IMPACT OF INFANT FEEDING CHOICE ON MATERNAL BODY MASS INDEX AT SIX MONTHS POSTPARTUM

BY

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1993

Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the Degree of
MASTER OF SCIENCE
July, 2000

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ACKNOWLEDGMENTS

I wish to express my deepest gratitude for my advisor, Dr. Lea Ebro for her encouragement, support, understanding, enthusiasm and belief in me as she provided the expertise I needed to complete my studies.

I also wish to thank Dr. William Warde for his assistance with the statistical analyses of my research and for his sense of humor during my pregnancy and subsequent lactation demonstrations. I also appreciate the willingness of Dr. Janice Hermann to join my committee after the retirement of Dr. Bernice Kopel who assisted me with the original design of the study and who contributed many useful ideas.

My family has been a pillar of strength for me as I have completed this project. My husband, Ken Stockero, has been my inspiration along with our sons Alexander and Eric. My parents, Jack and Jan Blankenship have always encouraged me to do my best. My father- and mother-in-law, Ray and Jeanne Stockero, have encouraged me as if I am their own child, truly making me feel special. To my brothers, Jack and Jeff, and sisters-in-law -- Kristin, Renee and Kathy -- thanks for those e-mails offering words of encouragement as I completed my journey.

Thank you to the staff of Community Medical Centers WIC Program, especially Melissa Yarbrough, for assistance with data collection. Finally, special thanks to Dr. Michael Haight, my friend and inspiration to help women succeed in lactation -- and for the swift kick to encourage me to finish what I started long ago.

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CHAPTER 1

INTRODUCTION

Obesity has become a major public health issue in the United States. More than 33 percent of the population is obese and at least half of the adult population is overweight. The cost of obesity accounts for more than $68 billion in direct health care expenditures each year in the United States (Rippe, 1998). Studies have shown that obesity is more prevalent among specific ethnic populations and disproportionately affects more women than men in this country (Bowen, Tomoyasu, and Cauce, 1991). For many women, pregnancy is one of the greatest risk factors for developing obesity (Rossner, 1995). During pregnancy, it has been postulated that a percentage of maternal weight gain is a protective measure that ensures adequate energy stores for the metabolic and caloric demands of breastfeeding. In theory, the absence of lactation should result in a surplus of adipose stores without the demand for lipolysis and the mobilization of energy stores required by lactation. It is expected that weight loss in non-breastfeeding women should occur slower than in women who breastfeed. Research has shown that women who participate in the federal Women, Infant and Children Supplemental Food and Nutrition Program (WIC) are less likely to breastfeed than non-WIC women (Schwartz, 1995).

There has been little research conducted in the area of breastfeeding duration and

its impact on body mass index (BMI) among low-income multi-ethnic populations. The Department of Health and Human Services (DHHS) report *Healthy People 2000: National Health Promotion and Disease Prevention Objectives* identifies both breastfeeding and obesity as national public health issues. Specifically, the objectives for breastfeeding are:

1. To increase to at least 75 percent the proportion of mothers who breastfed their babies in the early postpartum period [baseline for low-income women: 32 percent at discharge], and
2. To increase to at least 50 percent the proportion of mothers who continue breastfeeding until their babies are five to six months old [baseline for low-income women: 9 percent].

The specific objectives regarding obesity are:

1. To reduce overweight to a prevalence of no more than 20 percent among people aged 20 and older, and
2. To reduce overweight to no more than 15 percent among adolescents aged 12 though 19 years (*Healthy People 2000: Nutrition Objectives*, 1990).

The results from this study establish the degree to which *Healthy People 2000* objectives are being met by the sample population.

Purpose and Objectives

The purpose of this study was to determine the association between breastfeeding

duration and BMI in postpartum women participating in the Community Medical Centers (formerly known as the Agricultural Workers Health Centers) WIC Program in Stockton and Lodi, California. Specific objectives for this study were:

1. To determine if selected personal variables are associated with the duration of breastfeeding at six months postpartum. Personal variables include: age, ethnicity, weight, BMI, previous breastfeeding experience, migrant worker status, household size, income, participation in other public assistance programs, parity, pre-term delivery of infant, smoking, birth control method and method of delivery.
2. To determine if the initiation and continuation of breastfeeding is associated with more significant changes in BMI than non-initiation and/or subsequent formula feeding.
3. To determine the proportion of WIC participants who are completely breastfeeding and the proportion who are partially breastfeeding in the early postpartum period and at six months postpartum.
4. To determine the prevalence of overweight women enrolled in the WIC Program at six months postpartum and to determine if selected personal variables are associated with overweight. The personal variables include: age, ethnicity, breastfeeding of current infant, previous breastfeeding experience, income, household size, participation in the food stamp program, parity, smoking, birth control method, exercise habits and caloric intake.

Hypotheses

For this study, the following hypotheses were postulated:

H1o: There will be no significant association between the duration of breastfeeding at six months postpartum and selected personal variables for women participating in the WIC Program. Selected personal variables were:

1. Age
2. Ethnicity
3. Weight
4. BMI
5. Previous breastfeeding experience
6. Migrant worker status
7. Household size
8. Income
9. Participation in other public assistance programs
10. Parity
11. Pre-term delivery of infant
12. Smoking
13. Birth control method
14. Method of delivery

H2o: There will be no association between the initiation and continuation of breastfeeding and significant changes in BMI .

H3o: There will be no difference between breastfeeding rates in the early postpartum period and at six months postpartum for women participating in the WIC Program.

H4o: There will be no association between selected personal variables and overweight at six months postpartum for participants. Selected personal variables were:

1. Age
2. Ethnicity
3. Exercise habits
4. Breastfeeding of current infant
5. Previous breastfeeding experience
6. Income
7. Household size
8. Participation in the food stamp program
9. Parity
10. Smoking
11. Birth control method
12. Caloric intake

Assumptions and Limitations

The assumptions made regarding this study include:

1. The Competent Professional Authorities (CPA's) and the WIC staff have adequate training and skills to collect and record anthropometric data and

24-hour food recalls.

2. Participants have answered survey questions and recalled relevant information in a manner consistent with the actual course of events pertaining to the birth and subsequent postpartum period.
3. Medical record data has been correctly entered by the WIC staff into the California WIC Integrated Statewide Information System (ISIS).

Limitations of this study include:

1. Data was collected during a four month period which may not represent seasonal differences in the population being served by the WIC Program.
2. Only those participants who remained enrolled or whose infant remained enrolled at six months from delivery date were included in the study.
3. The majority of individuals surveyed and included in this study were Hispanic and, therefor, results can only be generalized to this group of participants.

Definition of Terms

Asia/Pacific Islander: Relating to a group or race indigenous to Asia and the Pacific Islands.

Black: Relating to a group or race characterized by dark pigmentation.

BMI: Body Mass Index; an estimate of body fatness and health risk calculated as the ratio of weight in kilograms divided by height in meters squared; BMI = weight/(height)^2.

Combination Feeding: Offering both breastmilk and artificial baby milk to an infant.

For purposes of the study, two groups were recognized. Group one consisted of women who were breastfeeding but offering more than eight ounces of artificial baby milk at six months post-partum. Group two consisted of women who were not currently breastfeeding, but who breastfed for more than thirty days.

CPA: Competent Professional Authority; physician, registered nurse, registered dietitian, or any person who fulfills the requirements set forth by the United States Department of Agriculture (USDA) and the State of California.

Exclusively Breastfeeding: Offering no more than eight ounces of artificial baby milk per day to an infant.

Extreme Obesity: A BMI greater than or equal to 40.

Food Stamp Program: a federal entitlement program that provides cash vouchers for food to individuals at 100% of the poverty level.

Formula Feeding: Offering artificial baby milk to an infant including women who exclusively breastfed or combination fed less than thirty days.

Healthy People 2000: A broad based health initiative administered by the Public Health Service with the primary goal of improving the overall health of the American people.

Hispanic: Relating to the people or culture of Cuba, Latin American, Mexico and Puerto Rico.

ISIS: The Integrated Statewide Information System used by the State of California WIC Branch to maintain WIC participant data.

Medi-Cal: The California version of Medicaid, a program jointly funded by the federal

government and states that provides funding for medical, dental and other health services to indigent people.

Migrant Worker: A participant who works in agriculture and who has left the area to work temporarily in the past two years.

Obesity: A BMI from 30 to 39.9.

Overweight: A BMI from 25 to 29.9.

Parity: The number of times a woman has given birth to an infant greater than 20 weeks gestation.

Postpartum: Of or occurring during the period shortly after childbirth.

Pre-term Infant: An infant born to a WIC participant at less than 37 weeks gestation.

White: Relating to a group or race of people characterized by light pigmentation.

WIC: The federally funded women, infants and children supplemental nutrition program which provides supplemental food, nutrition education and health care referrals to low-income women who are pregnant, nursing or have recently given birth and young children at nutritional risk.

CHAPTER II

REVIEW OF LITERATURE

This chapter will review the relevant recent literature as it pertains to obesity, breastfeeding and the WIC Program.

Overview of the WIC Program

The 1960's were a time of political and social change in the United States. Hunger and poverty which were often viewed as "foreign" problems came to the limelight during this era. President Kennedy was the first US President to outline a skeletal form of the food stamp program which remains in existence today. In 1966, the Child Nutrition Act was passed and the School Breakfast Program was initiated. This act would be important in the eventual authorization of the WIC Program. Anti-hunger activists were led by the Select Committee on Nutrition and Human Needs and fueled by reports of hunger in America such as the Ten-State and Preschool Nutrition Surveys in the late 1960's and early 1970's. Other independent surveys were completed by the Field Foundation and the Citizen's Board of Inquiry into Hunger and Malnutrition. Collectively these surveys pointed toward malnutrition in the nation's most vulnerable populations. While the message was well defined in these surveys, it became even more difficult to ignore when CBS broadcasted its 1968 documentary titled "Hunger in America." In 1969, President Nixon announced a "war on hunger" and held the White

House Conference on Food, Nutrition and Health (Frankle and Owen, 1993).

It became evident during this decade that women who had inadequate diets during pregnancy had a higher rate of miscarriage and other health problems. Infants of these malnourished women had lower birth weights, smaller head circumferences, and stunted growth. These findings were the impetus for the creation of the Commodity Supplemental Food Program, a joint program offered by the US Departments of Agriculture (USDA) and Health, Education and Welfare (HEW). This program offered supplemental foods in the form of government-purchased commodities to low-income, at-risk pregnant and nursing women and their young children. Early evaluations showed improved health status of the women and their children which led policy makers to develop a voucher system that included referrals to health care. In 1972, Congress authorized the Special Supplemental Food Program for Women, Infants and Children (WIC) as a three year experiment under the auspices of the Child Nutrition Act of 1966.

In 1975, WIC was reauthorized by congress as a federal food assistance program (Public Law 94-105). The program was later reauthorized by the Child Nutrition Act of 1978 and again in 1981 by the Omnibus Budget Reconciliation Act which provided authorization through 1984. One-year Continuing Resolutions kept the program on financial track for two more years. Public Law 99-591 and later Public Law 101-147 authorized WIC through the mid-1990's (Food Research and Action Center, 1991) .

WIC is an apportioned program that is operated by a Federal grant program for which Congress authorizes funds annually. Nationwide, there are 88 WIC state agencies, 2000 local agencies in 10,000 clinic sites in 50 State health departments, 33 Indian Tribal

Organizations, American Samoa, District of Columbia, Guam , Puerto Rico and the Virgin Islands. These agencies collectively serve more than 7 million people each month (USDA Food and Nutrition Services, 2000). The FNS reports that children are the largest category of participants averaging over 3.75 million children per months compared to 1.9 million infants and 1.7 million women.

In comparison, by 1997 California WIC agencies served over one million persons each month through 83 local agencies. The California State WIC Branch provides grants to county, city and local health agencies and private non-profit health organizations who each serve a specific agreed upon caseload (California WIC Program Training Manual, 1998).

In 1999, Congress appropriated $3.942 billion for WIC which included $15 million for the Farmers' Market Nutrition Program. "By comparison, the WIC program cost $10.4 million in 1974; $727.7 million in 1980; $1.5 billion in 1985 and $2.1 billion in 1990 (Food and Nutrition Services, 2000)."

WIC Program Basics

Unlike other food assistance programs, WIC specifies which foods participants can purchase with program vouchers and also requires participation in a variety of nutrition education programs and activities. The program targets women who are pregnant, breastfeeding or who have recently given birth, and children who are low-income, meet residency requirements, and who have an identified medical or nutritional risk factor (Food Research and Action Center, 1991). In California, the income requirement is 185 percent of the federal poverty level (California WIC Program Training

Manual, 1998) which is revised and published annually in the *Federal Register*. While most states use the maximum guidelines for participation, states may have more stringent requirements. Individuals who participate in other federally-funded programs with income guidelines such as the Food Stamp Program, Medicaid (Medi-Cal in California), or Temporary Assistance for Needy Families (formerly known as Aid to Families with Dependent Children) are automatically eligible for the WIC Program through adjunct eligibility. According to the Food and Nutrition Services Department of the USDA, WIC serves one in four new mothers and serves 45 percent of all infants born in the United States.

WIC Food Packages

The food packages provided to participants are designed to include key nutrients that are typically low in the diets of low-income populations. These include: vitamins A and C, iron, protein and calcium (Rush, 1988). Controversy exists in many forms regarding the best manner to provide these nutrients while honoring culturally different populations and without providing excessive fat. Typically, food instruments or vouchers are given to the participants to use at one of approximately 46,000 vendors across the US, District of Columbia, Guam, Puerto Rico and the Virgin Islands. Different food packages are provided for different categories of participants. Although some states distribute food through warehouses, most states use the voucher system. WIC foods include: iron-fortified infant formula and infant cereal, iron-fortified adult cereal, vitamin C-rich fruit and/or vegetable juice, eggs, milk, cheese, peanut butter, dried beans or peas, tuna fish

and carrots. All participants do not receive all foods listed and participants must sometimes choose between available foods, for example beans or peanut butter but not both. Exclusively breastfeeding women receive additional food vouchers. The cost of the additional food is minimal by comparison to the cost of providing formula to infants of non-breastfeeding women.

Because WIC is not an entitlement program which would guarantee benefits to all those individuals who meet eligibility criteria, a priority system has been developed to ensure that the most needy applicants are served first with program funds. Once an agency has reached its caseload agreement, it must begin to follow the priority system.

Priority I: pregnant women, breastfeeding women, and infants determined to be at nutritional risk because of serious medical problems.

Priority II: infants up to 6 months of age whose mothers participated in WIC or who could have participated and had serious medical problems.

Priority III: Children up to age 5 at nutritional risk because of serious medical problems.

Priority IV: Pregnant of breastfeeding women and infants at nutritional risk because of dietary problems.

Priority V: Children up to age 5 at nutritional risk because of dietary problems.

Priority VI: non-breastfeeding, postpartum women with any nutritional risk.

Priority VII: Individuals at nutritional risk only because they are homeless or migrants, and current participants who without WIC foods could continue to have medical and/or dietary problems (FNS, 2000).

Overview of Obesity

Little research has been done which demonstrates the prevalence of obesity in women and children who are enrolled on the WIC program and specifically on the relationship of breastfeeding and obesity for this population. Healthy People 2000 (MMWR, 1990) and Healthy People 2010 have both identified obesity as an important public health concern. The etiology of obesity is complicated and remains unclear despite unrelenting efforts by health care professionals and others to prevent, stop and reverse its existence. It is thought that genetic, environmental and social factors play a role in the development of obesity (Coulston, 1998).

Obesity in the United States

The prevalence of obesity in the US has reached what some health experts have defined as an epidemic (World Health Organization, 1997). The numbers are staggering; nearly half of the adult population is somewhat overweight. Between 1980 and 1990, there was a relative increase of 40 percent in the prevalence of obesity as it grew from 25 percent of the population to more than 33 percent (Rippe, 1998). Kuczmarski and others noted that maternal overweight and obesity are common, yet the prevalence is disproportionate among women of different races (Bowen, 1991). Specifically, among women who are in the reproductive age (20-44 years), approximately 15 percent of white, 32 percent of black and 30-45 percent of Hispanic women are overweight (Kuczmarski, 1992). A strong interaction has been reported between parity and weight after reproduction. Higher social class women gain less weight with subsequent pregnancies

than do lower social class women (Newcombe, 1982).

The Impact of Obesity

For the nation, the cost of obesity exceeds $68 billion per year which is an alarming 6 percent of total health care expenditures (Rippe, 1998). For individuals, the stakes of obesity are also high. Obesity in itself is a chronic disease, but also has many levels of comorbidity including coronary heart disease (CHD), hypertension, type II diabetes, and dyslipidemias. The third National Health and Nutrition Examination Survey (NHANES III) showed that individuals with a Body Mass Index (BMI) of greater than 27 had a 70 percent chance of having an obesity-related comorbidity (Wolf, 1998).

Body Mass Index as an Assessment Tool

BMI has become a useful tool in the assessment of body fatness (Spielgelman, 1992). BMI is defined as the ratio of weight in kilograms divided by height in meters squared [BMI = kg/m^2]. Although organizations vary slightly in their cut-off values, in general obesity is defined as a value greater than 30. The World Health Organization notably endorses those values created by the National Institutes of Health (NIH) Expert Panel on the Identification, Evaluation, and Treatment of overweight and Obesity in Adults. According to the panel, BMI values from 25 to 29.9 are indicative of overweight; 30 to 39.9 of obesity; and greater than or equal to 40 of grossly overweight (Rippe, 1998). These values are slightly different than those values used in the NHANES III which were designed to correspond to approximately 120 percent of the desirable weight range according to the 1983 Metropolitan Life and Weight tables (1983 Metropolitan height and weight tables).

Limitations of BMI

BMI is a tool which enables professionals to determine one aspect of an individual's health, but is not without limitations. Individuals with above average lean body mass (muscle) may be poorly represented. These persons would falsely be classified as obese or overweight because lean body mass is greater than that of adipose tissue. In addition, those persons with posture abnormalities would not be accurately portrayed by this method since the equation involves a measurement of height. Finally, BMI provides no information about the distribution of weight for the individual (Rippe, 1998). The latter is particularly important because studies have shown that central adiposity (also known has visceral or abdominal obesity), often measured as waist circumference, is a strong correlate for the comorbidities associated with obesity, especially cardiovascular disease (Despres, 1993) and type II diabetes in addition to elevated BMI. Despite these limitations, BMI is a widely used tool and was recently incorporated into the National Center for Health Statistics revised growth charts for the assessment of child and adolescent growth in the United States.

Comorbidities of Obesity -- CHD

Obesity and subsequent coronary heart disease (CHD) in women has been documented in studies such as the Nurse's Health Study (Manson, 1995) and the Framington Heart Study (Wing, 1987). The former study found that higher BMIs in women were associated with an increased risk of CHD while the latter found that obesity as an independent risk factor was predictive for both CHD and congestive heart failure.

Comorbidities of Obesity -- Type II Diabetes

Type II diabetes has also been well documented as a comorbidity for obese women. Some studies have shown that an alarming 80 percent or more of persons with type II diabetes are obese (Kelley, 1998). Perhaps the most definitive example of the role of BMI as a predictor for type II diabetes can be found in the analyses of the Nurse's Health Study. According to Colditz, et al., women with a BMI equal or greater than 31 are 40 fold more likely to develop diabetes than women with a BMI of less than 22.

Comorbidities of Obesity -- Hypertension

The link between obesity and hypertension is also well documented. Some researchers have suggested than more than one third of all cases of hypertension in the United States are related to obesity (Rexrode, 1996). A 2 to 4 fold increase in the risk of hypertension exists when obesity is present.

Comorbidities of Obesity -- Dyslipidemia

Dyslipidemia has been shown by Ebbeling (1998) to be associated with obesity. Lower high-density lipoprotein (HDL) cholesterol and higher triglyceride levels have been related to women with higher BMIs in all age groups (Despres, 1994). The same researchers noted that elevated low-density lipoprotein (LDL) cholesterol and total cholesterol were related to BMI for younger age groups.

Other Comorbidities

Other comorbidities for obesity exist such as gall stones, respiratory dysfunction (such as sleep apnea), gout, and osteoarthritis. Obesity may also be associated with certain cancers such as breast and prostate cancers (Pi-Sunyer, 1993).

Obesity and Parity

Normal weight gain during pregnancy has been defined as 12.5 kilograms of which two-thirds can be attributed to increases in maternal tissue and water. Most notably, the size of the uterus increases along with breasts tissue, plasma volume, red blood cell mass and total body water. By 30 weeks, it is estimated that 3.5 kilograms of fat have been stored. When weight gain exceeds 12.5 kilograms, the fat depot is increased proportionately (Scholl, 1995). While white middle-class women return to their pregravid weights within six months postpartum, the same can not be said for minority women who gain excessive weight. In fact, women were found to retain as much as 40% of their perinatal weight at six months postpartum (Schauberger, 1992). Several studies have suggested that up to 25% of women retain at least 5 kilograms in association with weight gains of 18 or more kilograms.

It has been well documented in the literature that for women, age and parity are associated with overweight and obesity. Not surprisingly, the amount of weight associated with parity is disproportionate among minorities. Wolfe et al found that among 18 to 45 year olds, blacks were more likely to have parity associated weight than whites (Wolfe, 1997). Scholl et al found that among 274 women with pregravid BMIs in the normal range, gestational weight gain was the strongest predictor of postpartum BMI. Excessive gain was associated with subsequent higher postpartum BMIs while lactation was not a significant predictor for postpartum BMIs (Scholl, 1995)

Obesity and Lactation

Studies that examine the relationship of lactation to weight have been inconclusive due in large part to poor study design or to limits imposed by data collection methods such as retrospective surveys. Most studies have not included all of the variables that could potentially impact the degree to which lactation does or does not facilitate postpartum weight loss or weight retention. Variables such as age of introduction of beikost or liquids, maternal dietary energy intake, weight loss efforts, use of herbs and supplements, birth control method, and employment status are exemplary of variables often overlooked or not included in studies. If lactation does in fact contribute to postpartum weight loss, does its absence contribute to weight retention and thus higher BMI's in these women?

Some researchers have concluded that weight gain during pregnancy is the strongest correlate between postpartum weight loss (Rossner, 1995; Potter, 1991; Thorsdottir, 1998). Again, these studies often overlooked important variables associated with lactation. Women who are lactating theoretically need extra energy and nutrients compared to non-lactating women. The World Health Organization has placed the energy requirement of lactation in the 750 kcal/day range (Potter,1991). It is usually recommended that lactating women consume an extra 500 kcal/day with the additional 250 kcal coming from adipose tissue stores laid during pregnancy. Thus, in theory, the lactating women should have a deficit of 250 kcal/day resulting in an approximately one pound per week weight loss. Since non-lactating women do not have this deficit, it is postulated that they would have slower weight loss.

In a study of 411 women in which weight was measured at 6 weeks and 12 months postpartum, no consistent relationship was found between infant feeding method and maternal weight loss. This study, however, failed to include food recall records or exercise logs. The most significant limitation of this study was the fact that neither the extent nor the duration of breastfeeding was measured. As in other studies the researchers found that women who gained more weight during pregnancy consistently lost more weight following delivery regardless of their pregravid weight (Potter, 1991).

Likewise, in the Stockholm pregnancy and weight development study breastfeeding was found to have only a minor influence on weight patterns. The methods used to determine the impact of lactation were not well described. The authors did note that the women with a higher breastfeeding "score" lost more weight during the first six months postpartum than others in the study. Weight increase during pregnancy was the strongest predictor for weight retention at one year postpartum (Rossner, 1995).

Dugdale and Eaton-Evans (1989) also failed to detect a relationship between lactation and postpartum weight loss. Similar to those studies previously discussed, the degree and amount of breastfeeding was not well defined. Although the researchers examined the types of milk and food given to the infant, they did not examine the impact of supplementation on maternal milk production. Other researchers (Cohen, RJ) have found that the introduction of solid foods to infants results in a compensatory decrease in breastmilk intake. Infants were found to regulate their intake of solids and breastmilk by which their total caloric intake closely matched those infants exclusively breastfeeding without supplementation of solids or other liquids.

In a another study designed to examine the effects of different gestational weight gains among women at 18 to 24 months postpartum, no significant correlation was found between lactation and postpartum weight loss. Again, this study did not analyze diet recalls and thus caloric intake of subjects nor did the authors define breastfeeding. It is also likely that the majority of women who were breastfeeding had weaned prior to the 18 to 24 month follow up interviews. The impact of lactation on weight loss may be more pronounced earlier in the postpartum period. Since 95 percent of the subject breastfed their infants to some degreee, it is difficult to apply these findings to groups with less prevalent breastfeeding rates. The authors found that high weight gains during pregnancy were associated with higher weights postpartum but that the women reached normal weight again irrespective of gestational weight gain (Thorsdottir, 1998).

Another study of 2295 women in Stockholm found that women who breastfed longer and more frequently tended to lose more weight that those who breastfed less. Linear regression analysis, however, gave no significant correlations. Prepregnancy BMI and age were found to be related. Older women were more likely to have higher pregravid BMIs than younger subjects (Ohlin, 1990).

In its review of studies conducted regarding the relationship between breastfeeding and subsequent postpartum weight loss, the Breastfeeding Promotion Committee of the State of California noted that in well-controlled studies, breastfeeding women have been found to have more rapid weight loss than non-breastfeeding women after three months postpartum.

Perhaps the best designed study measuring the impact of breastfeeding on weight

loss to date found a significant association between breastfeeding women and weight loss after six months. The study defined breastfeeding groups in detail. In addition to conducting skin-fold measures, the researchers also collected milk samples from the subjects to determine the caloric demands of breastfeeding (Dewey, 1993).

Another study of white women who were well educated found that exclusively breastfeeding resulted in a significant decrease between three and six months (Brewer, 1989). Finally, Kramer (1993) also found that exclusive breastfeeding was associated with a reduction in maternal weight in a small study. The researcher concluded that infant feeding choices influence postpartum anthropometric changes but that the changes may by temporary.

Breastfeeding Trends

In the US, and likewise in California, few systems are in place to monitor breastfeeding initiation and duration rates. The limited data that does exist has been collected by infant formula manufacturers in a survey that qualifies more as market research than as system surviellence. Other data exists in crude form in the charts of medical providers or in records of state and federal programs, but groups and organizations lack the sophistication to compile the data.

Rates of exclusive and supplemented breastfeeding hit an all-time low in 1971 when only 25 percent of mothers initiated breastfeeding. At six months postpartum, a mere five percent continued. A back to nature drive, led by a group of woman who formed Le Leche League International, helped increase the rate of initiation to 62 percent by 1982. From 1982 to 1990 the initiation rate dropped a point per year. By 1994, the

trend had begun to reverse and the initiation rate was 57.5 percent. Many have attributed the reversal of the most recent trend to increased initiation among the WIC population. Never the less, the initiation and continuation rates remain well below the Health People 2000 goals discussed previously.

In California, it has been estimated that 74 percent of mothers are breastfeeding or combination feeding at the time of discharge. This 1993 rate is close the the Healthy People 2000 goal of 75 percent. California infants are supplemented 42 percent of the time -- more than double the 19 percent rate in the United States. While Hispanic women have high initiation rates, they also are likely to supplement (56 percent of breastfeeders). Hispanic teens in California have been found to have initiation rates similar to those of older Hispanic women. Regionally, the highest rates of breastfeeding in California are seen in the coastal and mountain regions with low population density and mostly white non-Hispanic women. This study was conducted in the central region of California, specifically San Joaquin County. Compared the the 52 other counties, San Joaquin has the fifth lowest in-hospital breastfeeding rate (DHS, 1996).

Summary

Obesity is clearly a problem in the United States. Breastfeeding rates have not met the expected goals set forth by the Health People 2000 report. Better tracking systems are needed to monitor the progress of these two important nutrition related public health issues and to relay important information to the public.

CHAPTER III

METHODOLOGY

This study was designed to determine the impact of infant feeding choice on maternal body mass index at six months postpartum in women participating in the Special Supplemental Nutrition Women, Infants and Children (WIC) Program at Community Medical Centers in Stockton and Lodi, California. The study was approved by the administrator of the agency and by the Oklahoma State University Institutional Review Board (Appendix C). The population was taken from two of six permanent clinic sites in an urban area. All women who had infants participating on the program at six months postpartum were included in the study. Completion of the survey was voluntary and was not associated with program eligibility or benefits. This chapter includes the research design; population and sample; data collection including instruments used for collection and finally methods of data analyses.

Research Design

The research method used in this study was retrospective descriptive research. The study design allowed the research to describe, analyze and interpret the state of conditions at a point in time. Descriptive studies provide baseline data and can be useful in monitoring change over the course of time. While this type of study is useful for

establishing associations, it does not allow for causal relationships to be determined Retrospective studies begin with outcomes and attempt to review history to uncover the existence of relationships between variables or presumed causes (Monsen, 1991).

Surveys are "useful for general hypotheses regarding the determinants of a condition or disease or the characteristic of interest" (Monsen, 1991). Surveys are designed to describe and quantify known variables within a defined population with the main purpose of allowing the researcher to create a statistical profile of the population. Such research allows for the establishment of associations, pinpoints areas in which further research is indicated and provides baseline data such as prevalence. These measures can be particularly useful in the planning and execution of health services such as those offered by the WIC Program at Community Medical Centers.

Sample and Population

The population used in this study consisted of 100 women enrolled or with infants enrolled in the Community Medical Centers WIC Program in Stockton or Lodi, California in 1999. All women whose infants turned six months of age during a three month period were included in the study.

Data Collection

Project Development

This study was conceptualized during the summer of 1994. The idea for the

research topic evolved from the examination of available retrospective data via WIC Program records. Breastfeeding promotion is a key component of the WIC program in California and other states, yet little data has been available to identify potential target areas for future planning. Data analysis techniques were agreed up during the summer of 1994 and again in 1999. Data was collected as part of routine WIC enrollment and eligibility screening appointments using existing program tools beginning in May 1999 and continued through July 1999. Data from the prenatal and postpartum enrollment periods were collected from both paper and automated medical and WIC records. In addition a survey was completed during the six month mid-certification appointment for the infant or during the breastfeeding recertification appointment for the woman. Routine program data was collected by CPAs employed at Community Medical Centers and was compiled by the researcher.

A retrospective data collection sheet (Appendix A) was developed to collect the required data from prenatal and postpartum enrollment records. Completion of this tool required accessing program files and reviewing automated records for identified participants.

The six-month postpartum survey was completed by the participant with the assistance of the CPA who completed the required anthropometric data elements on each survey (Appendix A).

The data collection tools were reviewed by the graduate committee of the researcher and by staff members of Community Medical Centers for content, clarity, validity and format. Field testing of the survey was completed after translation to ensure

questions were understood by the participants. Translation of the survey was completed by a program staff member. The approved proposal was then sent to the Institutional Review Board, Oklahoma State University for approval.

Procedures

Using the data collection tools previously described, data was collected by the researcher and staff members during the enrollment and recertification appointments of WIC Program applicants and participants.

Data Analyses

Completed data collection records and surveys were coded with participant identification numbers which allowed data for the prenatal, postpartum and six-month survey periods to be matched and compiled. Data were coded and transcribed using the P.C. File Software Program. Standard Statistical Procedures were used to analyze data (SAS, 1979). Frequencies and percentages were used to describe characteristics of the subjects. Analyses of variance, Duncan's Multiple Range Test, t-test, Pearson's correlation coefficient, and Chi-square were used to test the hypotheses in this study.

CHAPTER IV

RESULTS AND DISCUSSION

The purpose of this study was to examine the relationship of infant feeding choice and maternal body mass index six month postpartum in women participating in the WIC Program at Community Medical Centers in Stockton and Lodi, California during 1999. Data was collected using the tools and techniques previously describe in Chapter III, "Methods and Procedures." Data from 100 records and surveys were used and analyzed.

Characteristics of the Sample Population

Age at Delivery, Ethnicity, Parity and Delivery Method

The age of women at the time of delivery ranged from 13 to 44 years. The mean age of participants was 26.51 years. The age breakdown was 19.6 percent (n=19) were less than 20 years of age; 54.6 percent (n=53) were between 21 and 30 years; and 25.8 percent (n=25) were over 30 years of age.

Eighty-three percent (n=83) of the subjects were Hispanic while 17 percent were other ethnicities including white, black and Asian/pacific islander. Twenty-eight percent of subjects could be classified as migrant workers according to WIC Program standards.

To be classified as a migrant worker, subjects must answer 'yes' to the following questions: Do you or does anyone in your family work in the field of agriculture? Do you or your family leave the area to do so?

Approximately one-third (32 percent) of the subjects were primiparas (n=32). Thirty percent had two children (n= 30); 17 percent had three children (n=17); 14 percent had four children (n=14); and finally, 7 percent had more than 4 children (n=7). The mean number of children for the sample was 2.4 children (sd +/- 1.42).

The majority of subjects (n=83) delivered vaginally. Seventeen subjects delivered their infants via Cesarean section; this rate is similar to the reported rate of approximately 20 percent of all births in California. Despite evidence that women who deliver by Cesarean are less likely to breastfeed (Ford, 1990 and Samuels, 1985), no significant difference in breastfeeding initiation was found for the subjects studied.

Income and Adjunct Program Participation

During the prenatal period, 17 percent of subjects received Temporary Assistance to Needy Families (TANF), formerly known as Aid to Families with Dependent Children (AFDC) in the state of California. Similarly, 19 percent received food stamp benefits. Sixty-two percent of the subjects were enrolled in Medi-Cal, the California version of Medicaid. Income ranged from $0 to $4557 per month. Household size ranged from one to eight family members. Previous studies have shown that lower income women are less likely to breastfeed than higher income women (Schwartz, 1995).

During the month in which the six-month survey was completed, 85.1 percent

(n=86) of subjects had not received food from an emergency food bank. Approximately 13 percent (n=13) had received emergency food on at least one occasion.

Breastfeeding Data

Fifty-three percent of subjects reported during the prenatal enrollment that they had some previous breastfeeding experience. Table 1 compares the planned infant feeding choice during the prenatal period with actual feeding method at the initial postpartum certification and at six months postpartum. Clearly more women planned to exclusively breastfeed than actually succeeded. At the initial postpartum certification appointment, 23 percent of the subjects were exclusively breastfeeding. At six-months postpartum 22 percent of those women who were initially exclusively breastfeeding continued. These numbers fall short of the Healthy People 2000 goals of 75 percent at discharge and 50 percent at six months postpartum. The 23 percent exclusively breastfeeding in the early postpartum period is less than the baseline measure of 32 percent for low-income women noted in the Healthy People 2000 report. The 22 percent figure at six months postpartum is greater, however, than the 9 percent baseline measure for continuation noted in the report. (*Healthy People 2000:Nutrition Objectives, 1990*).

While 51 percent of subjects were combination feeding at the initial postpartum certification, only 12 percent continued to partially breastfeed at six months postpartum. Thirty-eight percent of the women were no longer breastfeeding, but had breastfeed or combination fed for a minimum of 30 days (1 percent breastfed less than 30 days and

TABLE 1

PLANNED VERSUS ACTUAL FEEDING METHODS OF SUBJECTS

Feeding Method	Prenatal Stated Method	Initial Postpartum Method	Six-month Postpartum Method
Exclusive Breastfeeding	45%	23%	22%
Combination Feeding (Group 1)	29%*	51%*	12%
Combination Feeding (Group 2)	n/a*	n/a*	38%
Formula Feeding	13%	26%	28%
Unknown/Unsure	13%	n/a	n/a

*WIC data collection forms do not collect combination feeding information in as much detail as the six-month survey used for the study. Because the data was collected retrospectively, these figures were listed as "combination feeding" in the chart except for the last column which separates the group as defined in the study.

were therefore classified as formula feeding). At six months postpartum, 28 percent of subjects were classified as formula feeding. These women either never breastfed or breastfed for less than 30 days. This figure is double the planned rate of formula feeding as stated during the prenatal interview. Because information was collected using standard WIC program data collection tools, the length of time the women planned to breastfeed is not known. This would be useful in determining if they had met their goal.

Women who reported breastfeeding or combination feeding at the initial postpartum certification ranged form 2 to 12 times per day. Fifty-one percent of breastfeeding women reported breastfeeding fewer than eight times per day. Feeding less than eight times per day has been associated with decreased milk production and subsequent early weaning of the infant (Lawrence,1999). Approximately 14 percent (n=10) of the women reported breastfeeding less than ten minutes per feeding; 56 percent (n=41) reported 11 to 20 minutes; and 30 percent (n=16) reported feedings lasting longer than 20 minutes.

Of those subjects currently breasfeeding at six months postpartum, 25.7 percent had never given formula (n=9) while 74.3 percent reported having given formula on at least one occasion (n=26). Table 2 compares the introduction of formula by those women breastfeeding at six months postpartum to those who had attempted to breastfeed but were not breastfeeding at six months postpartum. It appears that more than half of all breastfed infants received supplementation in the hospital. Others have reported that in California the average rate of supplementation is 42 percent, a figure that is substantially higher than the national average of 19 percent (DHS, 1996). Early supplementation is

thought to increase the rate at which women stop breastfeeding.

TABLE 2
COMPARISON OF AGE OF INTRODUCTION OF INFANT FORMULA FOR BREASTFEEDING AND NON-BREASTFEEDING INFANTS

Date of Introduction	Breastfeeding		Non-Breastfeeding	
	N	Percent	N	Percent
Day of delivery	16	59.3	24	47.1
30 days or less	1	3.7	10	10.0
31 - 60 days	3	11.1	5	9.8
> 60 days	7	25.9	12	23.5

At six months postpartum, of those women who continued to breastfeed, 42.9 percent were not giving any formula while 57.1 percent were offering formula. The amount of supplementation ranged from one to eight times per day and from four to thirty-six ounces. Of those who continued to breastfeed, 80 percent reported that they did not work or go to school. Those who were working reported that they did not use a breast pump to express milk for their infant during periods of separation even though breast pumps are an available WIC Program benefit.

Breastfeeding Cessation

Reasons for the cessation of breastfeeding the current infant for those who were breastfeeding at the initial postpartum certification and the reasons given for cessation by subjects with previous breastfeeding experience were similar (Table 3). The most common reasons given for stopping included 1)that the baby no longer wanted to breastfeed or rejected the breast and 2) an insufficient milk supply. It is not known whether infants no longer wanted to be breastfed because of frequent supplementation

and a resulting preference for artificial nipples. The events that led to supplementation are also unknown. It is possible that the women perceived their babies to be receiving inadequate breastmilk and therefore offered formula. Formula supplementation would eventually result in an actual decreased milk supply as the breasts responded to less frequent emptying and stimulation (Lawrence, 1999). This area requires more in-depth interviews to collect data for further investigation.

TABLE 3

REASONS GIVEN FOR BREASTFEEDING CESSATION WITH THIS AND PREVIOUS CHILD(REN)

Reason Given for Cessation	This Child		Previous Child(ren)	
	Frequency	Percentage	Frequency	Percentage
Baby rejected	13	26.5	10	20.0
Insufficient milk supply	11	22.4	10	20.0
Unknown	6	12.2	8	16.0
Work/School	5	10.2	5	10.0
Other	4	8.2	6	12.0
Feeding problems	3	6.1	1	2.0
Infant illness	2	4.1	2	4.0
Maternal illness	1	2.0	2	4.0
Medications used	1	2.0	2	4.0
Biting/teething of infant	1	2.0	1	2.0
Mother did not like	1	2.0	1	2.0
Felt baby was too old	1	2.0	1	2.0
Too tiring	0	0.0	1	2.0
	N = 49		N = 50	

The amount of time that women who tried to breastfeed but who stopped varied as seen in Table 4. The largest "drop off's" in breastfeeding occurred at less than seven days, 31 - 60 days, 91 - 120 days 121 - 150 days and greater than 150 days. These differences were not statistically tested which would have been useful.

TABLE 4

LENGTH OF TIME SUBJECTS REPORTED BREASTFEEDING BEFORE CESSATION

Number of Days	Frequency	Percent
≤ 7	5	10.0
8 - 14	3	6.0
15 - 21	4	8.0
22 - 20	2	4.0
31 - 60	8	16.0
61 - 90	2	4.0
91 - 120	8	16.0
121 - 150	8	16.0
> 150	10	20.0

N = 50

Birth Control Methods

Subjects reported using a variety of birth control methods as shown in Table 5. The most common form of birth control was oral contraceptives or "the pill." Religious

TABLE 5

SELF-REPORTED BIRTH CONTROL METHODS USED BY SUBJECTS

Method	Frequency	Percentage
Oral Contraceptives (The pill)	38	36.20
Depo-Provera	7	6.60
Norplant	4	3.80
Intrauterine Device (IUD)	13	12.40
Tubal Ligation	12	11.40
Condoms	11	10.50
Spermacide	1	1.00
None	13	12.40
Abstinence	6	5.70
Rhythm	0	0.00

N = 105

influences may play a role in the use of contraceptives by this population. Traditionally,

Hispanic families are classified most often as Roman Catholic. Since the Catholic Church does not encourage birth control, these women may have different responses than would non-Catholic women. It may be useful in future investigations to consider religious practices as a variable. No subjects reported using the natural family planning method or rhythm method to prevent pregnancy. It is possible that subjects were not familiar with the language used in the translation of the survey.

Influence on the Decision to Breastfeed

Overall, the subjects reported that both their physician during pregnancy and the baby's physician made breastfeeding seem very important (Table 6). Since most women felt that the doctors made breastfeeding seem either very important or important, it appears that this influence had limited impact on the decision to breastfeed or not. Subjects were asked who influenced their decision about how to feed their infant. Sixty-four percent felt they made this decision on their own. Thirty-eight percent said that the father of the child influenced their decision and likewise, thirty-eight percent of women said a WIC employee influenced their decision.

TABLE 6

PHYSICIANS' ATTITUDE ON THE IMPORTANCE OF BREASTFEEDING AS PERCEIVED BY THE SUBJECTS

Importance	Prenatal Physician		Infant Physician	
N=100	Frequency	Percent	Frequency	Percent
Very Important	69	69.0	67	67.0
Important	14	14.0	18	18.0
Neutral	8	8.0	7	7.0
Unimportant	0	0.0	0	0.0
Don't Know	9	9.0	8	8.0

Further investigation is warranted in this area to determine what subjects are influenced by when they respond that it is their own idea.

Exercise

At the initial postpartum certification, 61 percent of the subjects reported that they walk or exercise three or more times per week as part of the certification data collection. When the six month postpartum survey was conducted, 63 percent of the subjects reported exercising. The majority reported exercising less than 30 minutes per day and an average of two to three times per week (Table 7). A more sensitive exercise questionnaire is needed to determine the caloric implications of exercise on weight loss during the postpartum period.

TABLE 7

SELF-REPORTED EXERCISE HABITS OF SUBJECTS AT THE POSTPARTUM CERTIFICATION AND AT SIX MONTHS POSTPARTUM

Exercise	Initial Postpartum Frequency	Six Months Postpartum Frequency
Yes	61.0	63.0
No	39.0	63.0

Statistical Analyses

Testing of Hypotheses One

Ho1: There will be no significant association between the duration of breastfeeding at six months postpartum and selected personal variables for women participating in the WIC Program. Selected personal variables include: age, ethnicity,

weight, BMI, previous breastfeeeding experience, migrant worker status, household size, income, participation in other public assistance programs, parity, pre-term delivery of infant, smoking, birth control method, and method of delivery. The researcher found significant associations between breastfeeding duration and several of the personal variables using Duncan's Multiple Range Test and Chi-Square Analysis. Based on these results the researcher rejected Ho1.

Testing of Hypothesis Two

There will be no association between the initiation and continuation of breastfeeding and significant changes in BMI. The researcher found no significant associations between initiation and continuation of breastfeeding and significant changes in BMI. Based on these results the researcher failed to reject Ho2.

Testing of Hypothesis Three

Ho3: There will be no difference between breastfeeding rates in the early postpartum period and at six months postpartum for women participating in the WIC Program. The researcher found significant differences in breastfeeding rates in the early postpartum period and at six months postpartum. Based on these findings the researcher rejected Ho3.

Testing of Hypothesis Four

Ho4: There will be no association between selected personal variables and overweight at six months postpartum for participants. Selected personal variables included: age, ethnicity, exercise habits, breastfeeding of current infant, income, household size, participation in the food stamp program, parity, smoking, birth control

method and caloric intake. Duncan's Multiple Range Test and Chi-Square Analysis were used to determine the association between personal variables and overweight at six months postpartum. The researcher found significant associations between overweight and various selected variables. Based on these results the researcher rejected Ho4.

Body Mass Index, Age and Ethnicity

A significant association was found between BMI and age for each of the three time periods. Pregravid BMIs for the ≤ 20 year age group were significantly ($p \leq .0116$) lower than those of the 21 - 30 year and >30 year age groups using Duncan's Multiple Range Test (Table 8 Appendix B). Pearsons correlation for age versus BMI also indicated a positive association between pregravid BMI and age (Table 13 Appendix B). The mean BMI for the ≤ 20 group was in the normal range according to the World Health Organization (WHO) values. The mean BMIs for both the 21 - 30 year and >30 year age groups were in the overweight range. Chi-square analysis also revealed a signifiant association ($p < .063$) between pregravid BMI and age (Table 25 Appendix B). Hispanic women in the study were found to have significantly ($p \leq .088$) lower mean pregravid BMIs than other ethnicities (Table26 Appendix B).

Initial postpartum BMI values were found to be significantly associated with age using the Duncan's Multiple Range Test at the $p \leq .1$ level. Although the significance level of $p \leq .05$ was used for the study, the results of this test reflect a trend in the data worthy of attention. The mean BMI for the ≤ 20 years age group was significantly ($p \leq .0891$) lower than both the 21-30 years and >30 years age groups (Table 9 Appendix B). The 21 - 30 years age group and >30 years age group were not significantly different.

During the intial postpartum period, the mean BMIs for women in the ≤ 20 years age group and the 21 - 30 year age group fell in the overweight range while the mean BMI for the >30 year age group was in the obese range.

Finally, the six-month postpartum BMI values were found to be significantly ($p \leq .0103$) associated with age for the ≤ 20 year age group compared to the 21 - 30 year and > 30 year age groups using Duncan's Multiple Range Test (Table 10 Appendix B). Pearsons correlation values for age and BMI at six-months postpartum indicated a significant postive association ($p \leq .0179$) between the variables (Table 13 Appendix B). Chi-square analysis also revealed a significant association at the $p \leq .10$ level ($p \leq .054$) between postpartum BMI and feeding choice at six months postpartum (Table 28 Appendix B). Hispanic women were found to have signficantly ($p \leq .044$) different BMIs than non-Hispanic women (Table 27, AppendixB). Both the ≤ 20 year and the 21 - 30 year age groups had lower mean BMIs at six months postpartum but remained in the overweight range. The mean BMI for the >30 year age group stayed in the obese range.

The trend exhibited reveals that women gained weight during pregnancy and mean BMI values remain elevated after pregnancy for all age groups. Those women in the >30 year age group appear to have the most difficulty with postpartum weight while their younger counterparts retained less weight at six months postpartum.

No significant association between parity and BMI were found using Chi-Square Analysis. Pearsons correlation, however, did reveal an association ($p \leq .0025$) between parity and pregravid BMI and six-month postpartum BMI values (Table 13 Appendix B). As parity increased, BMI increased both before pregnancy and at six-months postpartum.

The examination of parity may have been more meaningful if those women who had greater than four children were grouped together.

Weight Gain and Pregravid BMI

There was a significant ($p \leq .0255$) negative correlation between self-reported weight gain during pregnancy and pregravid BMIs (Table 12 Appendix B). These results indicate that women with higher pregravid BMIs reported gaining less weight than those with lower pregravid BMIs.

Exercise and Postpartum BMI

T Test comparisons of initial postpartum BMI and self-reported exercise were significant (Table 11 Appendix B). Contrary to what was expected, those who reported not exercising had lower BMIs than those who reported walking or exercising three or more times per week. Although unlikely, it is possible that those who exercise have a higher degree of lean body mass and BMI measures are not sensitive to body composition. The use of skin-fold measurements to determine percentage of body fat would be useful in determining obesity. Because certain portions of the data collected were retrospective, baseline measurements of skin-folds were not possible in this study. This would be useful to increase the accuracy of future research.

Infant Feeding Plans Versus Actual Feeding Method

Chi-square analysis indicated that there was a significant difference ($p \leq .001$) in the feeding plans of subjects and the actual feeding method during the initial postpartum certification (Table 14 Appendix B). A signficant number of women who reported that they planned to exclusively breastfeed were actually combination feeding in the early

postpartum period. There was also a significant difference ($p \leq .001$) between the intial postpartum feeding choice and the six months postpartum feeding choice (Table24 Appendix B).

Smoking and Feeding Choice

The number of women smoking (n = 9) was approximately 9 percent of the study population. Chi-square analysis (Table 15 Appendix B) indicates a significant ($p \leq .009$) difference in the feeding choice of those who smoke and those who do not smoke. Those who smoke were more likely to have breastfed less than 30 days or to be formula feeding at six months. It is not known whether these women chose to breastfeed because of the passage of harmful ingredients from cigarette smoke into the breast milk or for other reasons.

Income and Feeding Choice

As found in previous studies, there was a significant association ($p \leq .044$) between income and infant feeding choice at six months postpartum using chi-square analysis (Table 16 Appendix B). Those subjects with lower incomes were more likely to offer formula or to combination feed than those at higher income levels. Similarly, those subjects who received Aid to Families with Dependent Children (AFDC) were significantly ($p \leq .010$)more likely to formula feed than those who were non-recipients (Table 21 Appendix B). There was a significant association ($p \leq .009$) between receipt of food stamp benefits and infant feeding choice at six months postpartum (Table 22 Appendix B). Those women who received food stamp benefits were more likely to have breastfed less than 30 days and to be formula feeding at six months postpartum.

Previous Breastfeeding Experience and Feeding Method at Six Months Postpartum

A significant association ($p \leq .001$) was found between previous breastfeeding experience and the likelihood of breastfeeding the current infant (Table 17 Appendix B). Women who did not have experience breastfeeding were more likely to breastfeed less than 30 days or to formula feed their infants. Those women with previous breastfeeding experience were significantly more likely to have higher BMIs than women without breastfeeding experience (Table 29 Appendix B).

Feeding Choice and Age

A significant association ($p \leq .036$) existed between feeding choice and age (Table 18 Appendix B). Those women who were older were more likely to be breastfeeding at six months postpartum than those who were younger. Others have reported that breastfeeding rates of younger mothers who are of Hispanic ethnicity have similar breastfeeding rates as older mothers of the same ethnicity (DHS, 1996).

Migrant Worker Status and Feeding Choice at Six Months Postpartum

Those women who indicated that they or a family member were a migrant worker were signficantly ($p \leq .023$) more likely to breastfeed than their non-migrant counterparts (Table 20 Appendix B). It is not known whether the decision to breastfeed was made from financial reasons or other reasons such as convenience. Interestingly, a large percentage of migrant workers who intiated breastfeeding stopped in less than 30 days.

Contraception, Infant Feeding Choice and BMI

A significant association ($p \leq .041$) was found between the use of spermacide as a contraceptive and feeding choice at six months postpartum (Table 23 Appendix B). Only

one user of spermacide was noted to exist in the combination 1 feeding group. Those women who chose to have tubal ligation after the most recent pregnancy were found to have BMIs different than those who did not have tubal ligation as seen in Tables 30 and 31 in Appendix B. Those subjects without tubal ligations were more likely to fall in the normal BMI range pregravid and less likely to have BMIs greater than 40. At six months postpartum, those with tubal ligations were more likely to be in the very obese BMI range and less likely to be in the normal and overweight ranges than those without tubal ligation.

Comparison of Findings to Other Studies

This study found no significant association between infant feeding method and BMI. These results were similar to those of Dugdale (1989), Ohlin (1990), Potter (1991) and Thorsdottir (1998) and unlike those of Dewey (1993), Brewer (1989) and Kramer (1993) as described in Chapter II. Age and BMI were found to be related in this study similar to the results found by others (Ohlin, 1990).

CHAPTER V

SUMMARY, RECOMMENDATIONS, AND IMPLICATIONS

Summary

The purpose of this research was to determine the association between breastfeeding duration and BMI in postpartum women participating in the Community Medical Centers WIC Program. Four hypotheses were postulated to determine if BMI was affected by personal and health variables.

The results of the data collected by the researcher are presented and discussed in Chapter IV. The sample population included women who were participating in the WIC program and had an infant who turned six months of age during the data collection period. Retrospective and survey data were analyzed using frequencies, percentages, ANOVA, Duncan's Multiple Range Test, Students t-test, Chi-Square and scatter plots to determine if significant ($p \leq .05$) associations existed between selected personal and health variables of the subjects.

Eighty-three percent of the subjects were Hispanic. BMIs for subjects were not significantly different between the feeding method groups. Younger subjects were more likely to have a lower BMI than older subjects. Smoking status, low-income status and

receipt of Aid to Families with Dependent Children (AFDC) were associated with the decision to formula feed. Breastfeeding experience was a strong indicator of the likelihood of breastfeeding the current infant. Migrant and Hispanic women who were older were more likely to breastfeed their infants than non-migrant, non-Hispanic women.

At six months postpartum the number of women exclusively breastfeeding their infants compared to the initial postpartum certification remained constant. Those who were combination feeding showed a dramatic drop in breastfeeding at six months postpartum. Reasons given for breastfeeding cessation before six months closely matched reasons given by subjects for previous breastfeeding cessation with another child.

Recommendations

The research collection tools were lengthy and some data elements were difficult to interpret due to the manner in which WIC program data are collected. Future researchers could work closely with the California State WIC Branch to use information from the Integrated Statewide Information System (ISIS) to collect accurate and specific data elements. ISIS was implemented after the research project was initially designed and therefore, only portions of data were extracted from the automated system. Although trained in the administration of 24-hour food recalls, the CPAs who administered the surveys did a poor job of reviewing the information to be sure portion sizes and specific food items were well defined. As a result, the inclusion of dietary intake was reconsidered when it was determined that an accurate portrayal of intake could not be

established. The inclusion of this variable is important since intake is associated with weight and thus BMI. It is also recommended that future research include analysis of dietary intake that examines the percentages of RDAs met for calories and nutrients, specifically those targeted by the WIC food package and also those which have values which are increased during lactation.

Well-controlled studies with small sample sizes have also included the collection of breastmilk for evaluation of energy requirements. Such collection is difficult, but allows for a more accurate account of the caloric demands of lactation.

The use of skin-fold measurements in the pregravid, early postpartum and six month postpartum periods would help establish body composition of lactating women in future studies. These measures would strengthen the BMI assessment measures.

Additional research needs to be conducted to determine the impact of cultural differences with regard to both lactation and dietary habits on BMI among minority women. A comparison of other WIC programs within the state and nationally would be useful to determine if similar results could be obtained.

Implications

Given the disproportionate prevalence of obesity among minority women and the unquestionable benefits associated with breastfeeding and the health of both women and infants. WIC programs should continue to work with hospitals, doctors and community organizations to promote, support and protect breastfeeding as the preferred infant feeding method. Programs should work to assist women in the prenatal period to develop

plans of action for weight maintenance and weight loss after delivery. Concepts that emphasize healthy eating habits and exercise for the postpartum period should be included in lesson plans and patient education materials.

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APPENDICES

APPENDIX A

RESEARCH INSTRUMENTS

Data Collection Sheet

ID #_____ Clinic #_____

1. General Chart Information (Retrospective Data)

   a. Pregravid weight: _____

   b. Stated infant feeding choice: Breastfeed Combination Formula
      Unknown Unsure

   c. Previous breastfeeding? Yes No
      How long?_____ Reason Stopped:_____

   d. Ethnicity: White Black Hispanic
      American Indian/Alaskan Asian/Pacific Islander

   e. Age at delivery:_____ Date of Infant's birth:_____

   f. Migrant Worker Yes No

   g. AFDC Yes No

   h. Food Stamps Yes No

   i. Medi-Cal Yes No

   j. Household Size:_____

   k. Income:_____

2. Initial Post-partum Information

   a. Walk/Exercise three or more times/week? Yes No

   b. Usual number of meals/day:_____

   c. Infant feeding method: Breastfeeed Combination Formula

   d. If breastfeeding, # of times in 24 hours?_____
      Time for each feeding?_____

   e. Height: _____

   f. Weight: _____

g. Parity: _____

h. Pre-term infant? Yes No

i. HTN during pregnancy? Yes No

j. GDM during pregnancy? Yes No

k. Smoking? Yes No

If yes, # of cigarettes/day:_____

l. Date last two pregnancies ended _____

_____

m. Self-reported pregnancy weight gain: _____

n. 24 Hour Recall

Amount	Food and Drink

3. Six Month Post-partum Information (in addition to survey)

a. Weight: _____

b. Method of Delivery: C-Section Vaginal

c. Infant feeding history:

Number of Months Exclusively Breastfed: _____

Number of Months Partially Breastfed: _____

WIC ID #_____ Clinic Number:_____

Today's Date:_____

Six Month Postpartum Survey

Date of infant's birth _____ Delivery Hospital _____

How many children do you have? _____

List the ages of your children and circle how they were fed.

Age	How Fed			
____	Breast	Formula	Breast & Formula	Can't Remember
____	Breast	Formula	Breast & Formula	Can't Remember
____	Breast	Formula	Breast & Formula	Can't Remember
____	Breast	Formula	Breast & Formula	Can't Remember
____	Breast	Formula	Breast & Formula	Can't Remember

Please circle or write in your answers to the following questions:

1. Are you currently breastfeeding your infant? Yes No

   If you answered no, go to question 7

2. How many times in 24 hours do you breastfeed? _____

3. How many minutes (total) does your baby nurse each time? _____

4. Have you ever given your infant formula Yes No

   If yes, how old was your infant the very first time he/she was given formula? _____

5. Do you give your baby bottles of formula now? Yes No

   If yes, how many times per day do your baby drink a bottle of formula? _____

   How much formula does your baby drink in one day (total ounces)? _____

6. Are you working or going to school? Yes No

   If yes, do you pump your breast with a breast pump? Yes No

   If yes what type of pump do you use? Electric, brand: _____

   Manual, brand: _____

   Skip to question 8

7. Did you ever breastfeed this infant (even one time)? Yes No

If yes, how long? _____

Why did you stop? _____

How old was your infant the first time he/she received formula? _____

8. Does your baby use a pacifier? Yes No

If yes, how old was he/she when you starting using the pacifier? _____

9 How old was your infant when you first introduced the following?

Food/Drink	Age
Water	_____
Juice	_____
Other liquid	_____
Cereals	_____
Other solids, please list	_____

10. Do you walk or exercise three or more times each week? Yes No

If you answered no, go to question 13

11. How many minutes do you walk or exercise? _____

12. How many times per week do you walk or exercise? _____

13. Do you smoke? Yes No

If you answered yes, how many cigarettes do you smoke each day? _____

14. Do you currently take diet pills, supplements or herbs to lose weight? Yes No

If yes, what do you take? _____

15. Are you currently on a weight loss program or diet? Yes No

If yes, what type? Circle one:

a. Weight Watchers
b. Jenny Craig
c. Herbal Life
d. Nutri-System
e. Own program
f. Other:_____

16. Was this baby born by Cesarean? Yes No

17. Did you have pain medication during the birth of this baby? (such as an epidural or demerol) Yes No

18. Was your baby born with a health problem? Yes No

If yes, explain: _____

19. How long after you delivered your baby did you first try to breastfeed? Circle one.
a. Less than 30 minutes
b. 30 minutes to 59 minutes
c. one hour to two hours
d. more than two hours
e. never tried to breastfeed

20. Have you ever had breast surgery? Yes No

If yes, explain: _____

21. Who helped you decide whether to breastfeed or formula feed your new baby? Circle all that apply.

a. Baby's father
b. Your mother
c. Your sister
d. Friend
e. Your doctor (OB)
f. Your baby's doctor
g. WIC staff
h. Nurse
i. Nutritionist
j. Magazine/book
k. Class
l. Own idea
m. Other:_____

22. How important did the <u>doctor you saw during your pregnancy</u> make breastfeeding seem to you?
a. Very important
b. Important
c. Neither important nor unimportant (neutral)
d. Unimportant
e. I don't know

23. How important did the baby's doctor make breastfeeding seem to you?
   f. Very important
   g. Important
   h. Neither important nor unimportant (neutral)
   i. Unimportant
   j. I don't know

24. What method of birth control are you presently using? Select from the following, circle all that apply.
   a. The pill
   b. Shots (Depo-Provera)
   c. Skin patches (Norplant)
   d. IUD
   e. Diaphragm
   f. Condoms (rubbers)
   g. Spermacides
   h. Sponges
   i. Rhythm/Natural Family
   j. No method of birth control
   k. Abstinence (No sex)

25. How many times in the past year have you used the emergency food bank? Circle your answer.
   a. None
   b. 1-2
   c. 3-4
   d. 5-6
   e. 7 or more times

Please write down everything you ate and drank yesterday. Include the time and amount of food. Be as specific as possible.

Time	Amount	Food and Drink

FOR OFFICE USE ONLY: WT COMPLETED BY: DATE:

APPENDIX B

STATISTICAL SIGNIFICANCES

TABLE 8

DUNCAN'S MULTIPLE RANGE TEST FOR PREGRAVID BMI AND AGE

Duncan Grouping	Mean BMI	N	Age Group
A	29.164	24	>30 years
A			
A	26.781	49	21 – 30 years
B	23.292	18	≤ 20 years

Df = 2
Mean Square = 177.537
F value = 4.69
P = .0116

TABLE 9

DUNCAN'S MULTIPLE RANGE TEST FOR INTIAL POSTPARTUM BMI AND AGE

Duncan Grouping	Mean BMI	N	Age Group
A	30.806	24	>30 years
A			
B A	29.405	49	21 – 30 years
B			
B	26.912	21	≤ 20 years

Df = 2
Mean Square = 86.951
F value = 2.48
P = .0891

TABLE 10

DUNCAN'S MULTIPLE RANGE TEST FOR SIX MONTH POSTPARTUM BMI AND AGE

Duncan Grouping	Mean BMI	N	Age Group
A	30.803	24	>30 years
A			
A	28.757	48	21 – 30 years
B	25.276	21	≤ 20 years

Df = 2
Mean Square = 174.3681
F value = 4.81,P = .0103

TABLE 11

T-TEST COMPARISON OF INTIAL POSTPARTUM BMI AND SELF-REPORTED EXERCISE

Exercise	N	Mean BMI	Standard Deviation	Df	P > T
No	35	27.2769	4.9953	84.4	.0107
Yes	59	30.3501	6.3029	92.0	.0157

TABLE 12

PEARSON CORRELATION COEFFICIENTS FOR WEIGHT GAIN AND PREGRAVID BMI

	Pregravid BMI	
Wt Gain	Pearson Correlation	-0.49772
	P>R	0.0255
	N = 20	

TABLE 13

PEARSON CORRELATION COEFFICIENTS FOR AGE AND PARITY VERSUS BMI

	Pregravid BMI	Six Month Postpartum BMI
Age		
Pearson Correlation	.26039	.27859
P > R	.0127	.0075
N	91	91
Parity		
Pearson Correlation	.31372	.24511
P > R	.0025	.0179
N	91	93

TABLE 14

CHI-SQUARE ANALYSIS OF INFANT FEEDING PLANS AND ACTUAL FEEDING METHOD AT INITIAL POSTPARTUM CERTIFICATION

Planned Feeding Method	Actual Breastfeeding	Actual Combination Feeding	Actual Formula Feeding
Breastfeed	4.098	.0014	3.5636
Combination	3.12	2.9978	.6064
Formula	1.3513	6.697	23.147
Unknown	.3953	.0873	.0327
Unsure	.697	.1337	.0776

Chi-square = 47.948, df = 10, p = .001
Effective Sample Size 99
Frequency Missing = 16
Warnings: 14% of the data are missing; 61% of the cells have expected counts less than 5. Chi-square may not be a valid test.

TABLE 15

CHI-SQUARE ANALYSIS OF SMOKING AND FEEDING CHOICE AT SIX MONTHS POSTPARTUM

Frequency Expected Cell X^2 Percent	**Breastfeeding**	**Combination Feeding 1**	**Combination Feeding 2**	**Formula Feeding**	**Total**
Non-Smokers	24 21.861 0.2092 23.76	11 10.02 0.0959 10.89	34 32.792 0.0445 33.66	23 27.327 0.6851 22.77	92 91.09
Smokers	0 2.1386 2.1386 0	0 0.9802 0.9802 0	2 3.2079 0.4548 1.98	7 2.6733 7.0029 6.93	9 8.91
Total	24 23.76	11 10.89	36 35.64	30 29.70	101 100.00

Chi-square = 11.611, df= 3, P = .009
Effective sample size = 101
Frequency missing 14
Warnings: 12% of the data are missing. 50% of the cells have expected counts less than 5. Chi-square may not be a valid test.

TABLE 16

CHI-SQUARE ANALYSIS OF INCOME AND FEEDING METHOD AT SIX MONTHS POSTPARTUM

Income **Frequency** **Expected** **Cell X^2** **Percent**	**Breastfeeding**	**Combination Feeding 1**	**Combination Feeding 2**	**Formula Feeding**	**Total**
Less than $500	0 3.9655 3.9655 0	0 1.5517 1.5517 0	7 5.3448 0.5126 8.05	8 4.1379 3.6046 9.20	15 17.24
$501 – 1000	5 6.8736 0.5107 5.75	3 2.6897 0.0358 3.45	8 9.2644 0.1726 9.20	10 7.1724 1.1147 11.49	26
$1001 – 1500	11 7.1379 2.0896 12.64	4 2.7931 0.5215 4.60	10 9.6207 0.015 11.49	2 7.4483 3.9853 2.30	27 31.03
$1501 – 2000	7 4.7586 1.0557 8.05	2 1.8621 0.0102 2.30	5 6.4138 0.3116 5.75	4 4.9655 0.1877 4.60	18 20.69
>$2000	0 0.2644 0.2644 0	0 0.1034 0.1034 0	1 0.3563 1.1628 1.15	0 0.2759 0.2759 0	1 1.15
Total	23 26.44	9 10.34	31 35.63	24 27.59	87 100.00

Chi-square = 21.451, Df = 12, P = .044

Warnings: 24% of the data are missing. 60% of the cells have expected counts less than 5. Chi-square may not be a valid test.

TABLE 17

CHI-SQUARE ANALYSIS OF PREVIOUS BREASTFEEDING EXPERIENCE AND FEEDING METHOD AT SIX MONTHS POSTPARTUM

Breastfeeding Experience **Frequency** **Expected** **Cell X^2** **Percent**	**Breastfeeding**	**Combination Feeding 1**	**Combination Feeding 2**	**Formula Feeding**	**Total**
Inexperienced	4 10.43 3.9642 4.65	7 4.0814 2.07871 8.14	12 13.605 0.1893 13.95	16 10.884 2.4051 18.60	39 45.35
Experienced	19 12.57 3.2895 22.09	2 4.9186 1.7318 2.33	18 16.395 0.1571 20.93	8 13.116 1.9957 9.30	47 54.65
Total	23 26.74	9 10.47	30 34.88	24 27.91	86 100.00

Chi-square = 15.820, df = 3, p= 0.001
Effective sample size = 86
Frequency missing = 29
Warnings: 25% of the data are missing. 25% of the cells have expected counts less than 5. Chi-square may not be a valid test.

TABLE 18

CHI-SQUARE ANALYSIS OF FEEDING CHOICE AND AGE

Age Group Frequency Expected Cell X^2 Percent	Breastfeeding	Combination Feeding 1	Combination Feeding 2	Formula Feeding	Total
Less than 20 years	2 5.2874 2.0439 2.30	2 2.069 0.0023 2.30	11 7.1264 2.1055 12.64	5 5.5172 0.0485 5.75	20 22.99
21 - 30 years	9 11.632 .5956 10.35	5 4.5517 .0441 5.75	15 15.678 .0293 17.24	15 12.138 .6749 17.24	23 50.57
> 30 years	12 6.0805 5.7629 13.79	2 2.3793 .0605 2.30	5 8.1954 1.2459 5.75	4 6.3448 .8666 4.60	23 26.44
Total	23 26.44	9 10.34	31 35.63	24 27.59	87 100

Chi-square = 13.480, df = 6, p= 0.036
Effective sample size = 87
Frequency Missing = 28
Warning: 24% of the data are missing. 25% of the cells have expected counts less than five. Chi-square may not be a valid test.

TABLE 19

CHI-SQUARE ANALYSIS OF ETHNICITY AND FEEDING CHOICE AT SIX MONTHS POSTPARTUM

Ethnicity **Frequency** **Expected** **Cell X^2** **Percent**	**Breastfeeding**	**Combination Feeding 1**	**Combination Feeding 2**	**Formula Feeding**	**Total**
Hispanic	23 19.256 .728 26.74	8 7.5349 .9287 9.30	25 25.116 .0005 29.07	16 20.093 .8338 18.60	72 83.72
Other	0 3.7442 3.7442 0	1 1.4651 .1477 1.16	5 4.8837 .0028 5.81	8 3.907 4.2879 9.30	14 16.28
Total	23 26.74	9 10.47	30 34.88	24 27.91	86 100.00

Chi-square = 9.774, df = 3, p = .021
Effective sample size = 86
Frequency missing = 29
Warnings: 25% of the data are missing. 50% of the cells have expected counts less than Five. Chi-square may not be a valid test.

TABLE 20

CHI-SQUARE ANALYSIS OF MIGRANT WORKER STATUS AND FEEDING CHOICE AT SIX MONTHS POSTPARTUM

Migrant Worker Status **Frequency** **Expected** **Cell X^2** **Percent**	**Breastfeeding**	**Combination Feeding 1**	**Combination Feeding 2**	**Formula Feeding**	**Total**
Non-migrant Worker	12 16.126 1.0559 13.79	7 6.3103 .0754 8.05	20 21.736 .1386 22.99	22 16.828 1.5899 25.29	61 70.11
Migrant Worker	11 6.8736 2.4772 12.64	2 2.6897 .1768 2.30	11 9.2644 .3252 12.64	2 7.1724 3.7301 2.3	26 29.89
Total	23 26.44	9 10.34	31 35.63	24 27.59	87 100

Chi-square = 9.569, df = 3, p = .023
Effective sample size = 87
Frequency missing = 28
Warning: 24% of the data are missing.

TABLE 21

CHI-SQUARE ANALYSIS OF AID TO FAMILIES WITH DEPENDENT CHILDREN (AFDC) AND FEEDING CHOICE AT SIX MONTHS POSTPARTUM

AFDC Status **Frequency** **Expected** **Cell X^2** **Percent**	**Breastfeeding**	**Combination Feeding 1**	**Combination Feeding 2**	**Formula Feeding**	**Total**
AFDC Non-recipient	23 19.523 0.6191 26.74	8 7.6395 0.017 9.30	27 26.314 0.0179 31.40	15 19.523 1.048 17.44	73 84.88
AFDC Recipient	0 3.467 3.4767 0	1 1.3605 0.0955 1.16	4 4.686 0.1004 4.65	8 3.4767 5.8848 9.30	13 15.12
Total	23 26.74	9 10.47	31 36.05	23 26.74	86 100.00

Chi-square = 11.259, df = 3, p = .010
Effective sample size = 86
Frequency missing = 29
Warnings: 25% of the data are missing. 50% of the cells have expected counts less than Five. Chi-square may not be a valid test.

TABLE 22

CHI-SQUARE ANALYSIS OF FOOD STAMP STATUS AND FEEDING CHOICE AT SIX MONTHS POSTPARTUM

Food Stamp Status **Frequency** **Expected** **Cell X^2** **Percent**	**Breastfeeding**	**Combination 1**	**Combination 2**	**Formula Feeding**	**Total**
Food Stamp Non-Recipient	22 18.988 .4777 25.58	7 7.4302 .0249 8.14	28 25.593 .2264 32.56	14 18.988 1.3105 16.28	71 82.56
Food Stamp Recipient	1 4.0116 2.2609 1.16	2 1.5698 .1179 2.33	3 5.407 1.0715 3.49	9 4.0116 6.2029 10.47	15 17.44
Total	23 26.74	9 10.47	31 36.05	23 26.74	86 100.00

Chi-square = 11.693, df = 3, p = .009
Effective sample size = 86
Frequency missing = 29
Warnings: 25% of the data are missing. 38% of the cells have expected counts less than Five. Chi-square may not be a valid test.

TABLE 23

CHI-SQUARE ANALYSIS OF SPERMACIDE AS A CONTRACEPTIVE AND FEEDING CHOICE AT SIX MONTHS POSTPARTUM

Use of Spermacide as a Contraceptive **Frequency** **Expected** **Cell X^2** **Percent**	**Breastfeeding**	**Combination Feeding 1**	**Combination Feeding 2**	**Formula Feeding**	**Total**
Non Users	24 23.762 .0024 23.76	10 10.891 .0729 9.90	36 35.644 .0036 35.64	30 29.703 .003 29.70	100 99.01
Users	0 .2376 .2376 0	1 .1089 7.2907 .99	0 .3564 .3564 0	0 .297 .297 0	1 .99
Total	24 23.76	11 10.89	36 35.64	30 29.70	101 100.00

Chi-square = 8.264, df = 3, p = .041
Effective sample size = 101
Frequency missing = 14
Warnings: 12% of the data are missing. 50% of the cells have expected counts less than Five. Chi-square may not be a valid test.

TABLE 24

CHI-SQUARE ANALYSIS OF INTITIAL POSTPARTUM FEEDING CHOICE AND FEEDING CHOICE AT SIX MONTHS POSTPARTUM

Initial Postpartum Feeding	Breastfeeding	Combination Feeding 1	Combination Feeding 2	Formula Feeding	Total
Breastfeeding	11 5.0814 6.8938 12.79	1 1.9884 .4913 1.16	6 6.8488 .1052 6.98	1 5.0814 3.2782 1.16	19 22.09
Combination Feeding	12 12.035 .0001 13.95	8 4.7093 2.2994 9.30	23 16.221 2.8331 26.74	2 12.035 8.3673 2.33	45 52.33
Formula Feeding	0 5.8837 5.8837 0	0 2.3023 2.3023 0	2 7.9302 4.4346 2.33	20 5.8837 33.868 23.26	22 25.58
Total	23 26.74	9 10.47	31 36.05	23 26.74	86 100.00

Chi-square = 70.757, df = 6, p = .001
Effective sample size = 86
Frequency missing = 29
Warning: 25% of the data are missing. 25% of the cells have expected counts less than Five. Chi-square may not be a valid test.

TABLE 25

CHI-SQUARE ANALYSIS OF PREGRAVID BMI AND AGE

Pregravid BMI **Frequency** **Expected** **Cell X^2** **Percent**	**Less than 20 years**	**21 – 30 years**	**Over 30 years**	**Total**
Less than 25 (Normal BMI)	19 12.069 3.9799 18.81	24 27.812 .5225 23.76	10 13.119 .7415 9.90	53 52.48
25 – 29.9 (Overweight)	2 5.9208 2.5964 1.98	17 13.644 .8257 16.83	7 6.4356 .0495 6.93	26 25.74
30 – 39.9 (Obese)	2 4.3267 1.2512 1.98	10 9.9703 .0001 9.90	7 4.703 1.1219 6.93	19 18.81
≥40 (Extremely Obese)	0 .6832 .6832 0	2 1.5743 .1151 1.98	1 .7426 .0892 .99	3 2.97
Total	23 22.77	53 52.48	25 24.75	101 100.00

Chi-square = 11.976, df = 6, p = .063
Effective sample size = 101
Frequency missing = 14
Warning: 12% of the data are missing. 42% of the cells have expected counts less than Five. Chi-square may not be a valid test.

TABLE 26

CHI-SQUARE ANALYSIS OF PREGRAVID BMI AND ETHNICITY

Pregravid BMI **Frequency** **Expected** **Cell X^2** **Percent**	**Hispanic**	**Other**	**Total**
Less than 25	42 43.16 0.312 42	10 8.84 .1522 10	52 52
25 – 30	23 21.58 .0934 23.00	3 4.42 .4562 3.00	26 26
31 – 39.9	17 15.77 .0959 17	2 3.23 .4684 2	19 19
≥40	1 2.49 .8916 1	2 .51 4.3531 2	3 3
Total	83 83.00	17 17.00	100 100.00

Chi-square = 6.542, df = 3, p = .088
Effective sample size = 100
Frequency missing = 15
Warning: 13% of the data are missing. 50% of the cells have expected counts less than Five. Chi-square may not be a valid test.

TABLE 27

CHI-SQUARE ANALYSIS OF POSTPARTUM BMI AND ETHNICITY

Postpartum BMI **Frequency** **Expected** **Cell X^2** **Percent**	**Hispanic**	**Other**	**Total**
< 25	22 24.9 .3378 22	8 5.1 1.649 8	30 30.00
25 – 29.9	32 28.22 .5063 32	2 5.78 2.472 2	34 34.00
30 – 39.9	27 26.56 .0073 27.00	5 5.44 .0356 5.00	32 32.00
≥ 40	2 3.32 .5248 2.00	2 .68 2.5624 2.00	4 4.00
Total	83 83.00	17 17.00	100 100.00

Chi-square = 8.095, df = 3, p = .044
Effective sample size = 100
Frequency missing = 15
Warning: 13% of the data are missing. 25% of the cells have expected counts less than Five. Chi-square may not be a valid test.

TABLE 28

CHI-SQUARE ANALYSIS OF POSTPARTUM BMI AND FEEDING CHOICE AT SIX MONTHS POSTPARTUM

Postpartum BMI **Frequency** **Expected** **Cell X^2** **Percent**	**Breastfeeding**	**Combination Feeding 1**	**Combination Feeding 2**	**Formula Feeding**	**Total**
Less than 25	4 7.1379 1.3795 4.60	5 2.7931 1.7437 5.75	11 9.6207 .1978 12.64	7 7.4483 .027 8.05	27 31.03
25 – 29.9	6 7.4023 02657 6.90	2 2.8966 .2775 2.30	12 9.977 .4102 13.79	8 7.7241 .0099 9.20	28 32.18
30 – 39.9	13 7.6667 3.7101 14.94	2 3 .3333 2.30	5 10.333 2.7527 5.75	9 8 .125 10.34	29 33.33
≥40	0 .7931 .7931 0	0 .3103 .3103 0	3 1.069 3.4883 3.45	0 .8276 .8276 0	3 3.45
Total	23 26.44	9 10.34	31 35.63	24 27.59	87 100.00

Chi-square = 16.652, df = 9, p = .054
Effective sample size = 87
Frequency missing = 28
Warning: 24% of the data are missing. 44% of the cells have expected counts less than Five. Chi-square may not be a valid test.

TABLE 29

CHI-SQUARE ANALYSIS OF BMI AT SIX MONTHS POSTPARTUM AND PREVIOUS BREASTFEEDING EXPERIENCE

BMI at Six Months Postpartum **Frequency** **Expected** **Cell X^2** **Percent**	**No Previous Experience**	**Previously Breastfed**	**Total**
Less than 25	24 16.92 2.9626 24	12 19.08 2.6272 12	36 36.00
25 – 29.9	12 15.98 .9913 12.00	22 18.02 .879 22.00	34 34.00
30 – 39.9	11 12.69 .2251 11.00	16 14.31 .1996 16.00	27 27.00
≥40	0 1.41 1.41 0	3 1.59 1.2504 3.00	3 3.00
Total	47 47.00	53 53.00	100 100.00

Chi-square = 10.545, df = 3, p = .014
Effective sample size = 100
Frequency missing = 15
Warnings: 15% of the data are missing. 25% of the cells have expected counts less than Five. Chi-square may not be a valid test.

TABLE 30

CHI-SQUARE ANALYSIS OF TUBAL LIGATION AS CONTRACEPTIVE METHOD AND PREGRAVID BMI

Pregravid BMI **Frequency** **Expected** **Cell X^2** **Percent**	**No Tubal Ligation**	**Tubal Ligation as Contraceptive Method**	**Total**
Less than 25	40 39.828 .0007 45.98	5 5.1724 .0057 5.75	45 51.72
25 – 29.9	21 20.356 .0204 24.14	2 2.6437 .1567 2.30	23 26.44
30 – 39.9	15 14.161 .0497 17.24	1 1.8391 .3828 1.15	16 18.39
≥40	1 2.6552 1.0318 1.15	2 .3448 7.9448 2.3	3 3.45
Total	77 88.51	10 11.49	87 100.00

Chi-square = 9.593, df = 3, p = .022
Effective sample size = 87
Frequency missing = 28
Warnings: 24% of the data are missing. 50% of the cells have expected cell counts less than five. Chi-square may not be a valid test.

TABLE 31

CHI-SQUARE ANALYSIS OF TUBAL LIGATION AS CONTRACEPTIVE METHOD AND SIX MONTH POSTPARTUM BMI

Six Month Postpartum BMI **Frequency** **Expected** **Cell X^2** **Percent**	**No Tubal Ligation**	**Tubal Ligation as Contraceptive Method**	**Total**
Less than 25	32 30.092 .121 36.78	2 3.908 .9316 2.30	34 39.08
25 – 29.9	21 23.011 .1758 24.14	5 2.9885 1.3539 5.75	26 29.89
30 – 39.9	23 21.241 .1456 26.44	1 2.7586 1.1211 1.15	24 27.59
≥40	1 2.6552 1.0318 1.15	2 .3448 7.9448 2.30	3 3.45
Total	77 88.51	10 11.49	87 100.00

Chi-square = 12.826, df = 3, p = .005
Effective sample size = 87
Frequency missing = 28
Warnings: 24% of the data are missing. 63% of the cells have expected cell counts less than five. Chi-square may not be a valid test.

APPENDIX C

INSTITUTIONAL REVIEW BOARD APPROVAL

OKLAHOMA STATE UNIVERSITY
INSTITUTIONAL REVIEW BOARD
HUMAN SUBJECTS REVIEW

Date: 10-05-95 **IRB#:** HE-96-013

Proposal Title: THE IMPACT OF BREASTFEEDING ON MATERNAL BODY MASS INDEX (BMI) SIX MONTHS POST-PARTUM

Principal Investigator(s): Lea Ebro, Bernice Kopel, Jeanne Blankenship Fisher

Reviewed and Processed as: Exempt

Approval Status Recommended by Reviewer(s): Approved

ALL APPROVALS MAY BE SUBJECT TO REVIEW BY FULL INSTITUTIONAL REVIEW BOARD AT NEXT MEETING.
APPROVAL STATUS PERIOD VALID FOR ONE CALENDAR YEAR AFTER WHICH A CONTINUATION OR RENEWAL REQUEST IS REQUIRED TO BE SUBMITTED FOR BOARD APPROVAL.
ANY MODIFICATIONS TO APPROVED PROJECT MUST ALSO BE SUBMITTED FOR APPROVAL.

Comments, Modifications/Conditions for Approval or Reasons for Deferral or Disapproval are as follows:

Signature: John H. Wyckoff Date: October 17, 1995

Chair of Institutional Review Board

OKLAHOMA STATE UNIVERSITY
INSTITUTIONAL REVIEW BOARD

Date:	April 12, 2000	IRB #:	HE-96-013
Proposal Title:	"THE IMPACT OF BREAST-FEEDING ON MATERNAL BODY MASS INDEX (BMI) SIX MONTHS POST-PARTUM"		
Principal Investigator(s):	Lea Ebro Bernice Kopel Jeanne Blankenship Fisher		
Reviewed and Processed as	Continuation		

Approval Status Recommended by Reviewer(s): Approved

Signature:

Carol Olson

Carol Olson, Director of University Research Compliance

April 12, 2000
Date

Approvals are valid for one calendar year, after which time a request for continuation must be submitted. Any modification to the research project approved by the IRB must be submitted for approval with the advisor's signature. The IRB office MUST be notified in writing when a project is complete. Approved projects are subject to monitoring by the IRB. Expedited and exempt projects may be reviewed by the full Institutional Review Board.

VITA

Jeanne D. Blankenship

Candidate for the Degree of

Master of Science

Thesis: IMPACT OF INFANT FEEDING CHOICE ON MATERNAL BODY MASS INDEX AT SIX MONTHS POSTPARTUM

Major Field: Nutritional Sciences

Biographical:

Personal Data: Born in Cottage Grove, Oregon, on October 11, 1966. The daughter of Jack C. Blankenship, Sr. and Janice Seibold Blankenship. Married to Kenneth J. Stockero; two sons, Alexander James Stockero and Eric Harrington Stockero.

Education: Graduated from Cottage Grove High School, Cottage Grove, Oregon in May 1984; received Bachelor of Science Degree in Clinical Dietetics from Arizona State University, Tempe, Arizona in May 1993; completed Approved Preprofessional Practice Program at Oklahoma State University, May 1994; passed registration exam to meet requirements for American Dietetic Association Commission on Dietetic Registration in October 1994; completed requirements for the Master of Science Degree at Oklahoma State University in July 2000.

Professional Experience: WIC Program Coordinator, Community Medical Centers, Stockton, California July 1994 to June 1997. Director of Perinatal & Nutrition Services, Community Medical Centers, Stockton California June 1997 to June 1999.Consultant Dietitian, 1995 to Present. Dietitian and Lactation Consultant, University of California Davis Medical Center, Sacramento, California January 1999 to February 2000.

Professional Organizations: American Dietetic Association; California Dietetic Association, Golden Empire District; California WIC Association; Breastfeeding Coalition of Greater Sacramento; Breastfeeding Coalition of San Joaquin County; American Diabetes Association