and returning to maternal employment. Women of higher education level often have a higher income level, and therefore are not likely to need or qualify for the WIC program, which is negatively associated with breastfeeding in the early postpartum period. Likewise, it is reasonable to assume that women with higher education levels, particularly those who are college graduates or have postgraduate education, return to work in an environment that is supportive of the demands of a breastfeeding mother, who might have to leave the work environment to express breast milk during the workday. The current study does not assess the relationship between the above stated factors and maternal education, however it is reasonable to assume that these factors may have a strong influence on a woman's decision to breastfeed her child. More research is needed to evaluate the relationship between maternal education, the confounding factors mentioned above, and breastfeeding in the early postpartum period.

#### *Research Question 5*

The fifth research question asks if returning to paid employment is a significant predictor of breastfeeding in Utah women. Returning to paid employment after a child is

born has been shown to be negatively associated with breastfeeding (Earland, Ibrahim & Harpin, 1997; Noble, 2001), however a few studies have failed to confirm these findings (Visness & Kennedy, 1997; Fein & Roe, 1998). Results from this study found a statistically significant negative relationship between employment status and breastfeeding in the early postpartum period when utilizing Chi Square techniques ( $p = 0.00$ ). The simple logistic regression found that mothers who did return to paid employment after their child's birth were less likely to breastfeed (OR = .48, 95% CI: .32-.71) than were mothers who did not return to paid employment.

Data from the current study do not address important details related to maternal employment that may affect the respondents' decision to breastfeed in the early postpartum period, such as the type of employment they returned to, whether they were returning to a full or part time job, leave time they had available, or whether they were previously employed at the same place of employment. All of these details have been shown to be influential in a woman's decision to breastfeed her child. Research that further investigates the association between the above mentioned variables, returning to work and breastfeeding behavior is clearly necessary to fully understand the how maternal employment predicts breastfeeding in the early postpartum period.

#### *Research Question 6*

Parity has been briefly studied in the literature as a possible predictor of breastfeeding in the early postpartum period (Bulk-Bunschoten et al., 1998; Piper and Parks, 1996), but not enough is known to accurately conclude whether it is related to

breastfeeding behavior. The results of this study add to the general scientific knowledge of the association between parity breastfeeding in the early postpartum period. Results of the Chi Square indicate that there is not a statistically significant relationship between parity and breastfeeding in the early postpartum period ( $p = .055$ ), although the p value is approaching significance at .05 level. Results of the simple logistic regression also failed to find parity to be a significant predictor of breastfeeding in the early postpartum period. It is interesting to note that the p value for the simple logistic regression ( $p = .056$ ) is similar to the p value found in the Chi Square test ( $p = .055$ ).

In previous studies, it has been suggested that prior experience breastfeeding a child is a strong indicator of successful breastfeeding of subsequent children in the early postpartum period (Giugliana et al., 1994). This would indicate that multiparous women are at an advantage over primiparous women when it comes to deciding whether to breastfeed their children. The current study divided the interview respondents into two groups: women who have only given birth to one child (primiparous women) and women who have given birth to more than one child (multiparous women). No data were collected on whether the women had previously breastfed a child, which may be important in making a decision to breastfeed. More research is needed to further explore the relationship between parity and breastfeeding practices.

### *Research Question 7*

The results of the age stratified multiple logistic regression analysis found that after controlling for employment and marital status, the effects of education on

breastfeeding at 6-weeks postpartum differs across age groups in a statistically significant way ( $p = 0.00$ ). Education was found to be significant in both the younger (18-25 years) age group (OR = .56, 95% CI = .43, .71) and the older (26-42) age group (OR = 1.54, 95% CI = 1.28, 1.86) in this model. It can be concluded, then, that maternal education is a very important predictor of breastfeeding in the early postpartum period, and should be considered in intervention and program planning strategies to increase breastfeeding in the early postpartum period.

Although this multiple regression model provides some insight into the demographic factors that may influence breastfeeding in the early postpartum period, and their relationship to each other, it cannot fully explain the many factors that contribute to the decision on infant feeding methods. The scope of this study was limited to determining which demographic factors may serve as predictors of breastfeeding in the early postpartum period in Utah women, but even these demographic factors are more complex than can be explored in a 3-min intercept interview. In addition, the behavior of breastfeeding is multifactorial in nature, with possible influencing factors in society, family, the mother and the infant (Scott & Binns, 1999). The interaction between all these factors must be studied using multivariate analysis, which allows for concurrent interpretation of associations and interactions between variables. This multiple regression provides, on a very minute scale, a multivariate analysis of demographic factors that predict breastfeeding during the early postpartum period in Utah women stratified by age. Much more research is needed to fully understand the complicated



relationship between demographic, social, personal and family factors that also contribute to this behavior.

### Implications for Health Education

The findings of this study appear to have some value to the health education profession. Since the rates of breastfeeding are consistently lower than desired, both nationally and within the state of Utah, it seems likely that health educators would address this problem by designing interventions and educational programs to teach the benefits and recommendations of breastfeeding. Understanding which demographic factors predict breastfeeding in the early postpartum period is useful when designing these programs, to ensure that limited resources are directed to groups that might be amenable to change. For example, this study indicates that younger, single women with a high school level education are less likely to breastfeed than are older, married, college educated women. Designing a health education program that targets younger, single women rather than older, married women would be a more appropriate use of health education resources. Likewise, this study also indicates that participants in WIC are less likely to breastfeed in the early postpartum period. Health educators might direct some efforts towards understanding why a program that claims to support breastfeeding as the optimal infant feeding method actually appears to discourage it among the participants.

Health educators could also benefit from the findings of the current study when working with large corporations and companies trying to influence policy change. For example, the literature clearly proves that breastfeeding is the healthiest option for both

mother and child, resulting in less illness for babies, which in turn causes less of a financial drain on insurance monies and less time off work for mothers. The current study indicates that women who return to paid employment are less likely to breastfeed, and are therefore not providing their child the healthiest option for infant feeding. If health educators are working with companies trying to effect a policy change that allows more flexibility for working mothers to pump breast milk during the workday, this information provides a strong argument for adoption of this policy, using data derived from a local source, rather than national or international studies.

#### Recommendations for Further Research

It must be stated that this study was conducted in English only, so women who spoke other languages were not represented. Further research focusing on a non-English speaking population would increase the generalizability of this study and might provide useful insight into a population of women who are potentially very different from the population sampled in the current study.

Additional studies on factors that influence breastfeeding in the early postpartum period would do well to use a different data collection method, such as personal interviews, focus groups, or surveys, all of which would allow a more in-depth probe of the complicated variables that influence the decision to breastfeed a child. Both questions and responses in an intercept interview must be very limited in order to complete the interview in the short time period and only cursory information can be

obtained in this format. Another data collection method may provide an opportunity to collect much richer data.

The current study used non-random sampling techniques, therefore limiting generalizability. Future studies that use random sampling procedures would provide an interesting comparison to the current study. Although random sampling procedures can increase the difficulty of conducting studies for the researchers, the added generalizability add value to the scientific knowledge.

Data for the current study were collected at public venues in Salt Lake City, Utah, thus limiting the generalizability of this study. For a more robust study on Utah women, data need to be collected from a much larger sample of locations in Utah, including rural locations, private locations, such as homes and workplaces, and public locations in other cities and towns. A broader range of data collection locations would provide a more diverse sample of women, and would increase the generalizability of the findings of another study.

Participants of the current study were limited to women who were 18 years of age or older, due to the legal constraints of interviewing minors. It would be advisable for future studies that investigate the factors that influence breastfeeding in the early postpartum period to include women younger than 18 years of age in the study. These women are an important part of the population of mothers, and including their data would greatly increase the strength and generalizability of future studies.

Finally, women in the current study were at least 6-weeks, but no more than one year, postpartum. The participants were asked if they were breastfeeding their child at 6-

weeks postpartum, which in some cases, could be up to 46-weeks previously. It is reasonable to assume that accurate recall of behavior at 6-weeks postpartum could be difficult. In order to lessen the recall bias for future studies, it may be advised that researchers employ techniques that recall the breastfeeding behaviors within a closer time period. For instance, if the researcher is asking whether breastfeeding occurred at 6-weeks postpartum, the participants could be sampled during their child's two month immunization appointment or their own 6 week checkup.

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APPENDICES

