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Diet, Health Practices, and Variables Associated with Breastfeeding in Caucasian and Asian Participants in the Special Supplemental Food Program for Women, Infants, and Children: A Comparative Study

Rebecca E. Blaine
Utah State University

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DIET, HEALTH PRACTICES, AND VARIABLES ASSOCIATED WITH
BREASTFEEDING IN CAUCASIAN AND ASIAN PARTICIPANTS
IN THE SPECIAL SUPPLEMENTAL FOOD PROGRAM FOR
WOMEN, INFANTS, AND CHILDREN:
A COMPARATIVE STUDY

by

Rebecca E. Blaine

A thesis submitted in partial fulfillment
of the requirements for the degree
of
MASTER OF SCIENCE
in
Nutrition and Food Sciences

Approved:

UTAH STATE UNIVERSITY
Logan, Utah
1998
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ABSTRACT

Diet, Health Practices, and Variables Associated with Breastfeeding in Caucasian and Asian Participants in the Special Supplemental Food Program for Women, Infants, and Children: A Comparative Study

by

Rebecca Blaine, Master of Science
Utah State University, 1998

Major Professor: Dr. Georgia C. Lauritzen
Department: Nutrition and Food Sciences

The United States Department of Health and Human Services wrote Healthy People 2000 National Health Promotion and Disease Prevention Objectives. One major goal is to reduce the mortality rate for infants by reducing low birthweight. The disparities have been great when goals and objectives are applied to poor and minority populations.

Objectives have been set to reduce risk factors associated with low infant birthweight. These include addressing inappropriate health practices, and appropriate nutrition for mother and infant.

Forty-eight Asian and 50 Caucasian participants were compared for maternal diet, health practices, breastfeeding initiation and duration, and infant growth parameters. Data
were analyzed using the Statistical Package for the Social Sciences (SPSS).

Results showed 39 (81.3%) of the Asians and 43 (86.0%) of the Caucasians were breastfeeding at least once a day. There was no significant difference in the reasons for cessation of breastfeeding between ethnicities.

Diets were compared for kilocalories, protein, iron, calcium, vitamins A and C, and folate. Asian mothers had greater iron (13.13 mg) and vitamin A (2606.18 μg) intakes, along with a more nutrient dense diet overall. Caucasian mothers reported a greater calcium intake (1087.08 mg).

ANOVA (one-way analysis of variance) revealed no significant differences in nutrient intakes. However, Multiple Range Test Analysis identified calcium intake of Asian breastfeeding women (767.40 mg) as significantly lower than that of Caucasian nonbreastfeeding women (1094.89 mg). Vitamin A intake was higher in nonbreastfeeding Asian women (2788.46 μg) than in nonbreastfeeding (1740.44 μg) and breastfeeding (845.75 μg) Caucasian women.

Bivariate analysis revealed positive correlation between the Asian group and tobacco use during pregnancy. Mean height for age and mean weight for age were significantly greater in breastfed babies. Weight for height was not greater, indicating they are not proportionally different from their nonbreastfed peers.
DEDICATION

To my parents Willis and Elaine, lifelong teachers;
To Arash, endless in patience.

"There is a reason behind everything in nature."

-Aristotle
ACKNOWLEDGMENTS

My major professor, Dr. Georgia Lauritzen, has been instrumental in the completion of my work at Utah State University (1993-1997). I would also like to thank Dr. Ronald Canfield, Noreen Schvaneveldt, and Roxanne Pfister for their valuable input. I appreciate their open doors and readiness to help.

Support from the Bear River Health Department was tremendous. I would like to thank Dr. John Bailey, Kathleen Cardon, and the entire WIC program staff for their assistance.

Rebecca E. Blaine
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INTRODUCTION

Background

In recent years, the health and nutritional benefits of breastfeeding have become better acknowledged (1-3). However, several studies regarding the variables associated with breastfeeding have indicated a decline in its incidence and duration over the past several years (4-6).

The Special Supplemental Food Program for Women, Infants, and Children (WIC) has been recognized as an effective outlet in the promotion of proper nutrition and health in low-income women and children of the United States (7). Although it provides formula to those mothers who choose not to breastfeed, the WIC program does encourage breastfeeding. Recently, the objectives of WIC education have been not only to encourage breastfeeding, but also to provide the needed support to breastfeeding mothers. Breastfeeding education and support begins during the first few months of pregnancy and is continued through the first year of an infant's life.

Breastfeeding initiation and duration have both been shown to positively affect the health status of infants. Attitudes towards breastfeeding in low-income and minority populations, specifically Asians, have not been conducive to breastfeeding overall. Health and nutritional along with sociocultural trends associated with breastfeeding in the
Asian population have not been adequately identified. It is important to identify differences between cultures and address each group's specific educational needs in order that effective education programs can be constructed. This will help to provide appropriate and adequate health and nutrition information. More effective education programs would aid in the increase of the incidence of breastfeeding and improve infant nutrition overall in the general Asian and Caucasian populations.

The purpose of this study was to evaluate health and nutritional practices for their effect on the incidence and duration of breastfeeding. Two ethnic groups within the WIC program were evaluated. Comparison of these groups will aid in assessing the needs in maternal health and nutrition education of the ethnic groups. This assessment will be used to improve the already existing maternal health and nutrition and lactation education programs at a WIC clinic. Understanding the trends associated (and not associated) with breastfeeding is mandatory in identifying successful education strategies which will improve the incidence and duration of breastfeeding in the Asian population, thereby improving the health of Asian infants overall.

Hypothesis

It was hypothesized that a survey of already existing WIC clinic files would reflect a difference in maternal
diet, health practices, and breastfeeding initiation and duration among Asian and Caucasian WIC participants. These findings would aid in constructing appropriate breastfeeding promotion and nutrition education goals and objectives for both the Asian and Caucasian groups.

Objective

The objective of this project was to evaluate the incidence and duration of breastfeeding, maternal diet, and health practices among Asian and Caucasian mothers in the WIC setting.
LITERATURE REVIEW

Predictors of Health

Ethnicity and Demographics

New knowledge has brought with it both a keen sense of potential and a keen appreciation of how far most Americans, especially minorities and those with low incomes, are from that potential. (8:1)

--United States Public Health Service

By the year 2000, the racial and ethnic distribution of the United States will have a different pattern. Whites will represent a smaller proportion of the total, declining to 72% of the total population. The racial group of Asian and Pacific Islanders will increase from 3.5% to 4.3% of the total population. Additionally, by the year 2000, the American population is projected to increase by up to six million people solely through immigration (9).

The predominant minority populations of the United States are routinely categorized as Black, Hispanic, Asian and Pacific Islander Americans, and American Indians and Alaskan Natives. These ethnic groups simplify the assessment of health status and plans to improve the health of the particular group. Within each ethnic group, broad differences exist. Therefore, the research information concerning minority populations must be applied with the realization that it may not apply to all members of the ethnic group. An obstacle in studying the Asian and Pacific Islander population as a whole is its relatively small size
when compared to the other minority groups in the United States.

The diversity among the Asian and Pacific Islander Americans group is great. They are the nation's third largest minority group, but the label is a significant oversimplification. Over 30 different languages are spoken with many different cultures existing in this group (10).

An adequate picture of the health of those new to the United States in this ethnic group is blurred by the vast differences among subgroups. However, local studies have been successful in identifying higher than normal risks among subgroups of the Asian and Pacific Islander Americans in specific demographic areas (11).

For health-related studies, those born in the United States and established here for generations are comparable to the population as a whole. However, those more recent to the United States, specifically the new immigrants and refugees, are extremely poor with a low education level. In addition to financial struggles, language, and cultural differences, recent U.S. arrivals are exposed to western medicine and an unfamiliar health care system.

Health Status of Mothers and Infants in the United States

Progress made in the overall health of America is reflected in the record low rate of 10.1 infant deaths per 1,000 live births in 1987. This is a 65% drop compared to
1950 (12). However, it is still higher than mortality rates in many of the other developed countries. In addition, results reflect overall mortality rates for infants; there is a continual disparity between the infant mortality rate of minorities and that of the majority population.

For every 10 babies that die, there are 990 that live. Some of these babies did not have the best beginning. The quality, not just the quantity, of lives is an issue. Preventative health care during the mothers' prenatal period and thereafter during infancy offers opportunity for improving infant health.

There are prenatal risk factors associated with low birthweight and very low birthweight infants. Low birthweight is infant weight at birth less than 2500 grams, while very low birthweight is defined as less than 1500 grams.

An estimated 21% of women smoke during pregnancy (13). Smoking during the prenatal period has been associated with 20% to 30% of all low birthweight infants (8). Smoking is also associated with congenital defects and smaller head size of the infant at birth (14,15). This trend of smoking is decreasing in some socioeconomic and racial groups, but not in all. Women who are younger in age and from the lower socioeconomic groups have the greatest risk of smoking during the prenatal period. It is estimated that if all women abstained from smoking during their pregnancies, fetal and infant mortality would be reduced by 10% (16).
Alcohol consumed heavily by an expectant mother is linked to an increased risk for fetal alcohol syndrome. This syndrome includes retardation of fetal and infant growth, facial malformations, mental retardation, and dysfunction of the central nervous system. The effects are linked primarily to heavy consumption during the first trimester of pregnancy, but there is no estimated safe amount of alcohol consumption during pregnancy.

Maternal age is a risk factor for infant health and mortality. Teenage women under the age of 17 are at higher risk of having a low birthweight baby. For every 1,000 births, 50 babies have mothers between the ages of 15 and 19 years old. Infants born to mothers over 40 years of age have a much higher risk of congenital anomalies (17).

Those mothers with less than 12 years of education have a 70% greater chance of having a low birthweight infant or of experiencing an infant death. This socioeconomic indicator, along with lack of health insurance and prenatal care, are all linked to higher infant mortality rates. A prenatal woman with no prenatal care is at three times the risk of having a low birthweight baby (18). It is estimated that for every instance of low birthweight averted by prenatal care, the United States health care system saves $14,000 to $30,000 in health care costs (16).

Expecting women and newborn infants are at high risk when it comes to the effects of poor nutrition, another
socioeconomic indicator. A woman who gains less than 21 pounds during pregnancy is more than twice as likely to deliver a low birthweight infant than a woman who gains more (19). Appropriate nutrition is essential for the growth and development of infants, particularly for brain function. For most mothers, breastfeeding is an ideal way of nurturing their infants (10).

Goals and Objectives

The health care challenge of today is to use scientific knowledge, professional skill and commitment, community support, and political will to enable people to achieve their potential. This includes preventing premature death, preserving a physical environment that is conducive to human life, improving family and community support, and helping each individual to develop and use innate ability to see a need and to act on it.

Healthy People 2000 was written in response to this health care challenge. It is divided into three general goals: 1) Increase the span of healthy life for Americans, 2) reduce health disparities among Americans, and 3) achieve access to preventive services for all Americans.

From the three general goals come objectives associated with maternal and infant health (Appendix A). Objectives are set for some of the minority populations, but not for the Asian and Pacific Islanders as there were not available baseline data to use as a guide to set the goals.
Therefore, only the objectives for the overall population as a whole is stated as they apply to the Asian and Pacific Islanders groups as well as all other U.S. populations.

Healthy People 2000 Review, 1995-96, indicated that of the 16 maternal and infant health objectives, 6% were met. There was movement towards 37% of the objectives, movement away from 24% of the objectives, and no change in 6% of the objectives. There were no tracking data available for 18% of the objectives (17).

Breastfeeding

History of Breastfeeding

The goals and objectives stated in Healthy People 2000 regarding maternal and infant health encompass breastfeeding as well as other health practices. Vast recent and historic studies and reviews support breastfeeding as the optimal way to feed an infant.

Lactation is a biological process that has taken place for over 200 million years with the first mammals. Man has been in existence for more than one million years. Over this period of time, the keeping of cattle has only been practiced for .1% of the one million years of man's existence. The use of cow's milk formula has been widely used for the past 60 years in industrialized nations (20).

In 1934, morbidity and mortality of infants who were breast and artificially fed were compared (21). The common
thought of that day among physicians was that artificial formulas could safely replace breast milk without detriment to the infant. This was based only on observation; there were no scientific data to back this up. The study population was 20,061 infants that were followed by the Infant Welfare Society (IWS) for at least the first 9 months of their lives between 1924 and 1929 in Chicago. The ethnic distribution was representative of the overall population of Chicago. The IWS followed infants from a poverty environment with home visits by nurses and referrals for medical care as needed.

Of the 20,061 infants in the study, 48.5% were 100% breastfed with accessory feedings added; 43% were partially breastfed with accessory feedings added; and 8.5% were artificially fed. Accessory feeding consisted of: orange juice starting with half of a teaspoon at 4 weeks, cod liver oil beginning at 6 weeks, cereal at 5 months, vegetables at 6 months, and second cereal at 8 months. Artificially fed infants received boiled cow's milk with added water and cane sugar. The exact proportion of the ingredients was prescribed by a physician according to the infant's body weight.

In the study of morbidity, it was found that among the artificially fed infants 63.6% suffered infections, particularly respiratory. Only 37.4% of the 100% breastfed infants and 53.8% of the partially breastfed infants
experienced this. Gastrointestinal infections were experienced by 5.2% of breastfed, 12.8% of partially breastfed, and 16.0% of artificially fed infants. There were 218 deaths during the 5-year period of the study; 6.7% were 100% breastfed infants, 27.2% were partially breastfed, and 66.1% were artificially fed (21). The authors concluded in a follow-up paper that after 6 months of age there was a definite rise in morbidity among the artificially fed infants that was not shared by the breastfed or partially breastfed infants. Most deaths of the 100% breastfed infants occurred within the first 2 months of life (22).

Despite early findings, researchers continued efforts to increase the quality of artificial formulas rather than to rely on breast milk of the mother. Since the time of Grulee's study (22), breastfeeding has declined, reaching a low of 22% at the time of hospital discharge in 1972. In 1973, a significant increase in breastfeeding occurred and continued to increase until 1982 when the incidence of breastfeeding was 61.9% at the time of hospital discharge (4). Since then there was a slight but steady decrease in breastfeeding each year until 1995 when there was an increase to 59.7% breastfeeding at hospital discharge (23).

There are conflicting data regarding the duration of breastfeeding for those who chose to breastfeed. However, data were in agreement that breastfeeding rates suddenly dropped off between 1 to 2 months of infant age (4,5,6).
One recent study indicated that only about 20% of all infants are still being breastfed at 5 to 6 months of age (23). In short, breastfeeding rates are far from the goal of 75% of mothers breastfeeding at hospital discharge and 50% of mothers breastfeeding to 5 or 6 months infant age.

**Benefits of Breastfeeding**

Total comprehension of the benefits of breastfeeding cannot be achieved without an understanding of the common alternative to breastfeeding: artificial formulas. Many of the formulas originate from cow's milk or soybean.

**Proteins**

In a comparison of human milk and cow's milk, 7% of total calories come from proteins in breast milk, and 20% of calories come from proteins in cow's milk. There are two types of proteins in milk: casein and whey. When exposed to an acidic enough environment, casein forms curd. Whey is what is left of the proteins when casein is precipitated.

Breast milk proteins generally consists of 40% casein and 60% whey versus 80% casein and 20% whey in cow's milk. The relatively high amount of casein in cow's milk forms a curd of an insoluble calcium caseinate-calcium phosphate complex and results in delayed gastric emptying and gastrointestinal distress in infants.

To remedy the problem, all U.S. commercial infant formulas are heat-treated to reduce curd size and tension.
The result is less curdling than with untreated cow's milk, but it does not completely alleviate the result (24). Some formula companies have attempted to replicate the casein-to-whey ratio in human milk. However, the casein-to-whey ratio is not held constant in breast milk. The casein-to-whey ratio of early breast milk is 10:90; of mature milk the ratio is 40:60; and of milk after 8 months of lactation it is 50:50 (25).

Another common alternative to breast milk and cow's milk-based formulas are soy formulas. Unfortunately, often times infants diagnosed with milk protein allergy have a concomitant allergy to soy protein. Expensive specialized formulas are the next option (25).

Breast milk whey proteins include lactoferrin, lysozyme, immunoglobulins, enzymes, growth factors, and hormones. Their functions and benefits to the infant are listed in Table 1. Formula companies have been unable to replicate these properties of breast milk (26).

**Lipids**

After water, lipids are the most prevalent substance in breastmilk. Fatty acid composition and the position of the fatty acids on the glycerol molecule of breastmilk varies from cow's milk. Human milk also has a high oleic acid content which seems to have a positive effect on calcium absorption (27). The palmitate residue is positioned perfectly on the glycerol molecule at the 2-position, which
<table>
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<tr>
<th>Protein</th>
<th>Function</th>
<th>Benefit</th>
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<tr>
<td>Lactoferrin</td>
<td>Sequesters iron from pathogens</td>
<td>Presents iron to intestinal mucosa</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prevents pathogens from thriving in gastrointestinal tract due to lack of free iron</td>
</tr>
<tr>
<td>Lysozyme</td>
<td>Lyse bacteria</td>
<td>Direct-acting host (infant) defense</td>
</tr>
<tr>
<td>Immunoglobulins</td>
<td>Provides antibody to pathogen to which mother is exposed</td>
<td>Primary host (infant) defense to environmental pathogens</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Local protection to the gastrointestinal tract</td>
</tr>
<tr>
<td>Enzymes</td>
<td>Pass through stomach remaining intact</td>
<td>Assist in digestion, mineral transport, and pathogen destruction</td>
</tr>
<tr>
<td>Growth factors</td>
<td>Specifically mucosal growth factor</td>
<td>Promotes gut closure and maturing of the intestinal wall preventing excessive uptake of antigens</td>
</tr>
<tr>
<td>Hormones</td>
<td>Aid in maturation of stomach and intestines</td>
<td>Decreased risk of diseases associated with immature gastrointestinal tract</td>
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improves digestibility. Some evidence of lipolytic activity in human milk has also been thought to improve the absorption of the fat in the breast milk (28).

The fatty acid composition and structure of the fatty acids on the glycerol molecule of cow's milk make it less absorbable than breast milk lipids. Cow's milk has palmitate residue evenly distributed over all three positions on the glycerol molecule, which is poorly absorbed (28).

Early cow's milk formulas had butterfat as the primary fat source. This was replaced with vegetable oils in new formulas and improved the fat absorption to the level absorbed in breast milk. However, when animal fat is replaced with vegetable fat, virtually all cholesterol is removed. Soy formula contains no cholesterol. Human breast milk contains cholesterol, which has been linked to formation of nerve tissue and synthesis of bile salts (29). An ongoing longitudinal study in the Boston area has shown positive correlation with lower serum cholesterol level and adults who as infants were exclusively breastfed for at least 2 months. It is thought that the lack of cholesterol in the early diet in infancy resulted in underdevelopment in the enzymatic pathways responsible for the breakdown and absorption of dietary cholesterol (30).

Human breast milk contains lipases which remain active in the stomach and aid the infant in the breakdown of fat.
Neither cow's milk formulas nor soy formulas contain any such lipases (31).

**Carbohydrates**

Carbohydrates contribute 42% of the calories in breast milk and approximately 30% of the calories in cow's milk. Formulas of cow's milk origin must be supplemented with additional carbohydrate—routinely lactose.

Lactose is a common carbohydrate and is the ideal carbohydrate for most infants because of its benefits. Lactose is absorbed less efficiently than other sugars and this results in the fermentation of lactose by bacteria in the small intestines. A lower pH results. This acidic environment favors the growth of acidophilic bacteria over pathogenic bacteria, and also favors the absorption of calcium and phosphorus. Soy formulas are supplemented with calcium in an attempt to counteract the problems caused by the lack of lactose as an ingredient (24).

**Vitamins and Minerals**

Human milk is considerably lower in calcium, phosphorus, sodium, potassium, and chloride than cow's milk. The higher mineral content in addition to the higher protein content in the cow's milk causes a larger renal solute load than with breast milk. In addition, the infant absorbs a higher percentage of the minerals found in the breast milk than those in the cow's milk formulas.
The iron content of human milk is difficult to assess as it changes over time of lactation. It ranges from .5 mg/liter after 2 weeks of lactation to .3 mg/liter after 5 months of lactation. Cow's milk contains .5 mg/liter of iron. However, infants absorb 50% of the iron in human milk, 10% in unfortified cow's milk formula, and 4% from iron-fortified formulas (32).

Many formulas have been recalled because of deficiency or toxicity of vitamins or minerals. From 1982 to 1990, 19 separate formula recalls were conducted in United States. Of these 19 recalls, 7 were considered class I recalls. Class I is defined as a product whose use will cause serious health consequences or death (33).

Other Benefits to Mother and Infant

Studies have shown psychological benefits associated with breastfeeding. Mothers who breastfed showed more attachment behavior than women who did not breastfeed (34). Cognitive development among school-aged children was found to be significantly greater among those who were breastfed (35). Breastfeeding also has shown positive correlation with the decreased risk of Sudden Infant Death Syndrome (36).

Health benefits to the breastfeeding mother include lactation amenorrhea. Exclusive breastfeeding reduces the risk of pregnancy for at least 6 months (37). Loss of
maternal weight or fat loss has been associated with breastfeeding (38). Breastfeeding is also thought to provide protection against breast cancer before menopause (39).

Recent studies have been done on the economic benefits of breastfeeding. A study of the WIC program found that breastfeeding was cost effective when comparing the lower cost of foods for the lactating women with the higher cost of formula. Approximately $478 in WIC and Medicaid costs are saved if the infant is breastfed for the first 6 months of life (40).

**Variables Associated with Breastfeeding and Health Practices**

Although the health and nutritional benefits of breastfeeding are becoming better acknowledged, several studies regarding the variables associated with breastfeeding have indicated a decline in its incidence and duration over the past several years. Conflicting results have also been attained regarding the relationship between breastfeeding and the following variables: parity, sex of the infant, and plans to return to work (4).

Among demographic variables, the following values have been identified with breastfeeding initiation and success: Caucasian, middle to upper class, well educated, married, early 20s to 30s, nonsmoker, breastfed as an infant, healthy infant and mother, and prior success in breastfeeding (4).
Variables that can be impacted by the nutrition professional are the intent to breastfeed for a long time, early first feeding, commitment to breastfeed, good support, decreasing or eliminating the use of tobacco and alcohol, avoidance of supplemental feedings, and a positive attitude toward breastfeeding (4).

A study of the factors that influence breastfeeding was performed via a self-administered questionnaire of New York City WIC program participants to determine significant differences in selected demographic, sociocultural, and educational characteristics of women who chose to breastfeed versus bottlefeed their infants. These differences in characteristics were also compared for women breastfeeding their infants for various lengths of time (duration). The incidence of breastfeeding initially was 56.3% of the total sample. More than 55% of these mothers stopped breastfeeding within 2 months of initiation (41). Factors significantly associated with breast feeding and longer duration of breastfeeding were support of the baby's father, previous breastfeeding experience, higher educational attainment, and prenatal care beginning in the first trimester. Also, a majority of the breastfeeding mothers had spent most of their lives outside the U.S. One additional factor affecting only the duration of breast-feeding was the delayed introduction and infrequent use of
breast milk substitutes (41).

The predictors of breastfeeding were compared among WIC and non-WIC mothers. The research identified five variables that predicted breast-feeding duration for the first 8 weeks postpartum: introduction of formula, income, maternal perceived success, frequency of breastfeeding, and time of initiation of breastfeeding after delivery. Income was found to be a stronger predictor of breastfeeding than was previously anticipated (5).

Rassin et al. (42) studied the factors associated with the decision to breastfeed. Similar to other studies, it was found that marital status, maternal education, income, and number of pregnancies were found to be the most important variables associated with breastfeeding. However, the effect of ethnicity predominated over that of the other demographic variables when they were examined jointly within ethnic groups. The author stated that the importance of ethnicity in the decision to breastfeed has probably been underestimated.

Research has shown a greater decrease among breast-feeding rates for low-income and minority women. It is difficult to separate the effect of culture and income class because women from minority cultures are more likely to be economically and educationally disadvantaged than women from the dominant American culture (43).
Attitudes toward breastfeeding and infant feeding were evaluated among various minority immigrant populations, including Southeast Asians (Vietnamese, Cambodian, and Laotian). Formal interviews were conducted using a survey questionnaire that consisted of several groups of items: demographics regarding mothers and their children; breastfeeding practices; reasons for breastfeeding (if they did so); reasons for not breastfeeding (if they did not); and for those mothers who breastfed, items pertaining to when they started breastfeeding and who was in their support system for breastfeeding.

The findings of this study indicated that the primary reason immigrant mothers discontinued or decreased breastfeeding infants was economic. The southeast Asian mothers needed to return to school or to get a job and indicated that nursing a baby interfered with this. The recommendations that resulted called for a higher sensitivity of the health care professional to the social and cultural aspects of breastfeeding for more effective breastfeeding promotion and education (44).

Determinants of infant feeding choices among WIC clients who were also Southeast Asian immigrants were identified. Reasons for not breastfeeding included: convenience, returning to work or school, ability for others to feed infant, and concerns about insufficient milk.
Although many of the women chose returning to work or school as the primary reason for discontinuing breastfeeding, none of the mothers had actually returned after ceasing the breastfeeding, and few had a clear set plan to do so. The authors concluded that attitudes of Southeast Asian mothers differed notably from other ethnic minorities. To extrapolate results from other studies of other ethnicities to the Southeast Asian population is not effective (45).

A study of breastfeeding rates among international women at a university showed no significant difference in breastfeeding rates among Whites, Hispanics, or Asians. All subjects reported annual incomes of less than $15,000 and residence in the United States for approximately 4 years. Of the subjects, 45% had a bachelor's degree, and 21.6% had graduate degrees (46).

A health study compared the practices (specifically breastfeeding) of Vietnamese women before and after migration to Sydney, Australia. It was found that when these women migrated with their families to a western civilization, they adopted many of the health practices of the host country, including switching from breast to bottle-feeding (47).

Acculturation in the United States was strongly related to the intent to and the successful initiation of breastfeeding. Acculturation reflects the changes that take place
in the behaviors of a migrant population as they adapt to the larger society of their new culture. Initiation of breastfeeding was highest among those women who were least acculturated and lowest in those most acculturated (48).

The result of acculturation is that the chain of cultural breastfeeding knowledge has been broken. Where breastfeeding is the norm, girls grow up seeing their mothers breastfeed their younger siblings. Breastfeeding is a normal part of everyday life. In this type of culture, a girl inherits the knowledge of previous generations about such things as how to position the baby at the breast, how to tell if she has a let-down of the milk, and how to tell if the baby is properly latched on and getting milk.

Libbus (49) performed a known group comparison to evaluate infant feeding choice as influenced by social and cultural factors. A breastfeeding behavior questionnaire which presented breastfeeding narratives was administered to members of a La Leche League group and to a group of WIC participants. The purpose was to examine attitudes and beliefs that are thought to affect feeding choice and breastfeeding behavior among the diverse social and cultural groups. The findings of the study support the idea that different social groups display divergent attitudes and perceptions regarding breastfeeding. Therefore, there is a critical need to design and deliver educational
interventions to promote initiation and duration of breastfeeding, tailoring it to the specific cultural requirements and constraints of the group or the individual being served.

**Appropriate Diet and Health Practices During Lactation**

Nutritional concerns during lactation are warranted. Caloric requirements exceed those during pregnancy. The Food and Nutrition Board, National Academy of Sciences-National Research Council, Committee on Recommended Dietary Allowances considers the optimal diet for the lactating woman to be one that supplies more nutrients than that recommended for the nonpregnant female (50). Comparison of recommended nutrient requirements of nonpregnant, pregnant, and lactating women is shown in Appendix B (51).

Although lactation increases a woman's requirement for nearly all nutrients, most of these increased needs can be met through a well balanced diet with the additional calories required to support breastfeeding. Nutrients of particular concern are calcium, protein, iron, folic acid, and vitamins A and C. These nutrients are particular focus points in the WIC program.

Without adequate sources of calcium, protein, and folic acid in the diet, maternal stores are used to maintain the appropriate levels in the breast milk. Iron deficiency
during lactation can be a concern due to blood loss during delivery, a higher blood volume during pregnancy, and a low dietary intake (52).

Maternal diet has not been strongly associated with the quality of the breast milk, but rather the quantity. Milk composition from 60 underprivileged, periurban, lactating Bangladeshi mothers was analyzed. Results revealed that there was a relationship between maternal nutritional status and lactational capacity. Milk production decreased a significant amount during the famine seasons, but nutritional content of major minerals in the breast milk of each individual mother did not vary significantly (53).

The United States separates itself from all other industrialized nations and from much of the developing world in important matters of maternal and infant health policy. No other advanced nation provides so little help and so few incentives for mothers and infants to participate in essential social supports and health services (54:xii).

Health practices of concern during lactation include both smoking and the use of alcohol. Smoking has been shown to reduce the quantity of milk produced by the mother. Secondary exposure to tobacco smoke is of concern in regards to the baby’s health, not to mention the obvious harmful effect on the health of mother who smokes (55). Alcohol passes very quickly into breast milk. Use of alcohol by the breastfeeding mother was found to have an association with
retarded psychomotor development in the infant at one year (56).

Programs and Organizations

The WIC Program

In response to growing evidence linking nutritional inadequacy and poor health practices with mental and physical defects, Congress enacted the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) in 1972. It is an amendment to the Child Nutrition Act of 1966. At present, WIC provides nutritious foods for low-income (defined as 185% of poverty level), pregnant, postpartum, and lactating women, infants, and children to the age of 5 who are determined to be at special nutritional risk.

The purpose behind the congressional enactment of WIC was both preventive and therapeutic. WIC was uniquely designed to form a special relationship between nutrition and health care services. Federal regulations make it mandatory that local WIC agencies make available health care services to WIC program enrollees. This mandate makes WIC the first food assistance program to tie program eligibility to nutritional need. It is also the first program required to provide direct health care services or referrals for the provision of health care services.

The WIC program provides two services to participants
at no cost. The first is food distribution. The Department of Agriculture (USDA) has authorized food packages that must be prescribed under professional guidance to reflect the nutritional needs of each individual participant. Food packages are made available primarily through vouchers that are redeemed when food is purchased.

The second service of the WIC program is nutrition education. Federal regulation requires that nutrition education emphasize the relationship between proper nutrition and good health. It must assist participants in achieving positive changes in eating and health habits (57).

The growth of the WIC program during the past 15 years has tripled. The estimated proportion of income-eligible women who participate in WIC has increased from 3% in 1972 to 50% in 1991 (58).

WIC has been proven effective in reducing the prevalence of low birthweight (59). The program has also had notable effect in reducing the risk of anemia in toddlers and preschoolers (60).

With the abundance of known health benefits of breastfeeding to mother and infant, WIC has increased its breastfeeding incentives over the past recent years. Women who breastfeed receive larger WIC food packages for a longer period of time postpartum than the nonbreastfeeding women. In addition, much of the education during the prenatal
period and just after delivery consists of breastfeeding promotion and support. However, WIC is mandated to provide formula to those mothers who chose not to breastfeed.

The National Association of WIC Directors (NAWD) recognizes the advantages of breastfeeding for mothers and infants. WIC health professionals have a responsibility to provide appropriate services designed to help the client achieve the best health possible. These services include encouraging breastfeeding as the optimum method for infant feeding. The WIC program strongly encourages all clinics to promote breastfeeding aggressively (Appendix C).

World Health Organization

A joint WHO and UNICEF statement outlines "Ten Steps to Successful Breastfeeding" (Appendix D). It is designed to be a brief general statement, but practical for use in a variety of settings. Appropriate education in a WIC clinic setting can help progression through these steps.

Professional Organizations

The American Academy of Pediatrics, the American Dietetic Association, and the American Public Health Association agree in their support of exclusive breastfeeding for the first 4 to 6 months of life (1-3,61). The American Dietetic Association recommends for optimal nutrition to the infant, that he is breastfed for at least
The Challenge to Providers and Educators

It is generally accepted that poverty alone plays a large role in health and illness. Health care professionals need to be aware of both the socioeconomic issues and the cultural characteristics; the cause of different health issues cannot be easily determined.

Breastfeeding is continuing to receive worldwide attention from an increasing number of groups and associations, health professionals, consumers, media, and politicians. Important for the initiation and maintenance of breastfeeding are better, more humane health care practices that respect and support the fragile mother-baby interaction. Also important are health workers who know how to manage breastfeeding problems, because they have profound understanding of its scientific basis. (63:157)

The NAWD has identified lack of a support network during the critical postpartum period, and cultural issues as two critical barriers to breastfeeding (64). Cultural sensitivity means that one must develop an awareness and respect for differences among people. When working with multicultural communities, professionals must become familiar with the characteristics and situations specific to those communities.

Most women, even those who bottlefeed their infants are aware that breastfeeding is healthier, but this information
alone does not seem to influence them to make the decision to breastfeed. To change attitudes, an additional level of information and support must exist besides general breastfeeding facts and knowledge. For effective breastfeeding promotion, health care professionals must understand and adjust to the nutritional, health, and sociocultural factors that affect infant feeding choices.

Just as cultures should not be generalized, neither should individual members of that culture. The intent is to individualize the assessment as well as the education, not to make generalizations about groups of people, but to gather information regarding cultural characteristics that can shed light and give meaning to clients' behaviors (43).
MATERIALS AND METHODS

Restatement of the Objective

The objective of this study was to evaluate and compare maternal health and nutritional practices, incidence and duration of breastfeeding, and the effect on infant growth in two culturally different groups.

Research Design

The study design, a research survey, was intended to obtain available information within an already existing data base called the Utah WIC Information Network (UWIN). The UWIN system links all WIC clinics in Utah and is permanent storage for WIC records. In addition to the UWIN System, an individual physical file exists for each participant at her clinic. This file contains all diet records and infant growth charts filled out at certification appointments. A certification consists of obtaining current anthropometrical, biochemical, dietary, and health information and making an assessment. The participant is then prioritized according to the assessed nutrition and health risks. This assessment is based on criteria established by the state WIC program within federal guidelines. The question was which factors were related to infant growth, especially within ethnic populations.
This single clinic-based survey was carried out at the WIC clinic in the Bear River Health Department in Logan, Utah. All survey participants were WIC clients at this clinic or had received WIC at this clinic within 1 year prior to the beginning of the data collection.

Institutional Authorization

The study was approved by the Human Subjects Committee, Institutional Review Board (IRB) at Utah State University. Upon receiving IRB approval, the study proposal was approved by the supervisor at the WIC clinic and the director of the Bear River Health Department. Both granted permission for the survey project to be done at Bear River Health Department.

Description of Participants

All participants in the survey were WIC clients. They qualified to receive WIC because their gross income was 185% or less of poverty level, and they fit nutrition risk criteria at the time of enrollment and at all certification appointments thereafter. All the participants fit into the ethnic categories of Caucasian or Asian. The UWIN system codes define Caucasian as White with no Hispanic origin. The codes for Asian include: Pacific Islanders, Chinese, Cosmopolitan, Filipino, Hawaiian, Tongan, Japanese, Korean,
Samoan, South East Asian Refugee, and "other".

Description of the Survey and Procedures

The order of information on the survey (Appendix E) was determined by the order of the information on the data screens in the UWIN system. This helped with the organization and ease of the data collection.

Participants were chosen by randomly pulling charts of applicable ethnicity (Asian or Caucasian) from the clinic files. Selection ceased when there were 50 participants from each ethnic group.

Data collection occurred at the clinic site after office hours. Completed surveys were not linked with the participants' names, only their identification numbers from the UWIN system. All survey and file data were collected solely by the researcher. Each survey was secured by lock after data collection.

In addition to the gathering of specified information from the UWIN system, 24-hour food intakes were obtained from the files of each participant. These 24-hour intakes were not part of the UWIN system, but rather in the physical file kept at the clinic. The 24-hour food intake was initially filled out by the participant, then clarified (i.e., portion sizes, more specifics on type of food) if needed and assessed by a staff dietitian. The dietitian's
assessment (recorded in the UWIN system) was not used, but the actual 24-hour diet history with the dietitian's clarifications was later analyzed for nutrient breakdown.

Also gathered from the physical file was growth information on the infants in the study. Growth information was obtained from National Center for Health Statistics (NCHS) percentiles growth charts (Appendix F). This information was included in the survey (Appendix E) and categorized into ranges of percentiles. Although weight and height of each individual infant was taken at a various age, the percentile charts aided in standardization.

There were three clients in the Asian group that were missing key pieces of information. They were removed from the study as they were no longer receiving WIC and could not be contacted.

Data Processing and Analysis

All 24-hour dietary recalls were analyzed for nutrient content using the Computrition nutrient analysis program (Computrition Inc., Corporate Office, P.O. Box 4689, Chatsworth, California 91313-4689.). A codesheet was written for the survey. The codesheet converted all information to numerical form. All of the raw data including the nutrient analysis were coded and entered into a computer data file. The coded data were analyzed at the
Results and Discussion

Participant Demographics

Survey information from the records of 50 Caucasian and 48 Asian WIC participants was analyzed. Native countries of the Caucasian and Asian populations are shown in Table 2. All of the Caucasian participants chose English as their primary language. Choices of primary language by the Asian participants are shown in Table 3.

<table>
<thead>
<tr>
<th>Country</th>
<th>Asian (n=48)</th>
<th>Caucasian (n=50)</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>0 (0%)</td>
<td>48 (96%)</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>0 (0%)</td>
<td>1 (2%)</td>
</tr>
<tr>
<td>Australia</td>
<td>0 (0%)</td>
<td>1 (2%)</td>
</tr>
<tr>
<td>China</td>
<td>18 (37.5%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Korea</td>
<td>14 (29.2%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Taiwan</td>
<td>8 (16.6%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Vietnam</td>
<td>4 (8.3%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Japan</td>
<td>3 (6.3%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Singapore</td>
<td>1 (2.1%)</td>
<td>0 (0%)</td>
</tr>
</tbody>
</table>
Table 3
Choice of primary language by Asian participants

<table>
<thead>
<tr>
<th>Language</th>
<th>Number of Asians</th>
<th>Percent of Asian Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>25</td>
<td>52.1%</td>
</tr>
<tr>
<td>Southeast Asian</td>
<td>8</td>
<td>16.7%</td>
</tr>
<tr>
<td>Other</td>
<td>15</td>
<td>31.2%</td>
</tr>
</tbody>
</table>

Note: N=48.

The mean±SD (standard deviation) age of the Caucasian participants was 25.0±5.5 years. Ages ranged from 16 to 41 years. The mean±SD age of the Asian participants was 29.6±4.1 years and a range of 23 to 42 years.

The mean±SD time of living in the United States of the Caucasian participants was 23.98±6.91 years with a range from 2 to 41 years. The mean±SD time of living in the United States of the Asian participants was 2.98±2.03 years with a range from 0 to 8 years. Time less than 6 months was rounded down to the nearest year, while time of 6 months or greater was rounded up to the nearest year.

Eight members (16%) of the Caucasian group were single mothers with the remainder of 42 (84%) being married. One (2.1%) of the Asian participants was single while the other 47 (97.9%) were married.

Mean±SD household size of the Caucasian participants was 4.14±1.578 persons. The Asian participants had a mean±SD of 3.56±.741 persons.

The years of education of the Caucasian population
ranged from 9 to 22 years with a mean±SD of 13.7±2.2 years. Education of the Asian population ranged from 0 to 20 years with a mean±SD of 15.5±3.2 years. Years of education was the measure used in the UWIN system. No indication of diploma or degree attainment existed within this system.

Self-declared annual income ranged from zero to $30,014. The mean annual income of all participants was $11,194.35. A group t-test indicated that there was no significant difference in annual income between the two ethnic groups. An additional group t-test indicated that there was no significant difference in annual income between those who breastfed and those who formulafed, regardless of ethnicity.

The mean±SD month of pregnancy that prenatal care began for the Caucasian participants was 1.9±.9 months and ranged from 0 to 4 months. The month that prenatal care began for the Asian population ranged from 0 to 5 months with a mean±SD of 2.0±1.1 months.

Breastfeeding Choices

Breastfeeding choices of the mothers were compared by ethnicity. Those who breastfed were subdivided into breastfeeding frequency categories. A summary is shown in Table 4. Those mothers who breastfed without formula supplementation were defined as exclusively breastfeeding. Less than one ounce of formula in a 24-hour period and the remaining feedings as breastfeeding is defined as almost
exclusively breastfeeding. Substantially breastfeeding is defined as over one and no more than 8 ounces of formula supplementation in a 24-hour period with the remainder from breastmilk. Partially breastfeeding is defined as greater than 8 ounces of formula supplementation and breastfeeding more than twice in a 24-hour period. Token breastfeeding is defined as breastfeeding one to two times in a 24-hour period and supplementing formula for the rest of the feedings.

A summary of information from crosstabs (chi-square) results is shown in Table 4. However, the assumption that

<table>
<thead>
<tr>
<th>Categories</th>
<th>Asian (n=48*)</th>
<th>Caucasian (n=50*)</th>
<th>Total (n=98*)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exclusively Breastfeeding</td>
<td>9</td>
<td>16</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>18.8%</td>
<td>32.0%</td>
<td>25.5%</td>
</tr>
<tr>
<td>Almost Exclusively Breastfeeding</td>
<td>4</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>8.3%</td>
<td>12.0%</td>
<td>10.2%</td>
</tr>
<tr>
<td>Substantially Breastfeeding</td>
<td>12</td>
<td>15</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>25.0%</td>
<td>30.0%</td>
<td>27.6%</td>
</tr>
<tr>
<td>Partially Breastfeeding</td>
<td>9</td>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>18.8%</td>
<td>8.0%</td>
<td>13.3%</td>
</tr>
<tr>
<td>Token Breastfeeding</td>
<td>5</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>10.4%</td>
<td>4.0%</td>
<td>7.1%</td>
</tr>
<tr>
<td>Total Number of Breastfeeders:</td>
<td>39</td>
<td>43</td>
<td>82</td>
</tr>
<tr>
<td>Group Percentage of Breastfeeders:</td>
<td>81.3%</td>
<td>86.0%</td>
<td>83.7%</td>
</tr>
</tbody>
</table>

*n indicates total number of participants in each group regardless of breastfeeding status
no more than 20% of the cells have a value less than 5 was not met. Therefore, it is impossible to accept or reject the null hypothesis that the individual breastfeeding frequency categories (breastfeeding choices) are independent of ethnicity. With a larger sample size, the assumptions could have been met.

To meet the assumptions for Pearson's chi-square test, breastfeeding frequency categories were combined to decrease the number of cells that had a value less than 5. The categories of exclusively breastfeeding, almost exclusively breastfeeding, and substantially breastfeeding were combined into one group; partially breastfeeding and token breastfeeding were combined into another group. Crosstabs was used to examine the breastfeeding frequency data in its new groups. Pearson's chi-square test revealed that breastfeeding frequency was significantly different (p=.021) among ethnicities. Results with the breastfeeding frequency groups combined are shown in Table 5.

Both ethnic groups met the Healthy People 2000 objective of at least 75% of the mothers breastfeeding at hospital discharge. It is important to note that not all of these mothers breastfed exclusively. Data regarding mothers breastfeeding their infants at 5 to 6 months were limited as many of the babies had not yet reached this age at the time of data collection. Some subjects dropped out of the program before their infants were 5 to 6 months old. A follow-up
Table 5
Number and percentages of breastfeeding frequency categories by ethnicity (after categories were combined)

<table>
<thead>
<tr>
<th>Categories</th>
<th>Asian (n=48*)</th>
<th>Caucasian (n=50*)</th>
<th>Total (n=98*)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combined Group 1:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exclusively Breastfeeding</td>
<td>25 (52.1%)</td>
<td>37 (74.0%)</td>
<td>62 (63.3%)</td>
</tr>
<tr>
<td>Almost Exclusively Breastfeeding</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Substantially Breastfeeding</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Combined Group 2:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partially Breastfeeding</td>
<td>14 (29.2%)</td>
<td>6 (12.0%)</td>
<td>20 (20.4%)</td>
</tr>
<tr>
<td>Token Breastfeeding</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Number of Breastfeeders:</td>
<td>39</td>
<td>43</td>
<td>82</td>
</tr>
<tr>
<td>Group Percentage of Breastfeeders:</td>
<td>81.3%</td>
<td>86.0%</td>
<td>83.7%</td>
</tr>
</tbody>
</table>

*n indicates total number of participants in each group regardless of breastfeeding status

study could yield additional results regarding breastfeeding rates with the older infants who were still participating in the WIC program.

Reasons for Cessation of Breastfeeding by Ethnicity

Reasons for cessation of breastfeeding or not initially breastfeeding were compared between the Asian and Caucasian participants. Initially, Pearson's chi-square did not yield valid results because the assumption that less than 20% of the cells had a value less than 5 was not met. Reasons for cessation of breastfeeding were combined into less specific categories to increase cell sizes to above 5. Once assumptions for the test were met, Pearson's chi-square did not reveal a significant difference (p<.05) when comparing...
reasons for cessation of breastfeeding by ethnicity. The original information (with cell sizes less than 5) appears in Table 6. Some of the reasons listed in the table were not chosen by any member of either group, but it is important to acknowledge them because the participants chose from the complete list of reasons shown in Table 6.

Although there was no significant difference in the responses by ethnicity, there are some subtle differences. This information could provide insight for the WIC counselor to give the appropriate education and encourage continued breastfeeding. It will also be useful in breastfeeding promotion with the prenatal mothers in the Caucasian and Asian population.

**Maternal Diet and Health Practices**

Nutrient data from 24-hour dietary histories were analyzed using independent sample t-tests (Table 7). The pooled variance estimates in Table 7 showed a significant difference between the mean intakes of iron, calcium, and vitamin A between the two ethnic groups. The Asian mothers reported a significantly greater mean intake of iron and vitamin A, and the Caucasian mothers reported a significantly higher mean intake of calcium. Overall results indicate that the Asian participants have a more nutrient dense diet (lower in calories and higher in nutrients) than the Caucasian participants.
<table>
<thead>
<tr>
<th>Reason</th>
<th>Asian</th>
<th>Caucasian</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Enough Milk / Poor Quality</td>
<td>7 (14.5%)</td>
<td>9 (18.0%)</td>
</tr>
<tr>
<td>Work / School</td>
<td>13 (27.1%)</td>
<td>9 (18.0%)</td>
</tr>
<tr>
<td>Doctor's Order / Advice</td>
<td>0 (00.0%)</td>
<td>1 (02.0%)</td>
</tr>
<tr>
<td>Infant Ill</td>
<td>1 (02.1%)</td>
<td>2 (04.0%)</td>
</tr>
<tr>
<td>Infant Refused</td>
<td>3 (06.3%)</td>
<td>2 (04.0%)</td>
</tr>
<tr>
<td>Infant Teething</td>
<td>0 (00.0%)</td>
<td>0 (00.0%)</td>
</tr>
<tr>
<td>Inadequate Infant Weight Gain</td>
<td>0 (00.0%)</td>
<td>0 (00.0%)</td>
</tr>
<tr>
<td>Mother Ill</td>
<td>0 (00.0%)</td>
<td>1 (02.0%)</td>
</tr>
<tr>
<td>Sore Breast / Nipple</td>
<td>0 (00.0%)</td>
<td>1 (02.0%)</td>
</tr>
<tr>
<td>Special Mother Problems</td>
<td>3 (06.3%)</td>
<td>2 (04.0%)</td>
</tr>
<tr>
<td>Oral Contraceptives / Norplant</td>
<td>0 (00.0%)</td>
<td>0 (00.0%)</td>
</tr>
<tr>
<td>Contraindicated Medication</td>
<td>0 (00.0%)</td>
<td>0 (00.0%)</td>
</tr>
<tr>
<td>Breast Problems</td>
<td>0 (00.0%)</td>
<td>0 (00.0%)</td>
</tr>
<tr>
<td>Mother Pregnant Again</td>
<td>0 (00.0%)</td>
<td>0 (00.0%)</td>
</tr>
<tr>
<td>Lack of Support</td>
<td>0 (00.0%)</td>
<td>0 (00.0%)</td>
</tr>
<tr>
<td>Reluctant to Nurse in Public</td>
<td>0 (00.0%)</td>
<td>0 (00.0%)</td>
</tr>
<tr>
<td>Baby Too Demanding</td>
<td>0 (00.0%)</td>
<td>0 (00.0%)</td>
</tr>
<tr>
<td>Baby Old Enough to Quit</td>
<td>6 (12.5%)</td>
<td>9 (18.0%)</td>
</tr>
<tr>
<td>Mother Can't Lose Weight</td>
<td>0 (00.0%)</td>
<td>0 (00.0%)</td>
</tr>
<tr>
<td>Jaundice</td>
<td>0 (00.0%)</td>
<td>0 (00.0%)</td>
</tr>
<tr>
<td>Mother Led Weaning</td>
<td>1 (02.1%)</td>
<td>1 (02.0%)</td>
</tr>
<tr>
<td>Never Initiated Breastfeeding</td>
<td>9 (18.7%)</td>
<td>7 (14.0%)</td>
</tr>
<tr>
<td>Hasn't Quit Yet</td>
<td>5 (10.4%)</td>
<td>6 (12.0%)</td>
</tr>
</tbody>
</table>
Table 7
Independent t-tests of dietary intake of Asian and Caucasian WIC participants

<table>
<thead>
<tr>
<th>Variable</th>
<th>M</th>
<th>SD</th>
<th>df</th>
<th>t</th>
<th>2-tail Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kilocalories:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian'</td>
<td>1484.0417</td>
<td>495.390</td>
<td>96</td>
<td>-1.24</td>
<td>.217</td>
</tr>
<tr>
<td>Caucasian''</td>
<td>1619.2000</td>
<td>576.925</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protein (g):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian'</td>
<td>73.9167</td>
<td>31.909</td>
<td>96</td>
<td>1.33</td>
<td>.187</td>
</tr>
<tr>
<td>Caucasian''</td>
<td>66.1800</td>
<td>25.536</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iron (mg):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian'</td>
<td>13.1292</td>
<td>4.985</td>
<td>96</td>
<td>2.14</td>
<td>.035</td>
</tr>
<tr>
<td>Caucasian''</td>
<td>11.0420</td>
<td>4.667</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calcium (mg):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian'</td>
<td>855.3958</td>
<td>471.165</td>
<td>96</td>
<td>-2.19</td>
<td>.031</td>
</tr>
<tr>
<td>Caucasian''</td>
<td>1087.0800</td>
<td>569.796</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vitamin A (ug):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian'</td>
<td>2606.1750</td>
<td>2129.8962</td>
<td>96</td>
<td>2.26</td>
<td>.026</td>
</tr>
<tr>
<td>Caucasian''</td>
<td>1633.0740</td>
<td>2136.3414</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vitamin C (mg):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian'</td>
<td>149.1875</td>
<td>105.896</td>
<td>96</td>
<td>1.47</td>
<td>.145</td>
</tr>
<tr>
<td>Caucasian''</td>
<td>115.9200</td>
<td>16.616</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Folate (ug):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian'</td>
<td>263.0000</td>
<td>147.361</td>
<td>96</td>
<td>1.15</td>
<td>.253</td>
</tr>
<tr>
<td>Caucasian''</td>
<td>226.4400</td>
<td>166.414</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Asian N=48.
**Caucasian N=50.

The Recommended Dietary Allowances (RDAs) for non-pregnant, non-lactating women were compared with the mean
intakes of both ethnic groups (Table 7). Neither group met the RDAs (Appendix B) for kilocalories, calcium, or iron. When compared with the RDAs for lactating women, both groups failed to meet the recommended allowance for folate in addition to kilocalories, calcium, and iron.

Independent t-tests were used to compare data from 24-hour dietary histories of nonbreastfeeding and breastfeeding WIC participants, regardless of ethnicity. As shown in Table 8, findings revealed no significant difference in the mean dietary intakes between the nonbreastfeeding and breastfeeding mothers.

The mean intakes of the nonbreastfeeding, non-pregnant women (Table 8) were compared with the RDAs (Appendix B). Intakes of kilocalories, calcium, and iron did not meet the RDAs. For breastfeeding women, RDAs were not met for kilocalories, calcium, iron, and folate.

One-way analysis of variance (ANOVA) was used to compare the nutrient intakes reported on 24-hour dietary intakes between nonbreastfeeding Asians, breastfeeding Asians, nonbreastfeeding Caucasians, and breastfeeding Caucasians. ANOVA was conducted with the dependent continuous variable being a specific nutrient in each case. The ANOVAs for each nutrient are shown in Tables 9-15. None of the p values were less than .05, indicating that the variance is not significantly different for any of the nutrient intakes of the four groups.
Table 8
Independent t-tests of dietary intake of nonbreastfeeding and breastfeeding WIC participants

<table>
<thead>
<tr>
<th>Variable</th>
<th>M</th>
<th>SD</th>
<th>df</th>
<th>t</th>
<th>2-tail probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kilocalories:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-breastfeeding</td>
<td>1539.6842</td>
<td>532.733</td>
<td>96</td>
<td>-.07</td>
<td>.943</td>
</tr>
<tr>
<td>Breastfeeding</td>
<td>1549.0952</td>
<td>538.285</td>
<td>96</td>
<td>-.61</td>
<td>.546</td>
</tr>
<tr>
<td>Protein (g):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-breastfeeding</td>
<td>68.5921</td>
<td>27.307</td>
<td>96</td>
<td>-.41</td>
<td>.684</td>
</tr>
<tr>
<td>Breastfeeding</td>
<td>71.4286</td>
<td>31.366</td>
<td>96</td>
<td>-.61</td>
<td>.546</td>
</tr>
<tr>
<td>Iron (mg):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-breastfeeding</td>
<td>11.8118</td>
<td>4.720</td>
<td>96</td>
<td>1.22</td>
<td>.226</td>
</tr>
<tr>
<td>Breastfeeding</td>
<td>12.5381</td>
<td>5.367</td>
<td>96</td>
<td>1.17</td>
<td>.243</td>
</tr>
<tr>
<td>Calcium (mg):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-breastfeeding</td>
<td>1002.2368</td>
<td>549.525</td>
<td>96</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breastfeeding</td>
<td>842.3810</td>
<td>460.927</td>
<td>96</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vitamin A (µg):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-breastfeeding</td>
<td>2181.7105</td>
<td>2191.874</td>
<td>96</td>
<td>1.17</td>
<td>.243</td>
</tr>
<tr>
<td>Breastfeeding</td>
<td>1572.8143</td>
<td>1726.436</td>
<td>96</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vitamin C (mg):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-breastfeeding</td>
<td>134.7237</td>
<td>114.441</td>
<td>96</td>
<td>.90</td>
<td>.371</td>
</tr>
<tr>
<td>Breastfeeding</td>
<td>110.3810</td>
<td>91.143</td>
<td>96</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Folate (µg):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-breastfeeding</td>
<td>238.9474</td>
<td>149.166</td>
<td>96</td>
<td>-.28</td>
<td>.777</td>
</tr>
<tr>
<td>Breastfeeding</td>
<td>249.9048</td>
<td>180.618</td>
<td>96</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 9
ANOVA summary for comparison of kilocalorie intake between nonbreastfeeding and breastfeeding Asians and Caucasians

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>ss</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>674928.3506</td>
<td>224976.1169</td>
<td>.7923</td>
</tr>
<tr>
<td>Within Groups</td>
<td>94</td>
<td>26406899.13</td>
<td>283945.1520</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>97</td>
<td>27081827.48</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: N=98, p>.05.

### Table 10
ANOVA summary for comparison of protein intake between nonbreastfeeding and breastfeeding Asians and Caucasians

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>ss</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>1124.2545</td>
<td>374.7515</td>
<td>.4671</td>
</tr>
<tr>
<td>Within Groups</td>
<td>94</td>
<td>74611.6218</td>
<td>802.2755</td>
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</tr>
<tr>
<td>Total</td>
<td>97</td>
<td>75735.8763</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: N=98, p>.05.

### Table 11
ANOVA summary for comparison of iron intake between nonbreastfeeding and breastfeeding Asians and Caucasians

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>ss</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>126.3635</td>
<td>42.1212</td>
<td>1.8397</td>
</tr>
<tr>
<td>Within Groups</td>
<td>94</td>
<td>2129.3437</td>
<td>22.8962</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>97</td>
<td>2255.7072</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: N=98, p>.05.
### Table 12
ANOVA summary for comparison of calcium intake between nonbreastfeeding and breastfeeding Asians and Caucasians

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>ss</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>1612637.555</td>
<td>5375.8518</td>
<td>1.9448</td>
</tr>
<tr>
<td>Within Groups</td>
<td>94</td>
<td>25705253.08</td>
<td>276400.5708</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>97</td>
<td>27317890.64</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: N=98, p>.05.

### Table 13
ANOVA summary for comparison of vitamin A intake between nonbreastfeeding and breastfeeding Asians and Caucasians

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>ss</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>343213576.9</td>
<td>114404525.6</td>
<td>2.4233</td>
</tr>
<tr>
<td>Within Groups</td>
<td>94</td>
<td>4390511129</td>
<td>47209797.09</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>97</td>
<td>4733724706</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: N=98, p>.05.

### Table 14
ANOVA summary for comparison of vitamin C intake between nonbreastfeeding and breastfeeding Asians and Caucasians

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>ss</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>52980.3619</td>
<td>17660.1206</td>
<td>1.4861</td>
</tr>
<tr>
<td>Within Groups</td>
<td>94</td>
<td>1105157.679</td>
<td>11883.4159</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>97</td>
<td>1158138.041</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: N=98, p>.05.
### Table 15
ANOVA summary for comparison of folate intake between nonbreastfeeding and breastfeeding Asians and Caucasians

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>ss</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>23537.0407</td>
<td>7845.6802</td>
<td>.3173</td>
</tr>
<tr>
<td>Within Groups</td>
<td>94</td>
<td>2299680.052</td>
<td>24727.7425</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>97</td>
<td>2323217.093</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: N=98, p>.05.

Multiple range test analysis showed a significant difference between the mean reported calcium intake of two of the four groups. The mean reported calcium intake of the Asian breastfeeders (767.4000 mg) was significantly lower than mean reported calcium intake of Caucasian non-breastfeeders (1094.8864 mg). There was no significant difference between the mean reported calcium intakes of the breastfeeding Caucasians (1029.8333 mg) and any of the other three groups. The same was true for mean reported calcium intakes of the nonbreastfeeding Asians (874.8438 mg).

Please note no "multiple comparisons" protection is provided for this LSD (least-significant difference).

Multiple range test analysis showed a relationship between three of the groups in mean reported vitamin A intakes. The reported mean vitamin A intakes of the non-breastfeeding Caucasians (1740.43635 µg) and breastfeeding Caucasians (845.7500 µg) was significantly lower than that
of the nonbreastfeeding Asians (2788.4625 \( \mu \)g). There was no significant relationship between the mean reported vitamin A intakes of the breastfeeding Asians (1863.6340 \( \mu \)g) and the other three groups analyzed. Please note no "multiple comparisons" protection is provided for this LSD.

It is important to note that dietary results are based on information obtained from 24-hour diet histories completed by the participant. The intake recorded may not be complete and may not be typical of the participant's usual diet. The participant may have estimated portion sizes inappropriately for what she actually consumed.

**Ethnicity, Education, and Maternal Diet**

Bivariate correlation was used to analyze results of the survey. Choice of correlations to analyze was based on the objectives of this study and prior findings in similar past studies discussed in the review of literature.

Significant correlation coefficients related to ethnicity, weeks of breastfeeding, and maternal diet appear in Table 16. All of these correlations were significant at the \( p<.01 \) level.

As ethnicity varies from Caucasian to Asian, education (in years), iron in the daily diet, and vitamin A in the daily diet all significantly increased. Protein, iron, and vitamin A in the daily diet all correlated positively at a significant level with the number of weeks the mother
breastfed. As indicated in Table 16, no intercorrelation was found between number of weeks the mother breastfed and ethnicity.

Health practices as related to ethnicity and education, were also analyzed for correlation. Significant correlations appear in Table 17. Correlations were significant at the p < .01 level.

A significant correlation was found between ethnicity and education. The correlation coefficient between the variables indicates that as ethnicity varies from Caucasian to Asian, education is positively correlated. Possibly, many of the Asians in this study were students or in the United States with their student husbands rather than in this

<table>
<thead>
<tr>
<th>Table 16</th>
<th>Correlations of ethnicity, breastfeeding, and diet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
<td>1</td>
</tr>
<tr>
<td>1. Ethnicity</td>
<td>1.0000</td>
</tr>
<tr>
<td>2. Weeks Breastfed</td>
<td>*</td>
</tr>
<tr>
<td>3. Protein</td>
<td>*</td>
</tr>
<tr>
<td>4. Iron</td>
<td>-.2134</td>
</tr>
<tr>
<td>5. Vitamin A</td>
<td>-.2245</td>
</tr>
</tbody>
</table>

Note: N=98, p<.01.
*indicates no significant correlation.
country on refugee status. Refugees have a typically lower education level (9).

A negative correlation was found between education and tobacco use. This finding is opposite of what was expected based on the review of literature (13,16). Possible explanation of this finding could be that smoking is more accepted in Asian cultures as compared to the predominately Latter-day Saint (LDS) community from which the Caucasian WIC participants originated. The LDS faith does not permit its members to partake of tobacco or alcohol in any form. The population of Cache County is 59.4% LDS (65). Further study would be required to determine the significance of the effect on smoking during pregnancy and during lactation.

Table 17
Correlations of ethnicity, education, and health practices

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ethnicity</td>
<td>1.0000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Education</td>
<td>-.3196</td>
<td>1.0000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Tobacco Use (currently)</td>
<td>.1920</td>
<td>-.2782</td>
<td>1.0000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Tobacco Use (pregnancy)</td>
<td>.2553</td>
<td>-.3313</td>
<td>.6781</td>
<td>1.0000</td>
<td></td>
</tr>
<tr>
<td>5. Alcohol Use (pregnancy)</td>
<td>*</td>
<td>*</td>
<td>.2248</td>
<td>.2435</td>
<td>1.0000</td>
</tr>
</tbody>
</table>

Note: N=98, p<.01.
*indicates no significant correlation.
In addition, as ethnicity varies from Caucasian to Asian, current tobacco use and tobacco use during pregnancy positively correlate. As mentioned earlier, the Asian population has a higher education level. Smoking during pregnancy in relation to a higher education level is contraindicated by past literature. Additional education strategies targeted toward the Asian group regarding smoking during pregnancy could be beneficial.

There was no significant correlation between education or ethnicity with alcohol use during pregnancy. However, there was positive correlation between alcohol use during pregnancy, tobacco use during pregnancy, and current tobacco use. This may indicate that if a woman chooses to smoke during pregnancy, she would be more likely to drink alcohol, also.

**Maternal Weight Gain and Loss**

A positive correlation between weight gain during pregnancy and the amount of weight lost after pregnancy was found with a correlation coefficient of .4274 (p<.001). The more weight that a woman gains during pregnancy, the more weight she is likely to lose. No other variables, including incidence or duration of breastfeeding, were significantly correlated with weight gain during pregnancy or weight lost after pregnancy. This does not support current literature that indicates breastfeeding contributes to postpartum weight loss (38).
This researcher, using multiple regression and forcing variables in, noted that weight loss after pregnancy was regressed on the linear combination of ethnicity, education, breastfeeding frequency categories, duration of breastfeeding, alcohol use during pregnancy, tobacco use during pregnancy, and tobacco use postpartum. If the variable were not forced in, the equation containing these 11 variables would account for 17.84% of the variance in weight loss after pregnancy, $F(11, 87) = 1.70, p < .087$, adjusted $R^2 = .073$. Because the variables were forced in, it is essential to use the adjusted $R^2$. The equation containing these 11 variables accounted for 7.3% of the variance in postpartum weight loss.

**Infant Growth Statistics**

Data relating to baby growth parameters, breastfeeding data, and maternal health practices were analyzed using bivariate correlation, multiple regression, and group t-tests. Correlations relating ethnicity of the infant and breastfeeding frequency categories appear in Table 18. There seemed to be no strong correlation between ethnicity and breastfeeding frequencies.

The variables of ethnicity, education, tobacco use during pregnancy, current tobacco use, duration of breastfeeding, and the breastfeeding frequency categories were regressed (with the variables forced in) with percentiles of infant weight for age. Using the adjusted
Table 18
Correlations between ethnicity and breastfeeding frequency categories

<table>
<thead>
<tr>
<th>Variable</th>
<th>Ethnicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exclusively breastfeeding</td>
<td>.1519</td>
</tr>
<tr>
<td>Partially breastfeeding</td>
<td>-.1246</td>
</tr>
<tr>
<td>Token breastfeeding</td>
<td>-.1584</td>
</tr>
</tbody>
</table>

Note: N=98, p>.05.

\[ R^2, \text{ all 10 of the variables accounted for 7.6\% of the variance in infant weight for age, } F(10, 87)=1.71, p<.043, \text{ adjusted } R^2=.076. \text{ The association of tobacco use during pregnancy and low birthweight was not as strong as was anticipated as noted in earlier literature (13,16).} \]

With the use of multiple regression, percentile of length for age of the individual infants was regressed on the linear combination of ethnicity and the breastfeeding frequency categories (with the variables forced in). Using the adjusted \( R^2 \), the equation containing these six variables accounted for 11.7\% of the variance in infant length for age, \( F(6, 91)=3.14, p<.0075, \text{ adjusted } R^2=.117. \)

The variables of ethnicity, years of education, current tobacco use, alcohol use during pregnancy, duration of breastfeeding, tobacco use during pregnancy, and the breastfeeding frequency categories were regressed stepwise
with percentiles of infant head circumference for age. Variables entered in the equation were all the breastfeeding frequency categories and tobacco use during pregnancy. The equation containing these six variables accounted for 18.67% of the variance in infant head circumference for age, $F(6, 91)=3.47, p<.0038$, adjusted $R^2=.133$. The effect of maternal tobacco use on infant head circumference is supported by this finding and results of past studies (14,15).

Group independent sample t-tests were used to evaluate the effect of any amount of breastfeeding on infant growth parameters, regardless of ethnicity. It is important to note at this point that the growth parameters are unitless because number categories were used to arrange the data into ranges on the survey. The data were originally in pounds and inches, converted to percentiles on the NCHS growth charts, and then entered on the survey into the appropriate range of percentile values. Dependent variables used in separate independent sample t-tests were weight for age (wt/age), length for age (ht/age), head circumference for age (ofc/age), and weight for length (wt/ht) percentiles of infant growth. Breastfeeding and nonbreastfeeding were the independent variables used for the t-tests with each dependent variable. Results from the t-tests for each dependent variable are listed in Table 19.

The independent sample t-test of weight for age
initially yields no conclusion until the pooled variance estimate is considered. With a p-value less than .05 (p=.016), it is acceptable to reject that the mean weight for age is the same between the breastfed infants and the nonbreastfed infants. Therefore, the mean weight percentiles for age of the breastfed infants (5.9) is greater than the mean weight percentiles for age of the nonbreastfed infants (4.8).

The independent sample t-test analysis of length for age revealed a significant difference between breastfed and nonbreastfed infants. The pooled variance estimate in Table

| Table 19 |
| Results of t-tests of growth parameters of breastfed and nonbreastfed infants |

<table>
<thead>
<tr>
<th>Variable</th>
<th>M</th>
<th>SD</th>
<th>df</th>
<th>t</th>
<th>2-tail probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wt/age:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonbreastfed</td>
<td>4.8158</td>
<td>1.787</td>
<td>95</td>
<td>-2.45</td>
<td>.016</td>
</tr>
<tr>
<td>Breastfed</td>
<td>5.9048</td>
<td>1.868</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ht/age:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonbreastfed</td>
<td>4.6184</td>
<td>1.728</td>
<td>95</td>
<td>-2.08</td>
<td>.040</td>
</tr>
<tr>
<td>Breastfed</td>
<td>5.5238</td>
<td>1.887</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ofc/age:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonbreastfed</td>
<td>5.4474</td>
<td>2.042</td>
<td>95</td>
<td>.32</td>
<td>.747</td>
</tr>
<tr>
<td>Breastfed</td>
<td>5.2857</td>
<td>1.953</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wt/ht:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonbreastfed</td>
<td>5.5132</td>
<td>1.747</td>
<td>95</td>
<td>.59</td>
<td>.556</td>
</tr>
<tr>
<td>Breastfed</td>
<td>5.7619</td>
<td>1.546</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
19 indicates that it is acceptable to reject that the mean length for age percentiles is the same between the breastfed and nonbreastfed infants at the .05 level (\( p = .04 \)). The mean length for age percentiles of the breastfed infants (5.5) is greater than the mean length for age percentiles of the nonbreastfed infants (4.6).

The independent sample t-test analyses of both head circumference for age percentiles and weight for length percentiles are also shown in Table 19. P values were greater than .05. This indicates no significant differences between the breastfed infants and nonbreastfed infants in head circumference for age or weight for length percentiles.

As indicated, breastfed babies tend to weigh more and are longer for age than nonbreastfed babies. However, there is no significant difference between the weight for length of breastfed versus nonbreastfed infants. Weight for length indicates proportions (underweight or overweight). Therefore, breastfed babies may weigh more and are greater in length, but they are not proportionally different when compared to their formula-fed peers. Further extensive study would be needed to measure the effects of infant breastfeeding on weight and length later in life. Perhaps the NCHS growth charts should be separated for breastfed and nonbreastfed infants as their growth patterns appear to be different.
CONCLUSION AND APPLICATIONS

Initially, analysis of the survey results is not indicative that there is significant difference in initial breastfeeding rates among the Asian and Caucasian WIC participants. However, with less specific breastfeeding categories, there was a significantly higher number of Caucasian women (74.0%) who at least substantially breastfed, when compared to the Asian women (52.1%). A higher percentage of the Asian group (29.2%) were in the partial or token breastfeeding groups when compared to the Caucasian group (12.0%). Further data collection (a follow-up study) is indicated for accurate results regarding duration of breastfeeding.

The analysis of mothers' dietary intakes revealed differences in nutrient intakes between ethnicities and non-breastfeeding and breastfeeding categories. Asian mothers reported significantly higher intakes of iron (13.13 mg) and vitamin A (2606.18 μg) than reported by the Caucasian mothers (11.04 mg and 1633.07 μg, respectively). Caucasian mothers reported a significantly higher calcium intake (1087.08 mg) than reported by the Asian mothers (855.40 mg). Overall, the Asian women had a more nutrient-dense diet. There was no significant difference found in the reported intakes of breastfeeding women versus non-breastfeeding women, regardless of ethnicity. However, when taking breastfeeding status and ethnicity into account, multiple
range tests revealed that Asian breastfeeding women reported a significantly lower calcium intake (767.40 mg) than reported by the non-breastfeeding Caucasian women (1094.89 mg). In addition, reported Vitamin A intakes were found to be significantly lower in the nonbreastfeeding Caucasian (1740.44 μg) and the breastfeeding Caucasian (845.75 μg) groups than reported by the nonbreastfeeding Asian group (2788.46 μg). This should be taken into account when nutrition counseling mothers from different ethnicities or breastfeeding status.

Health practices in the Asian population should be a counseling focus. Dangers of cigarette smoking and alcohol use during pregnancy and lactation should be stressed. Participation in already existing cessation programs should be aggressively encouraged by the health professional when indicated.

Infant growth between ethnicities was not significantly different, indicating the same NCHS standards could be appropriately used for both ethnicities. The findings in this study showed significant differences in the growth parameters of breastfed and nonbreastfed infants. Further study would be needed to assess the validity of using the same NCHS standards for assessing the growth of breastfed versus nonbreastfed infants.

Findings in this study should not be applied to other populations as both the Asian and Caucasian groups have
characteristics that may or may not be exhibited by other similar socioeconomic and ethnic groups.
REFERENCES


47. Rossiter JC. Breastfeeding, the better option: getting the message across. World Health Forum. 1993;14:316-318.


APPENDICES
APPENDIX A. HEALTHY PEOPLE 2000
Maternal and Infant Healthy People 2000 Goals and Objectives

Health Status Objectives:

1. Reduce the infant mortality rate to no more than 7 per 1,000 live births (Baseline: 10.1 per 1,000 live births in 1987).

2. Reduce the fetal death rate (20 or more weeks of gestation) to no more than 5 per 1,000 live births plus fetal deaths (Baseline: 7.6 per 1,000 live births plus fetal deaths in 1987).

3. Reduce the maternal mortality rate to no more than 3.3 per 100,000 live births (Baseline: 6.6 per 100,000 in 1987).

4. Reduce the incidence of fetal alcohol syndrome to no more than 0.12 per 1,000 live births (Baseline: .22 per 1,000 live births in 1987).

Risk Reduction Objectives:

5. Reduce low birthweight to an incidence of no more than 5 percent of live births and very low birthweight to no more than 1 percent of live births (Baseline: 6.9 and 1.2 percent, respectively, in 1987).

6. Increase to at least 85 percent the proportion of mothers who achieve the minimum recommended weight gain during their pregnancies (Baseline: 67 percent of married women in 1980).

7. Reduce severe complications of pregnancy to no more than 15 per 100 deliveries (Baseline: 22 hospitalizations (prior to delivery) per 100 deliveries in 1987).

8. Reduce the cesarean delivery rate to no more than 15 per 100 deliveries (Baseline: 24.4 per 100 deliveries in 1987).

9. Increase to at least 75 percent the proportion of mothers who breastfeed their babies in the early postpartum period and to at least 50 percent the proportion who continue breastfeeding until their babies are 5 to 6 months old (Baseline: 54 percent at discharge from birth site and 21 percent at 5 to 6 months in 1988).
10. Increase abstinence from tobacco use by pregnant women to at least 90 percent and increase abstinence from alcohol, cocaine, and marijuana by pregnant women by at least 20 percent (Baseline: 75 percent of pregnant women abstained from tobacco use in 1985, no baseline data available for cocaine and marijuana).

Services and Protection Objectives:

11. Increase to at least 90 percent the proportion of all pregnant women who receive prenatal care in the first trimester of pregnancy (Baseline: 76 percent of live births in 1987).

12. Increase to at least 60 percent the proportions of primary care providers who provide age appropriate preconception care and counseling (No baseline data available).

13. Increase to at least 90 percent the proportion of women enrolled in prenatal care who are offered screening and counseling on prenatal detection of fetal abnormalities (No baseline data available).

14. Increase to at least 90 percent the proportion of pregnant women and infants who receive risk-appropriate care (No baseline data available).

15. Increase to at least 95 percent the proportion of newborns screened by state-sponsored programs for genetic disorders and other disabling conditions and to 90 percent the proportion of newborns testing positive for disease who receive appropriate treatment (Baseline: For sickle cell anemia, with 20 states reporting, approximately 33 percent of live births screened (57 percent of black infants); for galactosemia, with 38 states reporting, approximately 70 percent of live births screened).

16. Increase to at least 90 percent the proportion of babies aged 18 months and younger who receive recommended primary care services at the appropriate intervals (No baseline data available).
APPENDIX B. RECOMMENDED DIETARY ALLOWANCES
FOOD AND NUTRITION BOARD, NATIONAL ACADEMY OF SCIENCES  
NATIONAL RESEARCH COUNCIL  
RECOMMENDED DIETARY ALLOWANCES (RDAs)

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Non-pregnant*</th>
<th>Pregnant</th>
<th>Lactating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kilocalories</td>
<td>2200</td>
<td>2500</td>
<td>2700</td>
</tr>
<tr>
<td>Protein (g)</td>
<td>46</td>
<td>60</td>
<td>65</td>
</tr>
<tr>
<td>Vitamin A (µg)</td>
<td>800</td>
<td>800</td>
<td>1300</td>
</tr>
<tr>
<td>Vitamin D (µg)</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Vitamin E (mg)</td>
<td>8</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>Vitamin K (µg)</td>
<td>60</td>
<td>65</td>
<td>65</td>
</tr>
<tr>
<td>Vitamin C (mg)</td>
<td>60</td>
<td>70</td>
<td>95</td>
</tr>
<tr>
<td>Thiamin (mg)</td>
<td>1.1</td>
<td>1.5</td>
<td>1.6</td>
</tr>
<tr>
<td>Riboflavin (mg)</td>
<td>1.3</td>
<td>1.6</td>
<td>1.8</td>
</tr>
<tr>
<td>Niacin (mg)</td>
<td>15</td>
<td>17</td>
<td>20</td>
</tr>
<tr>
<td>Vitamin B&lt;sup&gt;6&lt;/sup&gt; (mg)</td>
<td>1.6</td>
<td>2.2</td>
<td>2.1</td>
</tr>
<tr>
<td>Folate (µg)</td>
<td>180</td>
<td>400</td>
<td>280</td>
</tr>
<tr>
<td>Vitamin B&lt;sub&gt;12&lt;/sub&gt; (µg)</td>
<td>2.0</td>
<td>2.2</td>
<td>2.6</td>
</tr>
<tr>
<td>Calcium (mg)</td>
<td>1200</td>
<td>1200</td>
<td>1200</td>
</tr>
<tr>
<td>Phosphorus (mg)</td>
<td>1200</td>
<td>1200</td>
<td>1200</td>
</tr>
<tr>
<td>Magnesium (mg)</td>
<td>280</td>
<td>300</td>
<td>355</td>
</tr>
<tr>
<td>Iron (mg)</td>
<td>15</td>
<td>30</td>
<td>15</td>
</tr>
<tr>
<td>Zinc (mg)</td>
<td>12</td>
<td>15</td>
<td>19</td>
</tr>
<tr>
<td>Iodine (µg)</td>
<td>150</td>
<td>175</td>
<td>200</td>
</tr>
<tr>
<td>Selenium (µg)</td>
<td>55</td>
<td>65</td>
<td>75</td>
</tr>
</tbody>
</table>

*for females between 19-24 years.

Note: allowances for lactating women after six months slightly decrease for protein, vitamin A, vitamin E, vitamin C, riboflavin, folate, magnesium, and zinc.
APPENDIX C. WIC BREASTFEEDING PROMOTION FUNDS
Virtually all health and nutrition authorities agree that breastfeeding is the preferred method of infant feeding.

The breastfeeding rates of WIC mothers are about half that of other mothers in the United States---some recent studies have shown they are even substantially lower than their low-income, non-WIC peers.

Breastfeeding rates among WIC women can be raised. Over the past six years, the U.S. Department of Health and Human Services have funded efforts to determine effective strategies for overcoming the barriers to breastfeeding common among low-income women. These studies show that more women breastfeed their babies when the following activities are provided:

1. individual counseling
2. peer groups discussions
3. in-service training for professional staff
4. postpartum support through hospital and clinic
5. visits and telephone consultation
6. networking between WIC and non-WIC health care providers and administrators

An analysis of breastfeeding promotions programs found that when resources were available to provide thoughtful, well-coordinated programs, more women chose to breastfeed and to breastfeed longer. In most cases, these programs were able to double the rates of breastfeeding. Rates were increased substantially even among population groups with high baseline rates.

Ten dollars per pregnant and breastfeeding woman (or about $8 million annually for the nation) can provide WIC agencies with both the resources and an incentive to promote and support breastfeeding among WIC mothers. That's a small fraction of what is spent on the purchase of infant formula.

The Food and Nutrition Service estimates that in FY 1988, the WIC Programs spent over five hundred million dollars to purchase infant formula. Even after the implementation of rebates in most state agencies, this figure will be in the hundreds of millions. Additional resources are required to negotiate and maintain infant formula rebate contracts and to educate vendors and clients about rebate procedures.
The WIC food costs of feeding a formula-fed baby in the first few weeks after delivery exceeds the costs of the breastfed baby by the cost of the infant formula package (this will vary state by state). This is because the mothers' food packages are identical until the recertification appointment (at about 6 weeks postpartum). Few WIC mothers breastfeed beyond this time. Our initiative would encourage breastfeeding in these crucial first six weeks.

Much of the current expansion of the WIC Program is reliant upon the lower infant formula prices gained through rebates. Yet, we have no way of knowing if the rebate contracts will be renewed.

We need to look for cost containment systems that we can count on in the long run should the current rebates no longer be available. Breastfeeding has that potential.

Now is the time to take action. A number of factors have begun to coalesce: the research data from the USDHHS-sponsored projects are coming in; the USDA and USDHHS are co-sponsoring breastfeeding education/promotion training sessions across the nation; and national groups are considering the viability of a national media campaign to promote breastfeeding.

New developments in the infant formula industry, including direct marketing to the consumer, increase the barriers to breastfeeding among low-income women. This underscores the need for even stronger breastfeeding promotion. Low-income women, who are most influenced by such direct advertising campaigns, deserve the opportunity of "equal advertising" for the superior infant food: breast milk.

The National Association of WIC Directors, the National Committee on Improving Breastfeeding Promotion Strategies in the WIC Program, and others are actively involved in working to assure that the reporting requirements for this initiative utilize an existing system of accountability and minimize administrative burdens.
APPENDIX D. TEN STEPS TO SUCCESSFUL BREASTFEEDING
WHO/UNICEF'S
TEN STEPS TO SUCCESSFUL BREASTFEEDING

Every facility providing maternity services and care for newborn infants should:

1. have written breastfeeding policy that is routinely communicated to all health care staff;
2. train all health care staff in skills necessary to implement this policy;
3. inform all pregnant women about the benefits and management of breastfeeding;
4. help mothers initiate breastfeeding within a half-hour of birth;
5. show mothers how to breastfeed, and how to maintain lactation even if they should be separated from their infants;
6. give newborn infants no food or drink other than breast milk unless medically indicated;
7. practice rooming in—allow mothers and infants to remain together—24 hours a day;
8. encourage breastfeeding on demand;
9. give no artificial teats or pacifiers (also called dummies or soothers) to breastfeeding infants;
10. foster the establishment of breastfeeding support groups and refer mothers to them on discharge from the hospital or clinic.
Data Collection Sheet

Woman: Participant #__________

DOB __/__/__
Age ___y ___m
Residential Status ___
___y ___m residence in U.S.
Education ___ (years)
Ethnicity ___
Native Country ____________
Primary Language ___
Marital Status ___
Household Size ___
Employment Status ___
Annual Income ______
# Previous Pregnancies _____
Previous Live Births _____
Previous Breastfeeding Experience ___ (y, n, or N/A)
Previous B.F. Experience Satisfactory? ___ (y, n, or N/A)
Month of pregnancy prenatal care began ___
Height ___ " (to the nearest quarter inch)
Pre-pregnancy wt. ____lbs. ____oz. (to the nearest oz.)
Planned pregnancy? ____ (y or n)
Baby born @ ____ wks. gestation

Use of:
   (during pregnancy)
      tobacco ____ per day
      alcohol ____ per day

Wt. at labor ____ lbs. ____ oz. (to the nearest oz.)
Woman (continued):                   Participant # __________

Wt. gain during pregnancy ___ lbs. ___ oz. (nearest oz.)

Use of:
(postpartum)
tobacco ___ per day
alcohol ___ per day

Hematocrit (after delivery) ___% (date: __/__/__)

Wt. loss since delivery ___ lbs. ___ oz. in ___ wks.

Frequency of Breastfeeding ___

Reason for cessation of breastfeeding ___

Date Ceased __/__/__

Duration of Breastfeeding ___ wk.

Current tobacco and alcohol use:

smoke ___ cigarettes/day
Was there a change during pregnancy? ___
What was it? ______
Do others in the household smoke?______

alcohol ___ days/wk
____ drinks/day

Infant:                               Participant # __________

DOB __/__/__

Gender ____ (m or f)

Birthweight ___ lbs. ___ oz. (to the nearest oz.)

Birth length ___ " (to the nearest quarter inch)

Current age ___y ___m (as of the day of measurements to follow)
Infant (continued):

Weight ____ lbs. ____ oz. (to the nearest oz.)

Percentiles: 1 <5th, 2 =5th to <10th,
(weight 3 =10th to <25th, 4 = 25th to <50th, 
for 5 =50th, 6 >50th to <75th, 
age) 7 =75th to <90th, 8 =90th to <95th, 
9 =95th or >

Length ____ " (to the nearest quarter inch)

Percentiles: 1 <5th, 2 =5th to <10th,
(length 3 =10th to <25th, 4 = 25th to <50th, 
for 5 =50th, 6 >50th to <75th, 
age) 7 =75th to <90th, 8 =90th to <95th %iles, 
9 =95th or >

Percentiles: 1 <5th, 2 =5th to <10th,
(weight 3 =10th to <25th, 4 = 25th to <50th, 
for 5 =50th, 6 >50th to <75th, 
length) 7 =75th to <90th, 8 =90th to <95th, 
9 =95th or >

Head Circumference ____ " (to the nearest quarter inch)

Percentiles: 1 <5th, 2 =5th to <10th,
(ofc 3 =10th to <25th, 4 = 25th to <50th, 
for 5 =50th, 6 >50th to <75th, 
age) 7 =75th to <90th, 8 =90th to <95th, 
9 =95th or >

Formula introduced at ____ wks. of age

Collect one Xerox Copy of Mother's 24 hour diet history from personal file. Black out any identifying factors besides WIC Identification Number. Attach it to the back of this form.
APPENDIX F. NCHS GROWTH CHARTS
BOYS: BIRTH TO 36 MONTHS
PHYSICAL GROWTH
NCHS PERCENTILES

NAME ______________________________ RECORD # --------------

AGE (MONTHS)

NCHS Growth & Development Program

MOTHER'S STATURE
FATHER'S STATURE

DATE
BIRTH
GESTATIONAL AGE
WEEKS

LENGTH
WEIGHT
HEAD CIRC

COMMENT

lb  kg

in  cm
APPENDIX G. BIBLIOGRAPHY


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