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# The effect of breastfeeding on the BMI of Hispanic preschool children

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COLLEGE OF HEALTH SCIENCES

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Linda Kilby

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2010

ABSTRACT


The Effect of Breastfeeding on the BMI of

Hispanic Preschool Children



by

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Submitted in Partial Fulfillment of the

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ABSTRACT

The American Academy of Pediatrics and World Health Organization recommend exclusive breastfeeding for the first 4-6 months of life to reduce risk of obesity in pre-school children.   Previous research has indicated a high rate of obesity among Hispanic children in the northeastern United States.  There is also a gap in the literature regarding the effectiveness of exclusive breastfeeding in preventing obesity among preschool Hispanic children.  Therefore, the purpose of this study was to determine if there was an association between exclusive breastfeeding and obesity among pre-school Hispanic children enrolled in the Special Supplemental Nutrition Education Program for Women, Infants and Children (WIC) in a metropolitan area of mid-Atlantic region between the years 2004 and 2009.  This retrospective secondary analysis of data for 4454 Hispanic children compared the body mass index (BMI) at 36-59 months of age for those that were breastfed to those that were not breastfed using the Student's t-test.  Duration of exclusive breastfeeding was examined for any correlation with BMI for the cohort of breastfeeding women using Pearson's correlation analysis.  Results revealed that the BMI for 1181 breastfed children was not statistically different from the non-breastfed children (16.97 vs. 17.04).  However, there was a statistically significant inverse relationship between duration of breastfeeding and BMI among children of breastfeeding mothers ($r = -.75$, $p < .05$).  These results make an important contribution to the existing literature and can enhance social change initiatives by encouraging practitioners to educate Hispanic mothers on the positive effects of exclusive breastfeeding the first 4 months of life which could help minimize obesity prevalence among children.

The Effect of Breastfeeding on the BMI of

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DEDICATION

This study is dedicated to my family--my parents, Theodore and Doris Kilby for teaching me the importance of education at a very early age, and for instilling in me the ability to persevere because "with God all things are possible". To my siblings, Ted, Mike, Marcia and Pene for supporting this effort and helping me to stay focused by reminding me that the light at the end of the tunnel was NOT a locomotive! Finally to my children, David, Lloyd and Erinn who were surprised that I decided to take this journey at this point in my life but who never ceased to encourage me to finish even when I was too tired to think! Last but not least my friend, Will for his support through the process. Thanks to all of you for believing in me and in my ability to succeed.

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INTRODUCTION TO THE STUDY

Introduction

Obesity is a significant public health problem among children. According to the

National Center for Health Statistics ([NCHS], 2006), a review of data from the National

Health and Nutrition Examination Surveys (NHANES I), from 1971 through the most

recent NHANES survey 2003 – 2004, shows that the prevalence of overweight and

obesity has increased significantly for preschool children 2-5 years of age, from 5% to

13.9%. This increase is especially high in Mexican American children at 26.3% (Flegal,

Ogden, & Carroll, 2004; Ogden, Carroll, Curtin, McDowell, Tabak, & Flegal, 2006).

Furthermore, as the Institute of Medicine (IOM) predicted, children born in the US

between 1998 and 2003 have a risk of being diagnosed with type 2 diabetes if they are

members of ethnic minority groups (2005). More must be learned about the etiology of

obesity in young children and a method  must be found to address the problem at the

grassroots level since childhood obesity is the best indicator of obesity in later life

(Whitaker, Wright, Pepe, Seidel, & Dietz, 1997). This study focused on the gap in the

literature on the association between the duration of breastfeeding and resulting

overweight of Hispanic children, 36-59 months of age.

Healthy People 2010 recommendations, as documented by the Centers for

Disease Control and Prevention (CDC) identified overweight and obesity as 1 of 10

leading health indicators and called for a reduction in the numbers of children and

adolescents that are overweight and obese (CDC, 2002). Most research to date has

focused on children over the age of 5, but recent studies are showing that excess weight in children is starting at an earlier age (Kimbro, Brooks-Gunn, & McLanahan, 2007). This chapter presents the (a) background of the problem, (b) statement of the problem, (c) nature of the study, (d) purpose of the study, (e) theoretical framework, (f) operational definitions, (g) assumptions, (h) limitations, (i) scope, (j) delimitations, and (k) significance of the study.

<div align="center">Background of the Problem</div>

Although breastfeeding has been found to be protective against childhood overweight in some studies (Arenz, Rückerl, Koletzko, & von Kries 2004; Bogen, Hanusa, & Whitaker, 2004; Clifford, 2003; Dewey, 2003; Dewey et al., 1995; Gillman et al., 2001; Hediger et al., 2001; Kramer, 1981; Kramer et al., 2003; von Kries et al., 1999), it has not been as well documented in the Hispanic population (Grummer-Strawn & Mei, 2004).  Giachello (1994) reported that breastfeeding and duration rates for women of Hispanic cultures are similar to American women from comparable socioeconomic backgrounds, but they are lower in general than in non-Hispanic women.  The literature shows that there are more studies addressing breastfeeding practices among women of Mexican heritage (Kersey, Lipton, Sanchez-Rosado, Kumar, Thisted, & Lantos, 2005) than for Hispanic women who have emigrated from Puerto Rico and other countries of South and Central America. Kersey et al., (2005) found that the Mexican population in their study accepted breastfeeding as culturally appropriate, and women chose to breastfeed their infants.  Libbus (2000) suggested that although many variables were associated with Hispanic women's decision to breastfeed, the extent of the acculturation

into the American culture seemed to be directly related to the decision. In the studies of Grummer-Strawn & Mei (2004), the highest breastfeeding rates were among the Hispanic population were those of Mexican Americans. Humphreys, Thompson, & Miner (1998) described the "relationship between breastfeeding intention among socioeconomically disadvantaged pregnant women" (p. 169) and learned that it "was positively correlated with older maternal age, higher education, more breastfeeding experience, Hispanic ethnicity and hearing about the benefits of breastfeeding from family members, the baby's father and lactation consultants but not from other health care professionals ( p. 169). Evidence from studies with women from South America showed that maternal education, social class, ethnic background, and religion were related to the decision to initiate and continue breastfeeding (Cernadas et al., 2003, p. 136). It is important to understand that the Hispanic population is not a homogenous group and that women living within the same community and speaking the same language may be culturally different because they come from different countries and have different experiences and knowledge about breastfeeding.

The short-term benefits of breastfeeding— the best source of nutrition for infants and the most economical means of feeding an infant—are well documented (American Academy of Pediatrics, 1998; World Health Organization, 1989). More evidence from multiple studies in the US and other countries has shown that the use of breastmilk may have longer-term benefits, including reduced risk of obesity in later life. But the studies are not conclusive (Bergmann et al., 2003; Clifford, 2003; Gillman et al., 2001; Kramer et al., 2004; von Kries et al., 1999).

Studies that address early determinants for overweight in preschool children have either been small or have not addressed the relationship between breastfeeding and the BMI of Hispanic children (Bogen, Hanusa, & Whitaker 2004; Dubois & Girard 2006; Flegal, Ogden, & Carroll 2004). Dewey's (2003) metareview of the most recent studies in the US discussed the possible causal relationship between the effect of breastfeeding and the reduced risk of childhood obesity.  One of the advantages for long-term reduced risk of overweight and obesity suggested in this study was the ability of the breastfed infants to control the amount of milk they consumed (Dewey, 2003). Infants that are breastfed usually stop eating when they are full, while infants that are bottle fed may continue to eat until the bottle is taken away.

According to Kumanyika and Grier, "any strategy to address childhood obesity in the overall population must include targeted interventions for children in the nation's minority and low-income families" (2006, p. 8).  They also suggest that if the public health community is to succeed in making a difference with the members of low-income Hispanic families, it will be necessary to rethink the methods used to provide information and education.  They suggest that "families living in urban communities need to have programs that provide information that is applicable to their specific environmental, educational, social and physical needs" (Kumanyika & Grier, 2006, p.9).

In an effort to increase breastfeeding incidences among low income women, breastfeeding promotion and education was mandated as a part of the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) Program in 1991 when the US Congress enacted Public Law 101-508, (1990), the Omnibus Budget

Reconciliation Act of 1990. Prior to 1991, the use of breastfeeding peer counselors, although common in developing countries, was not widely practiced in the United States (Haider, Ashworth, Kabir, & Huttly, 2000). The use of breastfeeding peer counselors was initiated by the Philadelphia WIC Program in 1990. Through the use of culturally diverse peer counselors, culturally appropriate brochures, breastfeeding aids, videos and group education, the average duration of breastfeeding for all infants in Philadelphia County has increased to 14.5 weeks and for Hispanic infants it was 15.9 weeks as of July 2007 (Pennsylvania Department of Health, Breastfeeding Duration Reports, July 2007).

The Pennsylvania WIC 4-Step breastfeeding education process is recommended to introduce the concept of breastfeeding to all pregnant women as the option of choice for infant feeding. It is projected that use of this educational method will help women enrolled for WIC benefits to understand the importance of breastfeeding and to choose to delay the introduction of formula, solid foods, and sweetened liquids into their infant's diets until the infant is at least 16 weeks of age (Pennsylvania WIC Plan of Action, 2006). Use of Latina peer counselors, communicating with Hispanic women in their language, and providing educational materials that they are able to read has been shown to be more beneficial than education provided by other health professionals (Humphreys et al., 1998). Specific programs designed to address the individual needs of these Hispanic mothers, would help them understand that breastfeeding is the feeding method of choice in the US and encourage them to make the choice to breastfeed their infants.

Statement of the Problem

Obesity is increasing in the United States among preschool Hispanic children from low-income families (Mei, Scanlon, Grummer-Strawn, Freedman, Yip, & Trowbridge, 1998). The prevalence of obesity and overweight according to Pediatric Nutrition Surveillance System (PedNSS) data shows a higher rate of increase for Hispanic children and children living in urban areas (CDC, 1994, 2003). Although breastfeeding has been documented as having a protective effect against obesity on children as they grow older (Briefel et al., 2006), it is not always justified as the only factor that affects the child's risk for obesity. Dietary intake and physical activity have been documented as contributing factors especially in non-White population (Hediger et al., 2001, Grummer-Strawn & Mei, 2004). The duration of breastfeeding has been associated with a decreased risk of overweight in children 2-5 years old (Kersey et al., 2005). However, children of Hispanic heritage were twice as often found to be overweight at age 3 as their African American or White counterparts (Kimbro, Brooks-Gunn, & McKanahan, 2007). It is not known whether there is an association between the reduction of obesity and breastfeeding duration in Hispanic preschool children. But if so, it may be helpful in overcoming the problem of overweight and obesity in these children and thus promote social change (Kersey et al., 2005).

This study has the potential to provide data for medical and nutrition professional staff working in the WIC program in Pennsylvania to develop better evidenced based nutrition education materials, to improve their counseling skills and to positively impact

the methods used by all public health medical professionals providing support to the families of these children.

## Nature of the Study

This quantitative study used a retrospective cohort design to compare the BMI of two groups of Hispanic children, 36 to 59 months of age, one of which was breastfed and one which was not breastfed. Through the use of historical computerized records of Hispanic children enrolled for WIC benefits in Philadelphia, PA, ages 36-59 months of age at the time of the study and collected at previously scheduled WIC appointments the researcher documented the weight and length by gender at birth as compared to the BMI at ages 36-59 months of age. The duration of breastfeeding in weeks, the age at which formula was introduced to the infant in weeks, and the age at which solid foods were introduced to the infant in weeks were also collected to learn more about the affect of these variables on the BMI. (Further discussion in chapter 3.) The records of all children of Hispanic heritage, ages 36 to 59 months of age, enrolled for WIC benefits in Philadelphia County Pennsylvania between August 2004 and August 2006 (3-5 years prior to data collection) were evaluated for inclusion in the study. The research questions and hypotheses were designed based on previous research and the need to address the possibility that the increased duration of breastfeeding may have a positive effect on reducing the risk of obesity for members of this target population.

## Research Questions and Hypotheses

The research questions for this research study were designed based on previous research and the need to address the possibility that the increased duration of

breastfeeding may have a positive effect on the reduced risk of obesity for preschool Hispanic children 36-59 months of age.

RQ₁     What is the relationship between Hispanic preschool children enrolled for benefits in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) in Philadelphia, PA who were breastfed and their BMI at 36-59 months of age?

*Rationale 1*

Breastfeeding has been suggested as having a protective effect on lowering the risk of obesity in children (Butte, 2001; Dewey, 2003). The findings in these studies suggested that "if the association is causal, the effect of breastfeeding is relatively modest as compared to other factors such as parental overweight, dietary practices and physical activity" (Dewey, 2003).

$H_0{}^1$     There is no statistically significant relationship between Hispanic children enrolled for benefits in the Special Supplemental Nutrition Program for Women, Infant and Children (WIC) in Philadelphia, Pennsylvania who were breastfed and their BMI at 36-59 months of age.

$H_A{}^1$     There is a statistically significant relationship between Hispanic children enrolled for benefits in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) in Philadelphia, Pennsylvania who were breastfed and their BMI at 36-59 months of age.

*Analytical Process 1*

A *t* test was used to test the mean of the population and to determine if there is an association between breastfeeding and BMI.

RQ$_2$    What is the relationship between the gender of Hispanic preschool children enrolled for benefits in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) in Philadelphia, PA and their BMI at 36-59 months of age?

*Rationale 2*

The prevalence of overweight is twice as high in Hispanic children at 4 years of age as compared to non-Hispanic children and boys were found to be at higher risk for overweight than girls (Dennison, Edmunds, Stratton, & Pruzek, 2004).

$H_0{}^2$    There is no statistically significant relationship between gender and the BMI of Hispanic children; ages 36-59 months, enrolled for benefits in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) in Philadelphia, Pennsylvania.

$H_A{}^2$    There is a statically significant relationship between gender and the BMI of Hispanic children, ages 36-59 months, enrolled for benefits in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) in Philadelphia, Pennsylvania.

*Analytical Process 2*

A *t* test was used to test the mean of the population and to determine if there is an association between gender and BMI.

RQ₃     What is the relationship between the birth weight and length of Hispanic preschool children enrolled for benefits in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) in Philadelphia, PA and their BMI at 36-59 months of age?

*Rationale 3*

Although many studies have discussed the increase in the prevalence of childhood overweight and obesity, there is little documentation that addresses when the problem of obesity begins or that provides a simple answer to the basic treatment needed to prevent it. Multiple potential causes have been suggested including birth weight (Parsons, Power, Logan, & Summerbell, 1999), maternal smoking during pregnancy, maternal pre-pregnancy weight (Gillman et al., 2001; Whitaker, 2004), and infant feeding patterns during the first year of life (Gillman et al., 2001; Owen, Martin, Whincup, Smith, & Cook, 2005). "These relationships are complex, and little is known about the overall influence on body-weight changes and overweight development in the preschool years" (Dubois and Girard, 2006, p. 611). In predicting obesity at birth, Whitaker states that "obesity prevention may be a better approach than obesity treatment and that prevention efforts should begin in very early life or even before the birth of the infant" (Whitaker, 2004, p. 35). If there is to be a successful way of preventing obesity in children, it seems that it would begin with the prenatal period and continues during the preschool years and must involve the community. (Whitaker, 2004)

$H_0{}^3$     There is no statistically significant relationship between birth weight and length and the BMI of Hispanic children; ages 36-59 months, enrolled for benefits in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) in Philadelphia, Pennsylvania.

$H_A{}^3$     There is a statistically significant relationship between birth weight and length and the BMI of Hispanic children; ages 36-59 months, enrolled for benefits in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) in Philadelphia, Pennsylvania.

*Analytical Process 3*

A *t* test was used to test the mean of the population and to determine if there is an association between birth weight and length and BMI.

RQ$_4$     What is the relationship between the duration of breastfeeding for Hispanic children enrolled for benefits in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) in Philadelphia, PA and their BMI at 36 -59 months of age?

*Rationale*

The duration of breastfeeding has been associated with a decreased risk of overweight in children at ages 2-5 (Kersey, Lipton, Sanchez-Rosado, Kumar, Thisted, & Lantos, 2005). Infants who were fed breast milk more than infant formula, or who were breastfed for longer periods, have been documented at lower risk of being overweight during older childhood and adolescence (Gillman et al., 2001). In a larger, longitudinal study by Grummer-Strawn and Mei (2004)

children who were breastfed for longer periods were found to have a lower risk of overweight; but this protection against pediatric overweight was only observed when the child was breastfed for at least 3 months.

$H_0 4$    There is no statistically significant relationship between the duration of breastfeeding for Hispanic children enrolled for benefits in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) in Philadelphia, Pennsylvania and their BMI at 36-59 months of age.

$H_A 4$    There is a statistically significant relationship between the duration of breastfeeding for Hispanic children enrolled for benefits in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) in Philadelphia, Pennsylvania who were not breastfed and their BMI at 36-59 months of age.

*Analytical Process 4*

Pearson's correlation coefficient was used to determine the association between the two variables, the current BMI as compared to the duration of breastfeeding. Use of a scatter plot diagram shows the actual points of data.

$RQ_5$    What is the relationship between the age of introduction to formula for Hispanic preschool children enrolled for benefits in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) in Philadelphia, PA and their BMI at 36-59 months of age?

*Rationale 5*

One of the advantages for long-term reduced risk of overweight and obesity suggested by Dewey (2003) was the ability of the breastfed infants to control the amount of milk consumed based on their response to internal satiety cues (Dewey, 2003). Infants that are breastfed usually stop eating when they are full while infants that are bottle fed may continue to eat until the bottle is taken away.

$H_0{}^5$    There is no statistically significant relationship between the age of introduction to formula for Hispanic children enrolled for benefits in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) in Philadelphia, Pennsylvania and their BMI at 36-59 months of age.

$H_A{}^5$    There is a statistically significant relationship between the age of introduction to formula for Hispanic children enrolled for benefits in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) in Philadelphia, Pennsylvania and their BMI at 36-59 months of age.

*Analytical Process 5*

Pearson's correlation coefficient was used to determine the association between the two variables, the BMI at ages 36-59 months of age as compared to the age of introduction to formula in weeks. Use of a scatter plot diagram shows the actual points of data.

$RQ_6$    What is the relationship between the age of introduction to solid foods for Hispanic preschool children enrolled for benefits in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) in Philadelphia, PA and their BMI at 36-59 months of age?

*Rationale 6*

In a study of feeding patterns of infants and toddlers, Mennella et al., (2006) collected information on breastfeeding status, introduction to solid foods, and most frequently consumed fruits and vegetables of children in three age groups, 4-5 months, 6-11 months and 12-24 months.  They documented the experiences of the Hispanic children, predominantly from Mexican American families, to show the differences in food habits as compared to the non-Hispanic children. According to their findings, Hispanic children younger than 12 months had usually been breastfed and  were introduced to solids at an earlier age. Hispanic infants 6-11 and 12-24 months of age were (a) usually eating fresh fruits, baby cookies, and a variety of traditional foods such as rice, beans, soups and tortillas; (b)  less likely to have eaten non-infant cereal and baby food vegetables and meat dinners and (c) already drinking sugary beverages. Hispanic toddlers were more likely to drink sweetened beverages other than fruit juice and to eat cookies.

$H_0{}^6$    There is no statistically significant relationship between the age of introduction to solid foods for Hispanic children enrolled for benefits in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) in Philadelphia, Pennsylvania and their BMI at 36-59 months of age.

$H_A{}^6$    There is a statistically significant relationship between the age of introduction to solid foods for Hispanic children enrolled for benefits in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) in Philadelphia, Pennsylvania and their BMI at 36-59 months of age.

*Analytical Process 6*

Pearson's correlation coefficient was used to determine the association between the two variables, the current BMI as compared to the age of introduction to solid foods. A scatter plot diagram shows the actual points of data.

$RQ_7$    Which of the variables are the best predictors of the BMI being within the normal range for Hispanic children?

*Rationale*

The effect of independent variables gender, birth weight and length, duration of breastfeeding, the age of introduction of formula and solid foods on the dependent variable BMI of the Hispanic children, 36-59 months of age, enrolled for WIC benefits in Philadelphia, PA, is not known.

$H_0{}^7$    There is no statistically significant relationship between the independent variables gender, birth weight and length, duration of breastfeeding, age of introduction to formula and age of introduction to solid foods for Hispanic children enrolled for benefits in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) in Philadelphia, Pennsylvania and the dependent variable BMI at 36-59 months of age.

$H_A{}^7$    There is a statistically significant relationship between the independent variables gender, birth weight and length, duration of breastfeeding, age of introduction to formula and age of introduction to solid foods for Hispanic children enrolled for benefits in the Special Supplemental Nutrition Program for Women, Infants and

Children (WIC) in Philadelphia, Pennsylvania and their BMI at 36-59 months of age.

*Analytical Process 7*

Multiple regression analysis was used to test the relationship between the BMI of Hispanic children and the variables gender, birth weight and length, duration of breastfeeding, age of introduction to formula, and age of introduction to solid foods.

## Purpose of the Study

The BMI for Hispanic children at 36 – 59 months of age was examined in this study. Those that were breastfed were compared to those who were not breastfed to see if there was a statistically significant difference in the BMI. Historical WIC participant data was used to identify demographic data, duration of breastfeeding, age of introduction to formula, and age of introduction to solid foods.

## Theoretical Framework

Social cognitive theory (SCT), originally known as the social learning theory , was used in this study  because "it addresses both the psychosocial dynamics influencing health behavior and the methods of promoting behavioral change;  it emphasizes that a person's behavior and cognition affect future behavior" (Baranowski, Perry, & Parcel 1997). Use of the SCT is appropriate because it explains "how people acquire and maintain certain behavior patterns and it also provides the basis for intervention strategies" (Baranowski et al., 1997). If, as they become acculturated in the US, pregnant women of Hispanic heritage can be taught the importance of breastfeeding and its

potential to reduce the risk of overweight and obesity , they may choose breastfeeding as the first choice for feeding their infants and healthier children may result.

Immigrant women have been shown to have higher rates if breastfeeding initiation and duration of feeding than American women (Singh, Kogan, & Dee, 2007). As immigrants become more acculturated they tend to bottle feed their infants. Use of the SCT in this study will impact the environment in which these women live by surrounding them with WIC staff, family and friends who support their decision to breastfeed. It will also enhance the mother's confidence in her ability to provide the best source of nutrition for her new infant.

<center>Operational Definitions</center>

*Birth weight* categories defined in the WIC Program as:
  normal weight 2500 g-4500 g
  low weight less that 2500 g
  high weight more that 4500 g

*Breastfeeding duration*:  the length of time the mother provides breastmilk as a source of nutrition for the child (*PA WIC Breastfeeding Manual*, 2004).

*Breastfeeding peer counselor support*:  the provision of education, support and assistance by a trained paraprofessional that possesses experience and basic knowledge similar to the needs of the target population (*PA WIC Breastfeeding Manual*, 2004).

*Body Mass Index*:  BMI; a method of measuring total body fat determined by dividing the weight in kilograms by the height in meters squared.  Children's BMI scores are not stable; they change as children age (Pietrobelli, Faith, Allison, Gallagher, Chiumello, & Heymsfield, 1998).  Pediatric BMI is plotted as percentiles based on the age and gender and is not reported as raw scores (Dietz & Bellizzi, 1999).

*Exclusive breastfeeding*:  the length of time when breastmilk is the only source of nutrition for the child (*PA WIC Breastfeeding Manual*, 2004).

*Height*        : the measurement from base to top (head to toe) for a person in a standing position (*Reader's Digest Oxford Complete Dictionary and Thesaurus*, 1996).  In this study height was determined using a Stadiometer height board that was mounted on the wall.  It precisely measures from 27 5/8 inches to 84 inches in increments of 1/16 inch.

> *Hispanic or Latino origin*:  people who identify with the term Hispanic or Latino who indicate that they are from Mexico, Puerto Rico, Cuba, Central or South America or other Hispanic or Latino countries and may be of any race (US Census Bureau, 2005).

*Length*        : measurement from head to foot using an Infantometer length board with stationary head board and moveable foot board. This length board measures with critical accuracy to 1/8 inch for recumbent length up to 37 inches (*PA Quick WIC Manual,* 2004).

> *Normal weight:*  children with a BMI between the 5th and 85th percentile for their gender (Quick WIC, 2004). Infants and children up to 35 lbs. are weighed using a Tanita 1583 digital scale with lock in display; 0-20 lbs. is displaced in 0.5 ounce increments and 20-40 lbs. is displayed in 1 ounce increments. Toddlers that can stand and adults are weighed using aTanita-BWB-800-P digital scale with a lock in weight display in 0.2 ounce increments, a lb/kg switch and a platform.

*Overweight:*        children with BMI between the 85th and 95th percentile for their age and gender (*Quick WIC Operational Manual*, 2004).

*Obese:*        children with BMI greater than the 95th percentile for their age and gender (*Quick WIC Operational Manual*, 2004).

> *Satiety triggers or cues*:  the way infants regulate their food intake according to their needs for growth and maintenance (*PA WIC Breastfeeding Manual*, 2004).

*Supplemental feedings*                : any liquids including formula or solid foods given to the child in addition to breastmilk (*PA WIC Breastfeeding Manual*, 2004).

*Underweight:*        children with BMI that is less than the 5th percentile for their age and gender (*Quick WIC Operational Manual*, 2004).

Assumptions

Assumptions for this study are:

1. Valid WIC anthropometric data were collected by WIC staff as the participants were seen at regular WIC appointments;

2. Self reported data regarding breastfeeding duration and introduction to formula and solid foods were valid as reported by the mothers during regular WIC appointment visits;

3. The Hispanic population within the Philadelphia WIC Program is similar to the Hispanic population in Philadelphia County.

4. All Hispanic ethnicity is self reported.

Limitations

Limitations for this study are:

1. The lack of data recorded in the computerized data base were due to incomplete WIC records and the lack of data available from the mother at the time of WIC certification due to poor recall or poor documentation by WIC staff.

2. The possibility that the measurements recorded by the medical or WIC staff were incorrect.

3. The self-declaration of ethnicity was questionable due to the limited understanding of the definition by the WIC participants.

4. There was a potential for misclassification by race and ethnicity due to the self-declaration by the participants.

5.  There was a possibility for confounding of the BMI of the children from multiple sources such as genetics, physical activity and dietary habits.

6.  There was no estimate of the number of Hispanic WIC participant records available.

## Scope

Although approximately 20% of the Philadelphia WIC population is documented as being of Hispanic heritage (PA Department of Health, 2006), there was no documentation of the number of this population group that meets the criteria of the study. There was also no known estimate of the percentage of Hispanic women who chose to exclusively breastfeed their infants, those who chose to breastfeed and formula-feed as compared to those that chose to bottle-feed formula exclusively. There was no data on the number of Hispanic children between the ages of 36 - 59 months of age enrolled for WIC program benefits during the period of this study.

## Delimitations

Delimitations of this study were as follows:

1.  The population of preschool Hispanic children, 36-59 months of age at the time of the study, were selected from a large urban city/county WIC program in southeastern Pennsylvania.

2.  Children included in the study were documented not only as ethnically Hispanic, they also had to have infant feeding history documented in their WIC records.

Significance of the Study

Research has documented that women of Mexican American heritage initiate breastfeeding at the rate of 72% to 91% and that they choose to breastfeed exclusively for 4 to 6 months at rates of 2% to 39% and have a higher initiation and duration rates than women of Puerto-Rican heritage (Anderson et al., 2004; Balcazar, Trier, & Cobas, 1995; Byrd, Balcazar, & Hummer, 2000; Gonzalez-Perez, Vega-Lopes, & Cabrera-Pivaral, 1998; Ertem, Votto, & Leventhal, 2001; Rassin et al., 1994). This study helped the researcher understand more about the association between the duration of breastfeeding and the potential for protective effects of breastfeeding as related to preschool Hispanic children in southeastern Pennsylvania where the members of the Hispanic subpopulation are predominately from Puerto Rico.

This study also provided the potential to develop a better evidence-–based training process for the nutrition and medical staff working with the WIC population. The staff working in the Pennsylvania WIC program will be trained to improve their counseling skills so that they would have a more positive effect on the breastfeeding choices of the Hispanic mothers. They will be able to provide proactive education instead of just providing interventions to help reduce the risk of obesity in the children as they grow older.

Summary

This cohort study compares two groups of Hispanic preschool children, ages 36-59 months of age, those that were breastfed to those that were not breastfed as it relates to the following variables: (a) gender, (b) age, (c) duration of breastfeeding, (d) introduction

of additional formula, and (e) introduction of solid foods during the first six months of the child's life.

Hispanic women enrolled for WIC benefits in the Mid-Atlantic and Northeast states are a heterogeneous group and their rates of breastfeeding initiation and duration are less than that for White women (Anderson et al., 2004; Pachon & Olson, 1999). This is especially significant in the WIC program in southeastern Pennsylvania where the Hispanic population is comprised largely of families from Puerto Rico and Central and South America. Although breastfeeding education is provided and all pregnant women are encouraged to breastfeed as their first choice for infant feeding, many of these women choose to give formula (Anderson et al., 2004; Pachon & Olson, 1999). The risk of overweight and obesity in preschool children is an indicator of the potential for the child to become overweight as an adult (Whitaker et al., 1997). Use of the SCT with pregnant women of Hispanic heritage will help these women (a) learn the technique of breastfeeding, (b) perceive acceptability of breastfeeding as first choice to feed their infant, (c) choose to breastfeed their new infants, (d) choose to continue to provide breastmilk for their infant as it grows older through the use of the breast pump, and (e) to delay the introduction of formula and solid foods, and (f) know that a breastfed infant will be a healthier infant. The participants were enrolled for benefits in WIC in Philadelphia County and documented as ethnically Hispanic.

In chapter 2 a summary of related literature addressed the health consequences of obesity for children, the prevalence of obesity among Hispanic preschool children and the risk factors for overweight and obesity in this population. Chapter 3 of this study

described the methods that were used to analyze historical WIC data collected from the

Pennsylvania WIC program database. Chapter 4 discussed the study results and provided

data on the techniques used to test each hypothesis of the study. And finally Chapter 5

provides an interpretation of the findings, implications for social change, and

recommendations for further actions and study.

CHAPTER 2:

REVIEW OF LITERATURE

Introduction

This systematic review of the literature examined data relevant to the study objectives. Research studies included English language studies on the health consequence of obesity, documentation of trends and causes of child obesity in the United States, obesity among Hispanic preschool children, protective elements of breastfeeding against childhood obesity, the relationship between the duration of breastfeeding and the risk of overweight and obesity in children, and the relationship of breastfeeding, early introduction to solid foods and the risk of overweight in preschool children. The literature search was conducted using epidemiological, medical, psychological, behavior science and nursing literature from the following databases for the period 1980 through 2007: MEDLINE (Pub Med); CINAHL Plus, Cochrane Library, and PROQUEST to learn more about the history of the problem. These databases were searched using the following terms: breastfeeding, breastfeeding duration, exclusive breastfeeding, breastfeeding initiation, breastfeeding incidence, child overweight, child obesity and breastfeeding, childhood overweight, Hispanic child overweight, Hispanic child overweight and breastfeeding; acculturation, Latino child overweight, percentile BMI, breastfeeding and BMI, breastfeeding and child overweight, infant feeding, complementary feeding and childhood obesity. Additional studies were identified through manual search of original articles and reviews on the subjects found by electronic search and by reviewing the references cited in the articles located.

The purpose of this literature review was to summarize what is known about the association between childhood overweight and obesity as expressed by the BMI (dependent variable) and the duration of breastfeeding (main independent variable); age of introduction to formula (secondary independent variable), and age of introduction to solid foods (secondary independent variable) in Hispanic preschool children. In addition, this literature review discussed breastfeeding practices and attitudes of women in the Hispanic community. The research problem in this study is that obesity is increasing among Hispanic preschool children (Mei, Scanlon, Grummer-Strawn, Freedman, Yip, & Trowbridge, 1998). Although breastfeeding has been documented as having a protective effect on children as they grow older, there is a lack of data regarding the association between the duration of breastfeeding and obesity in this population. We did not know if there was an association between the reduction of obesity and breastfeeding duration in Hispanic children.

## Overview

The prevalence of childhood obesity has more than doubled over the past 20 years, even among preschool children, and has been considered by some to be a silent epidemic (Freedman, Srinivasan, Williamson, Valdez, & Berenson, 1997; Troiano & Flegal, 1998). This public health problem affects approximately 24% or 14 million children in the United States between the ages of 2 and 17 years who are obese and an additional 8.6 million who are at risk for obesity (Wolf, 2001). Although obesity has increased among all children, the increase in the African American and Hispanic population is significant. From 1986 to 1998 obesity in these two groups increased disproportionately by more than 120% as compared to White children at only 50%

(Strauss, 2001). Increase in the weight of preschool children has serious implications for their health as they grow older, including increased cardiovascular risks, asthma, type II diabetes, respiratory problems, fertility problems, psychosocial problems, and even premature death (Reilly, Methven, McDowell, Hacking, Alexander, Stewart, & Kelnar, 2003).

A study released by the Institute of Medicine (IOM) Committee of Prevention of Obesity in Children and Youth (2004), projected that due to the increase in obesity children born in the US in 2000 would be diagnosed with type II diabetes at some point in their lives. If there is no change in the current obesity rates, it is projected that 30% of the boys and 40% of the girls will also be at risk of developing serious psychosocial burdens related to being obese in a society that stigmatizes this condition (Koplan, Liverman, & Kraak, 2005). Obesity prevention will require "an evidenced-based public health approach to ensure that recommended strategies and actions will have their intended effects" (Koplan et al., 2005, p.3.).  In predicting obesity at birth, Whitaker states that "obesity prevention may be a better approach than obesity treatment and that prevention efforts should begin in very early life or even before the birth of the infant" (Whitaker, 2004, p. 35). If there is to be a successful way of preventing obesity in children, it seems that it would begin with the prenatal period and continues during the preschool years and must involve the community. Media messages that encourage healthful food options, increased physical activity and preventive health care programs must be made available, especially to the low income populations (Koplan et al., 2005). Intervention strategies that focus on promoting behavior change and reinforce improved behavior that are specific to ethnic and cultural groups must be developed (Koplan et al.,

2005). One such strategy would be education for pregnant women that would encourage them choose to breastfeed their newborns. The protective benefits of breastfeeding associated with the reduced risk of obesity in later life Have not been studied in the Hispanic community. More information is needed on the association of exclusive breastfeeding duration as it is associated with reduction in the BMI of preschool Hispanic children.

The National Health and Nutrition Examination Surveys (NHANES I, 1971–1974, NHANES II 1976–1980 and NHANES III 1988–1994) and the PedNSS data show continued increase in the prevalence of overweight, defined as weight for height above the 85th and for obesity defined as weight for height at or above the 95th percentile, for US low-income children 0-59 months of age, adjusted by race or ethnicity, sex ratio and age in months (Mei, Scanlon, Grummer-Strawn, Freedman, Yip, & Trowbridge, 1998).

Among children less than 24 months of age there was an increase of 2.9 percentage points for boys and 3.4 percentage points for girls using the 85th percentile cut-off for overweight (Mei et al., 1998). The non-Hispanic White, non-Hispanic black and Hispanic subgroups all demonstrated an increasing trend in the prevalence of overweight from 1983 through 1995 (Mei et al., 1998). A comparison of the prevalence of overweight by the location of where the children live showed that there were increases documented in both urban and rural locations in the prevalence of overweight for children less than 24 months old. The percentage of increase was slightly higher in the urban settings though than in the rural areas (Mei et al., 1998).

Studies investigating the role of diet and/or physical activity have been small in general and the methodology has been inconsistent for defining breastfeeding, obesity

and overweight. The evidence has been inconclusive and has not addressed confounding factors such as maternal weight, social economic factors, infant feeding patterns and physical activity. Although there continues to be a suggested relationship between breastfeeding and the reduced risk of overweight and obesity in childhood, due to the limited size of the research samples and the lack of control with the variables in the studies, the results of the studies are inconclusive (Parsons, Power, Logan, & Summerbell, 1999). If breastfeeding does decrease the prevalence of obesity in childhood (von Kries, Koletzko, Sauerwald, von Mutius, Barnert, Grunert, & von Voss, 1999) the promotion of breastfeeding could be an important and economical public health tool in the fight against the rising incidence of obesity (Bogen, Hanusa, & Whitaker, 2004; von Kries et al., 1999).

Based on an extensive review of the literature on Hispanic children's BMI, duration of breastfeeding, age of introduction to formula, and age of introduction to solid foods, the researcher has identified the following six areas for discussion: (a) health consequences of obesity, (b) causes and trends of childhood obesity in the United States, (c) prevalence of obesity among Hispanic preschool children, (d) relationship between methods of infant feeding and the risk of obesity and overweight in children, (e) breastfeeding practices and attitudes of women in the Hispanic community, and (f) relationship of breastfeeding, introduction to solids and the risk of overweight in preschool children. Each area is discussed with relevant literature. This is followed by two sections addressing the methods used in the study and the theoretical framework for this study relative to the social cognitive theory.

Health Consequences of Obesity

Childhood and adolescent overweight and obesity is not only a major public health concern in the United States (Koplan et al., 2005), it is also devastating psychologically to the children that are affected (Schwimmer, Burwinkle, & Varni, 2003). According to Dietz, one in five children in the US was affected by obesity in the early 1990s (Dietz, 1997); and research by Ogden, Flegal, Carroll, and Johnson (2002) shows that this trend is increasing.  The long term health effects that result from the complications of obesity are just the beginning of problems that these children face. Low self-esteem, inability to participate in social and athletic activities and appearance can lead to depression and health-related quality of life issues (Schwimmer et al., 2003). Data from the National Health and Nutrition Examination Surveys (NHANES) show that the number of overweight children has increased from 4% in the 1963-65 study to 11% in the 1988-94 study (Troiano, Flegal, Kuczmarski, Campbell, & Johnson, 1995). Preschool children are also increasingly overweight with measurements increasing from the first NHANES study, 5.1% in 1971-74 to 7.9% in the second study completed in 1976-1980; and up to 10.4% in the third study completed 1988 – 1994; among infants from birth to 23 months, 11.4% were overweight (weight for length $\geq 95^{th}$ percentile); and overweight in children ages 2-5 years increased from 11.3% to 15.3% in the same studies (Ogden et al., 2002).

Comparing height and weight measurements to growth charts usually identifies overweight children. The National Center for Health Statistics (NCHS) developed growth charts that had been used since 1977. These charts had limitations because the infant charts (birth to 24 months) did not include sufficient samples of infants from diverse

backgrounds and were based on different data than the charts for older children. In May 2000, NCHS released a revised set of growth charts. These charts were based on pooled data from the five NHANES studies. The revised charts included eight separate gender specific charts instead of the four in the older version.

The revised growth charts provided several improvements from the 1977 charts. First, nationally representative survey data were used for all charts and all ages. Secondly, BMI charts were developed as new charts for children ages 2 and older and replaced the weight for height measurement (Troiano et al., 1995). Thirdly, NCHS eliminated culturally specific charts because according to Troiano and associates there is no difference in the "genetic potential for growth" in children (Troiano et al., 1995).

The study by Baughcum, Chamberlain, Deeks, Powers and Whitaker, (2000) illustrates that overweight and obesity are viewed in different ways as a child develops. Many cultures see fatness or a chubby child as healthy when they are infants or even toddlers (Epstein, Myers, Raynor, & Saelens, 1998; Ferrara, Thorpe, & Wilkerson, 2003). Many parents and family members do not understand that excess weight in young children may result in health problems as the children age (Jain, Sherman, Chamberlain, Carter, Powers, & Whitaker, 2001). They do not associate the child's overweight with the potential for medical problems that include hypercholesterolemia, hypertension, Type 2 diabetes, insulin resistance, menstrual irregularity, asthma, depression, cardiovascular risk, sleep apnea and low self esteem (American Academy of Pediatrics 2003; Dietz, 1998; Freedman et al., 1999; Institute of Medicine, 2005; Sinha et al., 2002; Slyper, 1998). In fact thinness is seen as a health problem because it is associated with malnutrition and intestinal disease (Crawford et al., 2004). Parents who admit that their

children are a bit "chubby" do not see them as over weight because they are active and feel that as they grow older and taller they will no longer be chubby (Crawford et al., 2004). As early as 1998 Barlow and Dietz expressed concern about the ability for health professionals to treat overweight children successfully because any treatment of the child must include the family. According to their studies, "obesity in children and adolescents represents one of the most frustrating and difficult diseases to treat" but programs that provide ways to sustain weight loss are usually ones that address behavior changes and are family based (Barlow & Dietz, 1998, p. e29).

<div align="center">Childhood Obesity in the United States – Causes and Trends</div>

Changes in the causes of childhood obesity have changed in the last twenty years, and according to Haire-Joshu and Nanney "early intervention with parents of young children is required to prevent the development of eating patterns that lead to pediatric obesity and Type 2 diabetes in youth" (Haire-Joshu & Nanney, 2002, p.415). Changes in the home environment, the interaction between parents and child and the increased number of hours the child spends outside of the home have been documented as having a positive effect on the increase in childhood overweight and obesity. (Haire-Joshu & Nanney, 2002).

Although many studies have discussed the increase in the prevalence of childhood overweight and obesity, there is little documentation that addresses when the problem of obesity begins or that provides a simple answer to the basic treatment needed to prevent it. Multiple potential causes have been suggested including: birth weight (Parsons, Power, Logan, & Summerbell, 1999), maternal smoking during pregnancy and maternal pre-pregnancy weight (Gillman et al., 2001; Whitaker, 2004), and infant feeding patterns

during the first year of life (Gillman et al., 2001; Owen et al., 2005). Although the various associations have been documented, no direct linkage has been shown to validate the associations as they relate to the overweight status of children under the age of 5 years (Dubois & Girard, 2006).

If we are to find an answer to the treatment of overweight and obesity it is also important to have a definition about what is meant by overweight and obesity in these children.  This question is not unique to the professionals in the public health area, it has been argued and discussed by physicians, epidemiologists and health professionals at all levels for many years. In 2000 the Centers for Disease Control and Prevention (CDC) published new growth charts that replaced the charts previously developed by the National Center for Health Statistics that had been used during the previous 30 years. The use of BMI as a screening tool to identify potential weight problems in children was recommended by both CDC and the American Academy of Pediatrics. Unlike the adult BMI charts that use cut-off points to identify overweight and obesity status, the child's BMI is defined through the use of percentiles and BMI is used as a reliable measure of fatness for children (Moussa et al., 1994; Pietrobelli et al., 1997; Travers et al., 1995).

Children's weight status as it relates to their height changes significantly as they grow, this change requires that accurate measurements for weight and height be taken and documented (Rosner, Prineas, Loggie, & Daniels, 1998). The BMI has been found to increase as the child grows older and is higher for females than males (Rosner et al., 1998). Hispanic girls and girls of African-American decent, ages 5-17 years were documented as having a higher mean BMI than White girls of the same age (Rosner et al., 1998). The highest BMI was found in children, both male and female of Hispanic and

African-American heritage (Rosner et al., 1998). If a health professional or parent is to

know if the child's BMI is within a normal healthy range, they must use the correct chart

based on gender and age. The use of BMI screening is recommended for children ages 2-

20 years to discover if they are at risk of overweight or obesity (Dubois & Girard, 2006).

Prior to this recommendation the importance of screening for children under age two had

been discussed at length and was not considered to be important until the report given by

Stettler et al. (2002) where it was documented that there was "a strong association

between the prevalence of overweight at age 7 and the rate of weight gain during the first

4 months of life" (Stettler et al., 2002, p. 194)  and suggests that the "rate of weight gain

during the first few month of life, and related determinants, such as type of infant

feeding, may influence weight status later in childhood (Ong, Ahmed, Emmett, Preece, &

Dunger, 2000; von Kries et al., 1999).

Although the use of BMI is recommended as a screening method, it is important

to remember that: (a) BMI is only a guideline, it does not measure bone, fat or muscle;

(b) BMI values considered "appropriate", increase with age; (c) there is no "right" BMI

value for any single child at any age; (d) BMI values should not be compared between

children; and (e) a high or low BMI value is not always cause for concern (Dubois &

Girard, 2006).

Risk classifications for weight status as used by the WIC program identify the

weight categories as BMI percentiles. The term "ideal" is no longer used to describe body

weight of children. BMI percentile ranges are "an important tool to identify growth

problems at an early age so we can better prevents excess weight gain" (Koplan, 2000).

*Table 1.*

Weight Status Categories and Percentile Range

| Weight status category | Percentile range |
|---|---|
| Underweight | Less than the 5th percentile |
| Low Normal weight | 5th percentile to less than the 50th percentile |
| High Normal weight | 50th percentile to less than the 85th percentile |
| At risk of becoming overweight | 85th to less than the 95th percentile |
| Overweight | Equal to or greater than the 95th percentile |

*National Heart, Lung and Blood Institute (NHLBI). (1998)*

Pietrobelli et al. (1998) agree that the percentile indicates "the relative position of the

child's BMI number among children of the same sex and age". BMI is recommended by

CDC and is used by the WIC Program as the weight screening method of choice to

identify possible weight problems in children. After the BMI is calculated for children

and teens, the BMI number is plotted on the CDC BMI for age growth charts by gender

to obtain a percentile ranking.   The growth charts (Appendices I and J) show the weight

status categories (underweight, healthy weight, at risk of overweight and overweight) by

gender, 2-20 years of age.  Although the BMI number is calculated the same way for

children and adults, the criteria used to interpret the meaning of the BMI number for

children and teens are different for those used for adults. "For children and teens, BMI,

age and sex-specific percentiles are used for two reasons:  (a) the amount of body fat

changes with age and (b) the amount of body fat differs between girls and boys.  The

BMI for age growth charts designed by CDC take into account these differences and

allow translation of a BMI number into a percentile for child's sex and age" (CDC,

Division of Nutrition and Physical Activity, 2006).  The Quick WIC system used by the

Pennsylvania Department of Health calculates the BMI from the length or height and

weight measurements for each participant as entered into the system by WIC staff. Sex

and age specific growth charts are generate from this data. The BMI measurement for all

children that meet the criteria for this study will be compared, that is children with a

measurement at the 85th percentile or higher will be compared to those with a BMI within

the healthy weight range.

The independent variables of infant feeding methods, breastfeeding vs. formula

feeding, child's gender, and maternal prepregnancy weight were shown in a cross-

sectional study by Hediger, Overpeck, Kuczmarkski, and Ruan (2001) to be the strongest

predictors of a child's potential for overweight as they grew older. The potential for a

child to be overweight was three times as great when the mother was found to be

overweight and four times as great when the mother was obese (Hediger et al., 2001).

If the pediatrician and other health care professionals responsible to provide

service to and interact with the parents and pre-school children on a regular basis are the

ones who will make the greatest impact on possible change in their lifestyle and resulting

weight status; there is a need for additional educational support for them. It is imperative

that they are trained to assess the problem, understand the importance of nutrition and

family-based lifestyle changes and be able to provide evidenced-based methodology to

reduced overweight in their families (Caprio & Genel, 2005). More information is needed

to provide guidelines for pediatricians and other medical professionals as they address

preventive methods instead of interventions to reduce the risk of overweight as children

grow older.

In a longitudinal study published by Nader, O'Brien and associates in 2006, the researchers provide data that began in 1991 and continued for 13 years and included healthy children 2-12 years of age living in 10 different states within the US. Seventy-six percent of the original sample or 1042 of these children continued to participate through the 13 year period and were measured 7 times. The study found that "children that were overweight, that is ≥85th percentile for BMI during their preschool years were 5 times as likely to be overweight at age 12 years than those who were below the 85th percentile for BMI" (Nader et al., 2006, p. e600). Although children from various locations within the US participated in the study, it was still a small sample. It seems though that when preventive measures were taken to keep the child's BMI within normal limits, less than the 85th percentile, the possibility of becoming overweight as a teenager was reduced with no significant differences shown for gender (Nader, et al. 2006). Therefore, it is possible that preventive methods addressing the difference in the BMI of males and females and that understand and accept cultural and ethnic differences may help in designing positive changes in daily dietary intake and increasing physical activity for children at an early age (Nader et al., 2006).

The Prevalence of Obesity among Hispanic Preschool Children

According to the March 2002 US Census Bureau Report, the population of Hispanic residents is growing significantly; in 2002 there were 37.4 million with the majority living in the West and Southwestern sections of the country. Population characteristics showed that based on the country of origin, Mexicans represented 66.9% and were more likely to live in the West, Puerto Ricans represented 14.3% and usually lived in the Northeast, Cubans 3.7% lived in the South and families from Central and

South America 14.3% lived in the Northeast, south and western sections of the country. The largest segment of this population group is said to be under the age of 18 years and 21.4% were living under the poverty level.

Philadelphia, PA has been documented as the 5th largest city in the nation with an estimated population of 1,448,394 and a Hispanic population of 151,571 or 10.5% of the population (US Census, 2006). In the most recent census report for Philadelphia there is a difference in the demographic breakdown as compared to the national statistics:  66.5% vs. 8.6% report their country of origin as Puerto Rico, 12% vs. 66.9% as Mexico, 3% vs. 3.7% as Cuba and approximately 33% vs. 6.5% do not state a country of origin but are counted as other in the Hispanic or Latino population.

Rates of overweight and obesity recorded in the NHANES studies for Hispanics, show that 15% of the population exceeds the 85th percentile and 5% exceed the 95th percentile for the three main subgroups: Mexican, Puerto Rican and Cuban; with women and children being most likely to be overweight (Pawson, Martorell, & Mendoza, 1991). Additional research using the same NHANES data and in addition, looking at the PedNSS for the same period was completed to determine if the prevalence of overweight had increased in pre-school children, especially in those 0-23 months of age. The reports from 1976 through 1995 showed an increase in the numbers of Hispanic children included in the study (8.3% to 22.5%) and an increase in the prevalence of overweight for all ethnic groups in this population (Mei, Scanlon, Grummer-Strawn, Freedman, Yip, & Trowbridge, 1998).

In studies addressing the health of Latino children living in California (Flores et al., 2002; Neufeld et al., 1998; Perez-Escamilla & Putnik, 2007) reported that this group

of children represented the largest group of minority children in the US with the largest

number living in California. It is projected that they will represent at least 25% of the

population by the year 2050 (Perez-Escamilla & Putnik, 2007). Although the health

concerns for these children included asthma, tuberculosis, mental health issues, oral

health, overweight and diabetes it varied depending on the country of origin (Flores et al.,

2002). As early as 1991 Pawson and associates reported an increase in the levels of

obesity linked diseases among the Hispanic population groups and suggested a need to

"enhance our knowledge about the levels of overweight and obesity in the US Hispanic

population" (Pawson et al., 1991, p. 1522S). One of the limitations of all of the findings

of these studies is that most of the available data address the Mexican American

population and say very little if anything about the Puerto Rican, Cuban American or

Central and South American sub-groups. The cultural and language barriers experienced

by the Hispanic population groups have prevented them from participating in research

studies and have limited the information that is available to provide culturally appropriate

training for the medical professionals (Flores et al., 2002).

Latino boys have been found to experience the greatest incidence of overweight

followed by Latina girls; the incidence of type 2 diabetes has accounted for 45% of new

cases diagnosed in California during the period of 1988-1998 (Neufeld et al., 1998).

Obesity continues to be a "major risk factor for chronic disease" among Latinos in

general and especially for nutrition related medical conditions including obesity and type

2 diabetes (Perez-Escamilla & Putnik, 2007). Access to medical care due to the lack of

medical insurance prevents more than 3.2 million Latino children from receiving the

level of medical care needed; it was also found that they experienced more medical errors and received a lower quality of health care in general (Flores et al., 2002).

The numbers of children of Hispanic heritage enrolled in the WIC Program in Southeastern Pennsylvania has grown over the past several years.  The percentage of Hispanic participants enrolled in the WIC Program in 1998 was 16.3% and has increased to 22.97% as of the end of the federal fiscal year 2006.  The obesity rates for the same period have increased from 12.6% to14.8%. (Pennsylvania WIC Enrollment, July 2006).

According to Kumanyika and Grier (2006, p. 8) "any strategies to address childhood obesity in the overall population must include targeted interventions for children in the nation's minority and low-income families". When addressing ways to prevent child obesity in ethnic minority and low-income population groups they suggest that health care professionals begin to think of unique and different ways to provide education that is specific to the "environmental, educational, social and physical needs" of these communities (Kumanyika & Grier, 2006, p.9).

Relationships among Methods of Infant Feeding and the Risk of Obesity and Being Overweight in Childhood

As early as 1994, research studies have shown a difference in the growth patterns of breastfed children as compared to those not breastfed (Garza, Frongillo, & Dewey, 1994). "The benefits of breastfeeding, including protection against exposure to harmful pathogens, provision of superior nutrition, transfer of antibodies and reduction in morbidity and mortality are indisputable" (Eckhart, Rivera, Adair, & Martorelli, 2001, p. 2304). To effect change it is important that the community be taught that breastfeeding is associated with decreases in morbidity and mortality and that the duration of

breastfeeding is "strongly associated with and inversely related with the prevalence of overweight preschoolers including Hispanic preschoolers" (Kersey et al., 2005, p. 357).

The American Academy of Pediatrics (AAP, 1997) and the World Health Organization (WHO, 2002) not only support breastfeeding but strongly encourage exclusive breastfeeding for the first 4-6 months of an infant's life. In addition, the health benefits to the mother and infant allows the mother to spend time with infant getting to know more about the infant's personality and health needs. It also helps the mother because her uterus returns to its normal size more quickly and the increased caloric needs required to breastfeed the infant help her to loose the weight she gained during the pregnancy. The entire family benefits from breastfeeding because it saves time, money and energy making it easier for the mother to care for the needs of the other members of the family (Lauwers & Woessner, 1989)

Health professionals at all levels are needed to promote and support breastfeeding to ensure the health of the new infant and the mother, and to ensure the best possible developmental and psychosocial outcomes for the infant. The American Academy of Pediatrics and the World Health Organization advocate the economic benefits of breastfeeding for the family in addition to the "significant and a modest reduction in the risk of obesity" (AAP, 1997, p. 1036).

To help mothers establish and sustain exclusive breastfeeding for the initial months of the infant's life, these organizations recommend that: (a) they initiate breastfeeding within the first hour after birth, (b) the infant be given only breast milk during the first 4-6 months without any additional supplement or water, and (c) the

mother breastfeed the infant on demand as often as the infant wants to feed, day and night; and that there be no bottles or pacifiers given (AAP, 1997, WHO 2002).

Breast milk has been documented as the best nutrition for infants as it provides natural immunization against childhood diseases during the first six months of life (Briefel, Ziegler, Novak, & Ponza, 2006).  There are specific nutritional benefits found in mother's milk that are not found in commercial formulas.  These immunologic benefits include immunoglobulin A, complex oligosaccharides, glycoprotein and cytokines and in addition the lactoferrin increases the protective effects of the mother's milk (Wold and Adlerberth, 2000). Infants who were fed breast milk more than infant formula, or who were breastfed for longer periods, have been documented at lower risk of being overweight during older childhood and adolescence (Gillman et al., 2001).  In a larger, longitudinal study by Grummer-Strawn and Mei (2004) children who were breastfed for longer periods were found to have a lower risk of overweight; but this protection against pediatric overweight was only observed when the child was breastfed for at least 3 months.  The numbers of studies including younger children are limited and are not as consistent as those studying older children. Kramer and associates (2004) in the Promotion of Breastfeeding Intervention Trial (PROBIT) confirmed that "formula and other milks accelerated both body weight gain and length gain during infancy, particularly after 3 months of age". They were also able to demonstrate a "dose-response relation between non-breast milk or formula intake and both length and weight gain" especially in infants 3-6 months of age (Kramer et al., 2002, p.604). Although breastfeeding is highly recommended, the conclusions on its protective effect against obesity vary depending on the study (Bogen, Hanusa, & Whitaker, 2004; Eckhart, Rivera

Adair, & Martorelli, 2001; Grummer-Strawn & Mei, 2004; Hediger, Overpeck,

Kuczmarski, & Ruan, 2001; Locke, 2002). Breastfeeding alone is not always justified as

the only factor that affects the child's risk for overweight as they grow older, dietary

intake and physical activity have also been documented as contributing factors especially

in non-White population groups (Hediger et al., 2001, Grummer-Strawn & Mei, 2004).

Breastfeeding promotion and education has been mandated as a part of the Special

Supplemental Nutrition Program for Women, Infants and Children (WIC) program since

1991 (Public Law 101-508 (1990). Prior to 1991, the use of breastfeeding peer

counselors, although common in developing countries was not widely practiced in the US

(Haider, Ashworth, Kabir, & Huttly, 2000). The use of breastfeeding peer counselors was

initiated in the Philadelphia, PA WIC Program in 1990. Through the use of culturally

diverse peer counselors, culturally appropriate brochures, breastfeeding aids, videos and

group education; the average breastfeeding duration for all races in Philadelphia County

increased to 13.5 weeks and to 15.9 weeks for Hispanic participants. The Pennsylvania

WIC 4-step breastfeeding education process is used to introduce the concept of

breastfeeding as the option of choice for infant feeding to all pregnant women enrolled

for WIC benefits. Use of this educational method has helped pregnant and postpartum

women to understand the importance of breastfeeding and to choose to delay the

introduction of formula, solid foods and sweetened liquids until the infant is at least 16

weeks of age (Pennsylvania WIC Plan of Action, 2006).

Breastfeeding Practices and Attitudes of Women in the Hispanic Community

Libbus (2000) in her study of attitudes of Hispanic American breastfeeding

women reported that more than 90% of these women plan to breastfeed because

breastfeeding is a part of the Hispanic culture but social and demographic factors often changed the intention once the infant was born. Perez-Escamilla et al. (2002, p. 661) suggested that for women of Puerto Rican origin "the length of time they live in the continental US was inversely associated with breastfeeding initiation." Bonuck, Freeman and Trombley (2005) agreed that acculturation seemed to have a negative affect on the choice for Hispanic women to breastfeed their children. If change is to be made in the incidence and duration of breastfeeding in the Hispanic community, education and support must be provided that will encourage the mother and her family to choose to breastfeed the new infant (Quinn et al., 2005)

The WIC program provides benefits to pregnant, breastfeeding, non-breastfeeding postpartum women, infants and children to age five who are at medical or nutritional risk and who have incomes that are less than 185% of the poverty level. These participants of the WIC Program receive nutrition education, breastfeeding promotion and support, access to medical and social services in addition to a nutrient dense food package in the form of WIC checks that are used to purchase specific food items (Pennsylvania WIC Plan of Action, 2006). The association between the women enrolled in the WIC Program and increased incidence of breastfeeding has been documented by Chatterji & Brooks-Gunn (2004) and Guttman & Zimmerman (2000). Even though WIC participants are encouraged to breastfeed, formula is easily accessible. Increased incidence and duration of breastfeeding has been documented in WIC populations where breastfeeding peer counselors have been available to provide education and support to the women. Use of Latina breastfeeding peer counselors has helped women of Hispanic heritage understand

that breastfeeding is the feeding choice in the US and to make this their choice for feeding their infants (Chatterji & Brooks-Gunn, 2004).

In the cross-sectional study (2002) on prevalence of exclusive breastfeeding in the US during the period of 1991-1994, Li et al., (2002) reported a higher national rate of breastfeeding during the first week after birth but showed a decrease from 47% to 10% by six months postpartum.   The rates for the Hispanic population were based on the Mexican American population and were found to be lower than rates for non-Hispanic White mothers but higher than those for non-Hispanic African American mothers. The numbers of women who continued exclusive breastfeeding were lower than for those who continued to provide some breastmilk with supplementation of formula (Li et al., 2002). Ahluwalia and associates (2003) used Pregnancy Risk Assessment and Monitoring System surveillance data for 1993-1998 to assess breastfeeding initiation and continuation and found that rates increased from 57% to 67.5%.  This study was limited to 10 states (Alabama, Alaska, Florida, Georgia, Maine, New York [excluding New York City], Oklahoma, South Carolina, Washington and West Virginia) and only two (Washington & Alaska) of the 10 were shown to exceed the 2010 objectives. Increases were observed in young African American women who participated in the WIC program and who involved in regular breastfeeding discussions during the prenatal period.  In general it was found that women who discussed breastfeeding during their prenatal visits and who received support were more likely to choose to breastfeed that women who did not (Ahluwalia et al., 2003).

The duration of breastfeeding has been associated with a decreased risk of overweight in children at ages 2-5 (Kersey et al., 2005).  The breastfeeding history of 364

children, 93 of Mexican American heritage in Minnesota showed a linear dose

relationship between the number of days breastfed as compared to the child's BMI.  Each

additional month that the child was breastfed was associated with a 10% decrease in the

odds ratio of overweight after controlling for child's sex, current age, prematurity, birth

weight, maternal education, and maternal weight status" (Kersey et al., 2005).  These

children were overweight at an early age but these mothers also reported that they

breastfed.  This study suggested that a longer duration of breastfeeding may be helpful in

overcoming the problem of overweight in these children (Kersey et al., 2005).

Kimbro, Brooks-Gunn and McLanahan (2007) agreed that children can begin to

experience problems with overweight and obesity at an early age and that those with

overweight mothers are at higher risk. In their study of 2271 children, 20% were Hispanic

as compared to 18% White and 15% African American.  It was found that the Hispanic

children were almost twice as often to be overweight at age 3 as the White and African

American children at 3 years of age but that this difference was not was not based on the

social-economic status, health status of specific characteristics of the parents. Further

research was recommended using interventions designed specifically for this

multicultural population group.

Through the use of a convenience sample of 154 low-income, multiethnic women,

from an urban setting; 50.6% who received WIC benefits and 27.9% who were Hispanic,

Guttmann & Zimmerman learned that breastfeeding rates were higher among these

Hispanic mothers at 38% as compared with the White mothers at 13.1% and African

American mothers at 29.8%. The message that breastfeeding is the best source of feeding

for their infants was accepted by these women and regardless of which infant feeding

method they chose, the majority of these women agreed that breastfeeding was the preferred and healthiest method for feeding infants. Their attitudes toward breastfeeding divided these mothers into four groups: content mothers who formula fed their infants, guilty or deprived mothers that formula fed their infants but believed that breastfeeding was better, socially constrained mother who breastfeed their infants and believe that breastfeeding was best and finally, mothers that felt they were forced to breastfeed but believe that formula feeding was equal or better to breastfeeding. For this group of women, having peer counselors to talk to during the prenatal period and after delivery was very helpful in providing education about breastfeeding; helping them to adjust to the breastfeeding process and to address the negative issues presented from their peers that breastfeeding was time consuming, inefficient, and even nasty (Guttman & Zimmerman, 2000).

Cultural beliefs of families from Puerto Rico, living in New York were examined by Higgins (2000) in her qualitative, ethnographic nursing research project. This purposive sample of participants came from the health center and included 10 key informants and 5 general informants. In general the breastfeeding rates in this population group were much lower than other Hispanic population groups and the children were overweight due to the feeding habits of the families. The study found that influences of the extended family members on the feeding practices for the infants and young children made it difficult for the parents to make changes. Specific cultural themes were found to be prevalent throughout the community that influenced infant feeding; they were: kinship and social elements, cultural values and life ways and religion and philosophical views. Although the informants verbalized their thoughts differently, the recurring themes

related to the individual beliefs and values, were the thread that was woven through each

of the interviews:

> (a) Family care is the center of the Puerto Rican world and children are cherished and their care shared by the family;
> (b) Cultural care means that a child is healthy if she or he is big and chunky, big is beautiful, g*ordito* (little fat one) is considered the highest compliment. A child that does not eat or that is thin is cause for great worry and cultural pain.
> (c) Overfeeding until they spit up is the norm. It is not unusual for parents to put rice cereal in the bottle of a 2 month old and food in the bottle by 4 months; rarely were infants spoon fed prior to six months of age.
> (d) Parents do not share the information on the routine overfeeding with the health care provider and although the feeding pattern is discussed, the parents continue to feed the child as they have been taught by grandmothers and older female relatives and often children continue to take a bottle until age three.
> (e) Children are fed cultural food and the family eats together. Feeding is influenced by traditional and religious celebrations. The belief of *mal de ojo* is practiced to overfeed as a protective care behavior to keep the child healthy, safe from illness and harm. Many believe in superstitions so the children wear black and coral bracelets, gold crosses, medals of saints and scapulars or black bags around their necks to protect them from harm and for good luck.
> (f) Decrease in breastfeeding rates has resulted from the lack of discussion about breastfeeding between mothers and daughters, more women working and breastfeeding being seen as a sexuality issue. Formula feeding is seen as easier and preferred. (Higgins, 2000, p. 22-26)

WIC paraprofessionals working with the WIC program in Philadelphia, Pennsylvania

were trained to work with the nutrition professional staff to provide basic nutrition

education and breastfeeding education and support. WIC participants come to the WIC

office once every 2-3 months for nutrition education and to pick up their WIC checks.

When breastfeeding peer counselors were not available, culturally diverse members of

the WIC staff provided information on the importance of breastfeeding to the pregnant

women. Information was provided that included a discussion of the importance of

breastfeeding and specific information on the reasons that breastmilk is superior to

formula. The pregnant women were encouraged to ask questions and if needed were

referred to the WIC breastfeeding pump manager. At each visit prior to the delivery of

the new infant, the staff discussed infant feeding options with the pregnant mom and

provided written materials and videos that answered questions and provided support for

moms considering breastfeeding as an option. These education sessions continued unless

the mom stated that she was no longer interested in participating in the discussions

(Philadelphia, PA WIC Nutrition Education/Breastfeeding Support Plan of Action, 2006)

The racial ethnic breakdown of the Philadelphia WIC population included

Caucasians of varied ethnic communities, African-Americans from diverse groups

including the Caribbean and the continent of Africa, Hispanic Americans from many

countries including Puerto Rico, Dominican Republic, South and Central America, Cuba

and Mexico; and Asian Americans from many ethnic populations including Viet Nam,

Cambodia, Laos, Korea and China (Pennsylvania Department of Health,  WIC

Racial/Ethnic Report, 2006). To increase the incidence and duration of breastfeeding in

the WIC population in Philadelphia, culturally diverse peer counselors, who had

breastfed al least one child, were hired and trained in 1990 to provide education for the

pregnant women and their families during pregnancy and to postpartum women soon

after delivery when they came home from the hospital (WIC Healthy Start Breastfeeding

Report, 1992). During the past ten years through the use of these peer counselors and

training of all WIC staff to use the "WIC Breastfeeding 4-step method" of providing

education to pregnant and postpartum women, the incidence of breastfeeding has

increased from 14.4% in 1997 to 24.6% in 2006 and the duration rates increased from

10.2 weeks in 1997 to 14.9 weeks in 2006 (Pennsylvania WIC Breastfeeding Duration

Report, 2007).

Relationship among Breastfeeding, Introduction of Solids, Maternal Obesity and the Risk of Overweight in Preschool Children

Studies that addressed early determinants for overweight in preschool children have either been small or have not addressed the relationship between breastfeeding and the BMI of Hispanic children (Dubois & Girard 2006; Bogen, Hanusa & Whitaker (2004; Flegal, Ogden, & Carroll 2004). Dewey's (2003) meta-review of the most recent studies in the United States  discussed the possible causal relationship between the effect of breastfeeding and the reduced risk of childhood obesity. One of the advantages for long term reduced risk of overweight and obesity suggested in this study was the ability of the breastfed infants to control the amount of milk consumed based on their response to internal satiety cues (Dewey, 2003).  Infants that are breastfed usually stop eating when they are full while infants that are bottle fed may continue to eat until the bottle is taken away.

Mennella and associates (2006) in a study of feeding patterns of infants and toddlers collected information through the use of interview questions on breastfeeding status, introduction to solid foods and most frequently consumed fruits and vegetables of children in three age groups, 4-5 months, 6-11 months and 12-24 months.  They documented the experiences of the Hispanic children, predominately from Mexican American families to show the differences in food habits as compared to the non-Hispanic children. They learned that Hispanic children younger than 12 months had (a) usually been breastfed, and (b) were introduced to solids at an earlier age; Hispanic infants 6-11 and 12-24 months of age were (a) usually eating fresh fruits, baby cookies, and a variety of traditional foods such as rice, beans, soups and tortillas; (b) they were

less likely to have eaten non-infant cereal and baby food vegetables and meat dinners and

(c) they were already drinking sugary beverages; and Hispanic toddlers were more likely

to drink sweetened beverages other than fruit juice and to eat cookies. This study was

limited by the small numbers of Hispanic children included and by the socioeconomic

differences in the Hispanic versus the non-Hispanic children.  In general the children ate

more fruits than vegetables but few if any ate green leafy vegetables. Understanding

cultural differences and the influences of older family members on the young family is

important if nutrition professionals are to be able to encourage change in what the parents

are feeding the young Hispanic children of various ethnic backgrounds (Mennella,

Ziegler, Briefel, & Novak, 2006).

Theoretical Framework

The SCT  was used as the theoretical framework for this study because it has been

shown to be helpful to health educators when attempting to increase behavior change

because "it addresses the dynamics of individual behavior and gives direction to the

design of the intervention strategies" (Baranowski, Perry, & Parcel, 2002).  Use of this

theoretical framework emphasized the importance of "enhancing a person's knowledge

and skills and self-confidence to engage in a particular health behavior" (Lewis, 2002).

This was especially important when working with pregnant women in low-income

minorities within ethnic/racial groups who have lower rates of breastfeeding initiation

and duration (Ryan & Zhou, 2006; Anderson et al., 2004; Ryan, Zhou, & Acosta, 2002).

Through the use of the three components of "environment, people and behavior

outcomes" materials can be designed that will address the specific needs of these women

and their families. Through the use of audio, video and print materials new behavior

skills can be introduced to encourage the woman to set personal goals to breastfeed and to provide breast milk as the only source of nutrition for her new infant. Staff will also be able to develop better ways of evaluating the change the mothers have made (Baranowski et al., 2002)..

The SCT constructs of environment, situation, behavior capability, expectations, expectancies, self-control, reinforcements, self-efficacy and reciprocal determination provided the basis for the theoretical framework for this study (Baranowski, Perry, & Parcel, 2002). Listed below are examples of the use of the constructs in this study. It was projected that the women who were taught the benefits and importance of breastfeeding for their infants during the prenatal period and who received support in the early post partum period would develop the confidence they will needed to breastfeed (Ozturk, Votto, & Leventhal, 2001; Perez-Escamilla et al., 1998).

1. Environment – influence of family members, friends and the WIC staff on the pregnant/postpartum woman's decision to breastfeed her new infant.

2. Situation – perceived acceptability of breastfeeding practice by the pregnant woman.

3. Behavior Capability – ability of the pregnant/postpartum woman to develop skill to breastfeed.

4. Expectations – breast milk is the best source of nutrition for the new infant.

5. Expectancies – breastfed infant is a healthier infant.

6. Self-Control – setting personal goals to breastfeed and to provide breast milk for the new infant by learning to use a breast pump prior to returning to work or school.

7. Reinforcements – education, support and incentives for pregnant/postpartum women to encourage breastfeeding initiation and duration.

8. Self-efficacy – enhancing the mother's confidence in her ability to provide the best source of nutrition for her new infant.

9. Reciprocal determination – willingness of pregnant/postpartum women to learn the technique of breastfeeding, choose to breastfeed their infants, choose to continue to provide breast milk for their infant/child through the use of a breast pump once they return to work or school.

One of the most essential concepts of the SCT is "self-efficacy or self confidence because it predicts the (a) initiation of a new health behavior, even under adverse condition; (b) the continuation of the target health behavior, even under conditions of failure; and (c) the maintenance of complex health behaviors, even under stressful conditions" (Dougherty, Johnson-Crowley, Lewis, & Thompson. 2001; Parcel et al., 1994; Bandura, 1972, p.164). Hispanic families enrolled for WIC benefits in the Philadelphia, PA WIC program, who choose to breastfeed overcame the barriers and challenges of environment, people and behavior outcomes in order to successfully breastfeed their infants during the first months of life.

Use of the SCT was relevant to the design of public health education programs because it synthesized cognitive, emotional and behavior understanding of behavior change; it suggested many important avenues for new behavioral research and practice and lastly it permitted the application of theoretical ideas to be used between the various disciplines including psychology, health behaviors and behavior change (Baranowski et al., 1997). In this study it was projected that the independent variables of breastfeeding and gender would have a definite affect on the preschool child's BMI. It was expected that the independent variables would influence or explain the dependent variable, BMI because prior research showed that the use of the SCT environmental characteristics

including the influence of family and friends could have a major effect on the decision

the mother made concerning infant feeding (Baranowski et al., 1997; Bandura, 1986).

Members of the family learned from each other and from those outside of the family

circle by receiving reinforcement and by observation (Bandura, 1972, 1986).

<div align="center">Summary</div>

Obesity is a public health problem that is affecting the health of infants and

children at an earlier age (Ogden et al., 2002). The studies addressed in this review

showed that there was a need for change in the behavior of families if there was to be a

reduction in the weight of the children. Specific interventions were needed for children

of minority population groups. Hispanic families, especially those living in large urban

settings needed programs that provide education that was applicable to them as they

became acclimated to living in the United States (Eckhart, Rivera, Adair, & Martorelli,

2001; Perez-Escamilla et al., 1998). They must understand that acculturation does not

mean the change of all traditional health practices such as breastfeeding (Anderson et al.,

2004; Rassin et al., 1994). More evidence is needed to document the benefits of

breastfeeding as it relates to the BMI of preschool Hispanic children of varied ethnic

backgrounds.

In chapter 3 the research design, the study population and setting, the methods

used to collect WIC historical data from the Pennsylvania WIC program data base and

the process of data analysis was used. The problem statement, seven research questions

and hypotheses were used to determine the guidelines for the study (Creswell, 2003).

Chapter 4 discussed the study results and provided data on the techniques used to test

each hypothesis of the study. And finally Chapter 5 provides an interpretation of the

findings, implications for social change, and recommendations for further actions and study.

CHAPTER 3:

RESEARCH METHOD

Introduction

Obesity is increasing among preschool Hispanic children and there is a lack of data regarding the association between the BMI for Hispanic children 36-59 months of age that were breastfed as compared to those who were not breastfed with respect to (a) birth weight and length, (b) gender, (c) duration of breastfeeding, (d) age of introduction of formula and (e) age of introduction of solid foods. It is not known if there is an association between the lower BMI and the breastfeeding duration in Hispanic preschool children.

The seven research questions for this study were based on the problem statement. The theoretical framework of this quantitative study was based on the social cognitive theory. It was proposed that the independent variables of breastfeeding and gender would have a definite effect on the preschool child's BMI. It was expected that the covariates would influence or explain the dependent variable, BMI, because previous research had shown that in the use of the social cognitive theory, environmental characteristics—including the influence of family and friends—may have a major effect on the decision the mother made concerning infant feeding (Baranowski et al., 1997; Bandura, 1986). Members of the family learned from each other and from those outside of the family circle by receiving reinforcement and by observation (Bandura, 1972, 1986). The purpose of this chapter is to describe the methods used in this research study and covers the research design,  study population and setting, data collection methods, and  data analysis.

The quantitative approach was used in this research study to (a) improve clarity and relevance of purpose, (b) improve the research ability of the problem, and (c) involved methods of data collection including historical data "which enabled conceptual data to be collected, measured and compared to a standard" (Professional Teachers Council, New South Wales, p. 1). In this study, historical data from the Pennsylvania Quick WIC database was the source. These data, collected over 3-5 years, were used to (a) identify the BMI of Hispanic children at 36-59 months of age, (b) document any significant statistical relationship between the BMI of the children that were breastfed as compared to those that were not breastfed, (c) show any correlation between the age and sex of the children that were breastfed as compared to those who were not, (d) show any correlation between that age at which formula was introduced to the infants, and (e) show any correlation between the age at which solid foods were introduced to the infants and their BMI at 36-59 months of age.

Research Design

This study used a retrospective, longitudinal, cohort design to guide the data collection process. This design was chosen because it "looked backwards and examined exposures to suspected risk or protection factors in relation to the outcome that was established at the start of the study" (Stats Direct, 2007, p. 1). The purpose of this study was to compare the WIC participant data documented on Hispanic preschool children that were breastfed as compared to the children that were not breastfed to see if there was a significant difference in their BMI at 36-59 months of age. The demographic variables of gender and age were statistically controlled in the study. Historical WIC participant data

were used to identify demographic data, duration of breastfeeding, age of introduction to formula and age of introduction to solid foods for the participants in the study.

Longitudinal studies allow social scientists to distinguish short- from long-term phenomena and are beneficial in portraying similarities and differences between subjects over the course of several years or even decades (D. Clemente, Crosby, & Kegler, 2002). In this study use of the retrospective cohort study design allowed the researcher to clearly define the cohort based on their exposure in the past (having been breastfed) and follow them to the current time to determine their risk of developing the outcome (obesity). This study covered 2004–2009 and recorded data that encompassed anthropometric and infant feeding records of more than 5,400 children enrolled for WIC benefits in Philadelphia, PA (Davis, 2006). The researcher looked at WIC data that had been recorded over a period of 3-5 years, as infants and children enrolled for WIC benefits were seen at regular WIC appointments. The data were collected and analyzed to determine whether growth of the children that were breastfed differed from those who were not breastfed. Additional covariates which were examined include the duration of breastfeeding, the age of introduction to formula and the age of introduction to solid foods.

Through the use of secondary data the researcher analyzed existing historical WIC participant records. The major strength of using this design method was the savings in time and effort because there is no need to collect new data. The disadvantage to using this secondary data was the lack of control over the methods used to collect this information and the accuracy of the data collected.

In this study data were collected from the computerized WIC database as reported by the mothers of Hispanic infants about their breastfeeding practices during the first

twelve months of the infant's life.  Data documenting the possible association between

the BMI measurements at 36-59 months of age (dependent variable) of these preschool

Hispanic children enrolled for WIC benefits in the Philadelphia, PA and the independent

variables of (a) birth weight and length, (b) breastfeeding duration in weeks; (c) age of

introduction to formula in weeks and (d) age of introduction to solid foods in weeks were

entered into the computerized data bases at the Philadelphia WIC offices as a part of

regular assessment visits. Medical or nutrition professional WIC staff met with the

parents of the WIC participants during these visits to discuss growth and development

and feeding practices. Birth weight and length measurements were recorded at the initial

WIC enrollment visit for each participant. Anthropometric measurements were taken and

recorded for infants at six month of age and at regularly scheduled recertification visits,

every six months, as mandated by the program. At these visits WIC staff weighed and

measured each child and entered the data into the Pennsylvania computerized Quick WIC

data base. Computerized growth charts were generated and the BMI plotted by gender on

these charts. During the first year, WIC staff also discussed and recorded data on infant

feeding practices and documented the duration of the breastfeeding experience and the

date at which formula and solid foods were introduced to the infant.

## Study Population and Setting

The criteria for inclusion in this study included the following: (a) a child, male or

female that was documented as Hispanic, (b) a child that had records documenting the

mothers feeding preference (breastfeeding or no breastfeeding); (c) a child with records

documenting the birth weight and length and BMI at 36-59 months of age and (c) a child

with records documenting age at which formula and solid foods were introduced. The

setting for this study was Philadelphia, PA. Philadelphia, PA is the 5th largest city on the nation with an estimated population of 1,448,394 and a Hispanic population of 151,571 or 10.5% of the population (US Census Bureau, 2006). In the most recent census report for Philadelphia the country of origin for the members of the Hispanic population was reported as: (a) 66.5% from Puerto Rico; (b) 12% from Mexico; (c) 3% from Cuba and approximately 33% without a specific country of origin recorded but who are documented as 'other' in the Hispanic or Latino population. A query of the participants enrolled for WIC benefits in Philadelphia County during this period of this study revealed a slightly different demographic breakdown: (a) 59.85% documented their country of origin as Puerto Rico; (b) 15.86% as Mexico; (c) 12.59% from the Dominican Republic; (d) 2.37% from countries of South America; (e) 0.9% from Central America and 8.43% as other.

Data for this study were downloaded electronically from the Pennsylvania Quick WIC database and saved in a Microsoft EXCEL spreadsheet. While these data were analyzed they were stored on a password protected computer and also copied and stored on a flash drive that was kept in a locked file at NORTH, Inc. The data for this study will be stored electronically for 3 years in a locked file. Data checking and cleaning methods were used to ensure that data wee free of errors and that the data were consistent (Pallant, 2006). Table 2 provides the following summary of information about this study:

1. The problem statement – the problem that will be addressed by this study

2. Study questions – the research questions for this study

3. Information needed – a list of the information that is needed to answer the research questions.

4.      Data questions – (a) what data is needed, (b) where to find the data

needed, (c) how is the data secured and (d) how to analyze the data to

secure the information needed (Schumaker, year, 1-2).

*Table 2.*

Quantitative Study Methodology Summary

| Problem Statement: The research problem in this study is that obesity is increasing among preschool Hispanic children in the US among low-income populations. The prevalence of obesity and overweight according to the PedNSS data shows a higher rate of increase for Hispanic children and especially for those living in urban areas. Although breastfeeding has been documented as having a protective effect against obesity as children grow older, it is not always justified as the only factor that affects the child's risk for obesity; dietary intake and physical activity have been documented as contributing factors especially for non-White population groups. The duration of breastfeeding has been associated with a decreased risk of overweight in children 2-5 years of age. Hispanic children have been found to be at a higher risk for overweight at age 3 than their African American or White counterparts. We do not know if there is an association between the reduction of obesity and breastfeeding duration in Hispanic preschool children. If this association can be documented, this may provide evidence for social change through the development of breastfeeding materials specifically designed for pregnant Hispanic women and their families to encourage breastfeeding. The longer breastfeeding duration may be helpful in overcoming the problem of obesity in these children. | | | | | |
|---|---|---|---|---|---|
| **Research Questions** | **Information Needed** | **What Data is Needed?** | **Where do the Data Reside?** | **How Can the Data be Collected?** | **What will be Done with the Data?** |

*Table 2*. Continued

| | | | | | |
|---|---|---|---|---|---|
| Q-1 What is the relation-ship between Hispanic preschool children enrolled for benefits in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) in Philadelphia, PA who were breastfed and their BMI 36-59 months of age,? | WIC data documenting genders, age breastfeeding (y or n) and BMI for all Hispanic children 36-59 months of age. | Historical WIC records | Pennsylvania Quick WIC Data Base | Electronic query of database | Analyzed through the use of SPSS software |
| Q-2 What is the relation-ship between the gender of Hispanic preschool children enrolled for benefits in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) in Philadelphia, PA and their BMI 36-59 months of age,? | WIC data documenting genders, age and BMI for all Hispanic children 36-59 months of age. | Historical WIC records | Pennsylvania Quick WIC Data Base | Electronic query of database | Analyzed through the use of SPSS software |
| Q-3 What is the relation-ship between the birth weight and length of Hispanic preschool children enrolled for benefits in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) in Philadelphia, PA and their BMI at 36-59 months of age? | WIC data documenting age, birth weight, birth length And BMI for all Hispanic children 36-59 months of age. | Historical WIC records | Pennsylvania Quick WIC Data Base | Electronic query of database | Analyzed through the use of SPSS software |
| Q-4 What is the relation-ship between duration of breastfeeding for Hispanic preschool children enrolled for benefits in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) in Philadelphia, PA and their BMI at 36-59 months of age? | WIC data documenting breastfed (y or n) age in weeks when breastfeeding stopped and BMI for all Hispanic children 36-59 months of age. | Historical WIC records | Pennsylvania Quick WIC Data Base | Electronic query of database | Analyzed through the use of SPSS software |

*Table 2*. Continued

| Q-5 What is the relation-ship between the age of introduction to formula for Hispanic preschool children enrolled for benefits in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) in Philadelphia, PA and their BMI at 36-59 months of age? | WIC data documenting age in weeks when introduced to formula, breastfeeding (y or n) and BMI for all Hispanic children 36-59 months of age. | Historical WIC records | Pennsylvania Quick WIC Data Base | Electronic query of database | Analyzed through the use of SPSS software |
|---|---|---|---|---|---|
| Q-6 What is the relation-ship between the age of introduction to solid foods for Hispanic preschool children enrolled for benefits in the Special Supplemental Nutrition Program for WIC in Philadelphia, PA and their BMI at 36-59 months of age? | WIC data documenting age when introduced to solids, breastfeeding (y or n) and BMI for all Hispanic children 36-59 months of age. | Historical WIC records | Pennsylvania Quick WIC Data Base | Electronic query of database | Analyzed through the use of SPSS software |
| Q-7 Which of the variables are the best predictors of the BMI being within the normal range for Hispanic children 36-59 months of age? | WIC data documenting age, breastfed (y or n) BF duration, age in weeks formula and solid foods introduced to the preschool Hispanic child. | Historical WIC records | Pennsylvania Quick WIC Data Base | Electronic query of database | Analyzed through the use of SPSS software |

*Note*. From "*Study Guide for Development of Problem Statement and Study Questions*",

by C. Schumaker, adapted with permission from the author.

## Data Collection

*Availability of data*

Because there was no data available concerning the projected number of Hispanic

preschool children that could be included in the study; the researcher requested a

preliminary query of potential eligible children that was completed in April 2007. This

query found approximately 2,800 children documented as ethnically Hispanic between the ages of 36-59 months enrolled for benefits in the Philadelphia WIC program (Pennsylvania Department of Health, WIC Program Enrollment, July, 2007). The researcher collected records for all children documented as ethnically Hispanic, 36-59 months of age at the time of the study (April 2009) that met the inclusion criteria; determined their exposure to breastfeeding in the past and determined their risk of obesity. A total of 7, 176 records were found to meet the selection criteria. Exclusion criteria eliminated 1,157 records that did not have a height or weight measurements within six months prior to the date of collection. A second exclusion criterion eliminated 1,347 records for children that did not have data for all variables and 218 were eliminated because of multiple records for the same child resulting in a final number of 4,454 records.

*Data collection process*

Collection of data was accomplished through the use of On-Line Analytical Processing (OLAP) Cube which is a software tool, used by the Pennsylvania WIC Program, which provides analysis of data stored in a database.  It enabled the user to view data for time and trend analysis.

WIC administrative staff has access to the OLAP cubes to complete queries as needed to help manage the WIC program.  The areas available include assistance, enrollment, food instruments, nutrition, food packages, participation, problem data and survey.  Data are available by county and can be filtered by use of the drop down lists. Through use of the participation priority cube the total number of unduplicated participants can be displayed over the last six months based on those that received food

instruments. It was possible to filter by homeless, migrant, breastfeeding, agency, clinic, date and county; and further by participant type – breastfeeding, child, infant, post-partum, nonbreastfeeding, and pregnant.

The advantages to using the OLAP cube included: the ability to filter data from drop down listings, use of the pivot table function to rearrange the fields displayed in rows, columns and data items to get different views of the same data; and the ability to drill down and get the details down to the individual participant level. The drop down lists were designed to allow the investigator to click on the arrow and display basic choices, expand the list by clicking on the + sign and make a selection by unclicking the checked boxes. The pivot tables wee easy to use and allowed the researcher to move columns and rows within the cube in a drag-and-drop fashion. They could also be manipulated via 'trial-and-error' and immediately showed the result. If the researcher found that this was not the data expected, it was a simple process to rebuild by hitting the 'rebuild' button to return to the original display to begin the process again. These tables allowed the researcher to generate and extract meaningful information from a large table of information within a matter of minutes. By double-clicking on any particular cell, the cube displayed specific records that were behind the summary. Once the data was down loaded into the tables, it could be copied to an Microsoft EXCEL spread sheet for further organization and display.

The data collected in this study provided documentation of the information collected from mothers during the post partum period from the infant's birth to 6-12 months of age as the mother visited the WIC office every two months to receive education and WIC benefits. WIC staff documented data at each of these visits. The

information provided by these mothers was more reliable because she was discussing information about her recent experiences and not trying to recall information about experiences that happened months or even years before.

Data collected during this study included: Letters of Permission and Support (Appendix A and B); and the query information from the Pennsylvania WIC data base (participant birth weight and length, birth BMI, participant BMI at ages 36-59 months, participant age, participant gender, date formula was introduced and date solid foods were introduced to infant). Identifying ethnically Hispanic participants within the WIC program was problematic because the federal government requires all WIC participants to self-declare their ethnicity and their race. As with all federal government programs, the WIC program uses the five categories:  White, Black or African American, American Indian/Alaskan Native (AI/AN), Asian or Pacific Islander,  Native Hawaiian and other; in addition each participant must self declare ethnicity by answering yes or no to the question, Are you Hispanic?

Data for this study were collected from the WIC participant historical records which are stored in the Pennsylvania Quick WIC computer system. Identification of child WIC records was accomplished by use of a query of the following data fields:  (a) child's personal WIC identification number, (b) date of birth, and (c) gender. This allowed the researcher to capture and consolidate historical information on children that had breaks in enrollment, that had been in and out of the system due to foster care or adoption; moved from one WIC office to another within the system or that had more than one WIC identification number. Birth weight and length and routine measurement were taken at regular six month intervals that began when the child was enrolled for WIC benefits.

These measurements were documented by the physician and sent to the WIC office on the WIC certification forms (Appendix C) or they are taken by the WIC staff when the child visited the WIC office. WIC office staff use the recommended protocols developed by the Centers for Disease Control and Prevention (CDC) for obtaining length/height and weight measurements. Documentation regarding infant feeding history, BMI, age at which parent or guardian reported introduction to formula and solid foods were also available from the computerized data base.

Children were seen at least twice within a 12-month period to have height and weight measurements recorded. Standardized methods are used by WIC staff to measure the height and weight of infants and children. Infant-o-meter boards (Appendix D) were used to measure recumbent length for children birth to 24 months of age. These boards allowed the staff to measure with critical accuracy for children up to 37 inches long. Tanita digital scales (Appendix E) were used to weigh these children; this equipment has an easy to read digital display that locks in the weight; this allowed time for the staff to document that data on the certification form and remove the children from the scale prior to entering the data into the computer. Weight for children 0-20 pounds was displayed in increments of 0.5 ounces; 20-40 pounds was displayed in increments of 1.0 ounces. Children over 24 months of age and that were able to stand were measured using the height Standiometer board (Appendix F) which was mounted to the wall and precisely measured heights from 27 5/8 inches to 84 inches in increments of 1/16$^{th}$ of an inch. These older children were weighed using Tanita-BWB-800-P scales (Appendix G) which also had an easy to read digital display and a capacity to weigh individuals up to 440 pounds and that could be switched between pounds and kilograms. This piece of

equipment also had a platform and displayed weights in increments of 0.2 ounces.

Weights were measured after outer clothing and shoes were removed. The BMI

(Appendix H) was automatically calculated by the Quick WIC system and plotted on the

appropriate growth chart (Appendix I and J). Records of children ages 36-59 months

documented as ethnically Hispanic and born between July 2003 and July 2005 were

included in this study.  Records for children without birth weight and length, weight and

height and BMI at 36-59 months of age or lacking infant feeding data were excluded.

This study utilizes the Statistical Graduate Package for Social Science (SPSS), version 17

for Windows to analyze the quantitative data.

Data Analysis

*Quantitative Analysis*
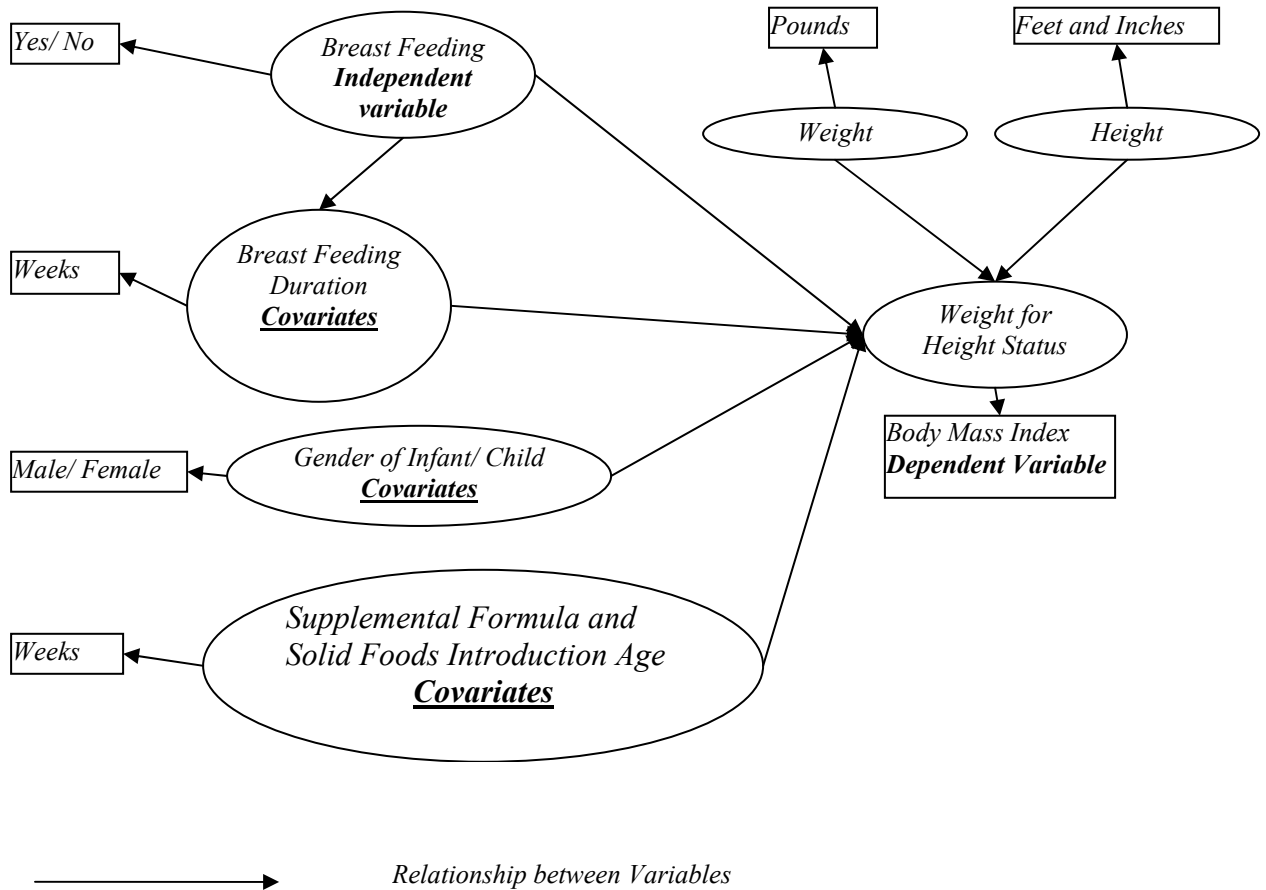


*Figure 1*. Research path diagram for this study.

*Note*. By W. Barker, 2008, Indiana University of Pennsylvania, adapted with permission

from the author.

In this study *t* statistics or *t* test, were used to test the hypothesis about the mean

of the population. After finding the estimation of the coefficient, the *t* test for that

coefficient, was the ratio of the coefficient to its standard error. This was tested against a

*t* distribution to determine how possible it is that the true value of the coefficient was

really zero. The *t*-statistics was a substitute for the z-scores when the researcher did not

know the standard deviation (Hoffman, 2003). The researcher determined whether the

association between breastfeeding and obesity remained even after controlling for gender.

If an association was determined, it was included and the researcher knew that there is no

confounding by gender. This possible association was determined for each of the

covariates: gender, birth weight and length, source of nutrition—breastfed or not

breastfed.
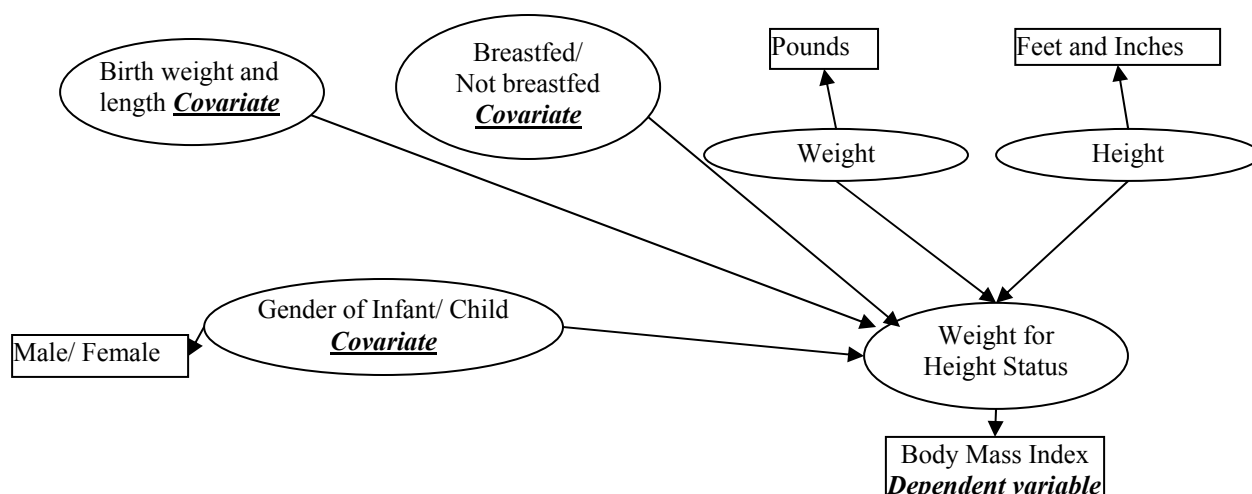


Figure 2. Independent Samples t test, one grouping/dichotomy predictor variable and one

continuous outcome variable to be used to test the hypotheses for research questions 1-4.

*Note*. By W. Barker, 2008, Indiana University of Pennsylvania, adapted with permission

from the author.

Analytical technique used for each hypothesis:

$H_0{}^1$:     There is no statistically significant relationship between the BMI of Hispanic

children enrolled for benefits in the Special Supplemental Nutrition Program for

Women, Infants and Children (WIC) in Philadelphia, Pennsylvania who were

breastfed and their BMI at ages 36-59 months of age.

$H_0{}^2$     There is no statistically significant relationship between the gender and the BMI

of Hispanic children; ages 36-59 months, enrolled for benefits in the Special

Supplemental Nutrition Program for Women, Infants and Children (WIC) in

Philadelphia, Pennsylvania.

*Analytical Process 1 & 2*

A *t* test was used to test the mean of the population and to determine if there is an

association between (a) breastfeeding and BMI, (b) gender and BMI.

*Table 3.*

*t* test

| Descriptive Characteristics | BF children Total number | Non BF children Total number | P-value; *t* test |
|---|---|---|---|
| Gender | Male # and % | Male # and % | P-value here |
|  | Female # and % | Female # and % | P-value here |
|  |  |  |  |
| Birth weight | Mean and SD | Mean and SD | P-value here |
| Birth length |  |  | P-value here |
| BMI |  |  | P-value here |
|  |  |  |  |
| Age intro to formula | Mean and SD | Mean and SD | P-value here |
| Age intro to solids | Mean and SD | Mean and SD | P-value here |
|  |  |  |  |

$H_0 3$     There is no statistically significant relationship between birth weight and length and the BMI of Hispanic children, ages 36-59 months, enrolled for benefits in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) in Philadelphia, Pennsylvania

*Analytical Process 3:*

One way between groups analysis of variance (ANOVA) was conducted to explore the impact of birth weight and birth length on the BMI of the Hispanic children 36-59 months of age.

$H_0 4$     There is no statistically significant relationship between the duration of breastfeeding for Hispanic children enrolled for benefits in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) in Philadelphia, Pennsylvania and their BMI at 36-59 months of age.

*Analytical Process 4:*

Pearson's correlation coefficient was used to determine the association between the two variables, the BMI of the children at 36-59 months of age as compared to the duration of breastfeeding in weeks. A scatter plot diagram showed the actual points of data.

$H_0 5$     There is no statistically significant relationship between the age of introduction to formula for Hispanic children, enrolled for benefits in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) in Philadelphia, Pennsylvania and their BMI at 36-59 months of age.

*Analytical Process 5:*

Pearson's correlation coefficient was used to determine the association between

the two variables, the BMI of the children at 36-59 months of age, as compared to

the age of introduction to formula in weeks. Use of a scatter plot diagram will

show the actual points of data.

$H_0{}^6$     There is no statistically significant relationship between the age of introduction to

solids for Hispanic children enrolled for benefits in the Special Supplemental

Nutrition Program for Women, Infants and Children (WIC) in Philadelphia,

Pennsylvania and their BMI at 36-59 months of age.

*Analytical Process 6:*

Pearson's correlation coefficient was used to determine the association between

the two variables, the BMI of the children at 36-59 months of age, as compared to

the age of introduction to solid foods in weeks. Use of a scatter plot diagram will

show the actual points of data.
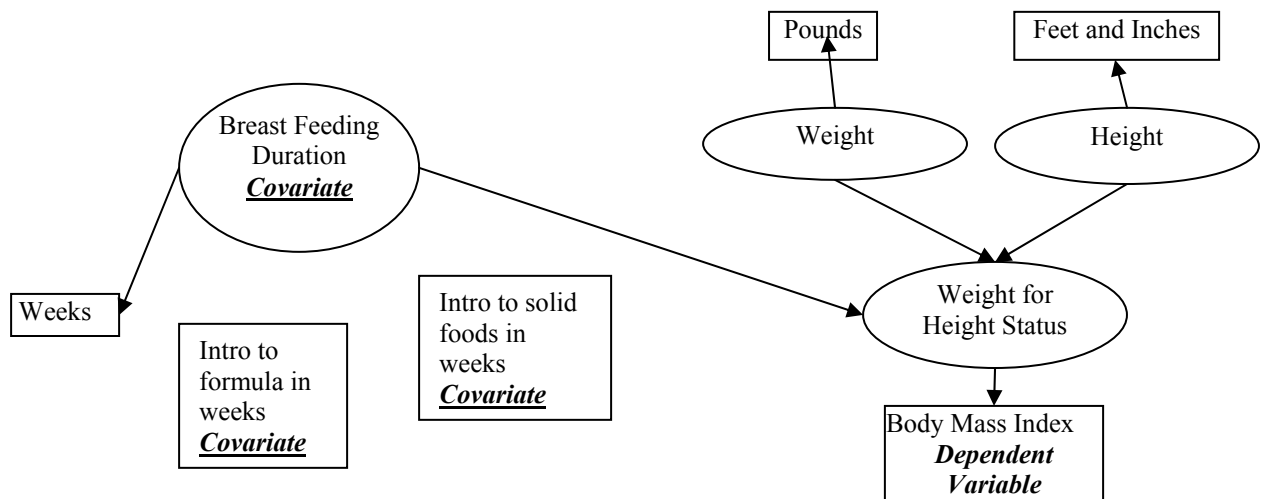
*Figure 3.* Simple Linear Regression (Pearson Correlation), one continuous or dichotomy predictor variable and one continuous outcome variable.

*Note*. By W. Barker, 2008, Indiana University of Pennsylvania, adapted with permission from the author.

Pearson's correlation coefficient was used to determine the association between the BMI of Hispanic children, 36-59 months of age as compared to duration of breastfeeding in weeks and a scatter plot diagram was used to show this relationship.

$$r = \frac{\frac{\sum XY}{N} - (\frac{\sum X}{N})(\frac{\sum Y}{N})}{\sqrt{\frac{\sum X^2}{N} - (\frac{\sum X}{N})^2 * \frac{\sum Y^2}{N} - (\frac{\sum Y}{N})^2}}$$

*Figure 4.* Pearson's correlation coefficient formula to calculate *r*.

In this equation the numerator equals the mean of XY ($\overline{XY}$) minus the mean of X ($\overline{X}$) times the mean of Y ($\overline{Y}$); the denominators are the standard deviation for $X$ (SD$_X$) and the standard deviation for $Y$ (SD$_Y$) (University of Michigan, 2006, p 5-6).

Pearson's formula can be written as:

$$r = \frac{XY - \overline{XY}}{SDX * SDY}$$

*Figure 5.* Pearson's correlation coefficient equation

*Note*. University of Michigan, 2006, adapted with permission from the author.

Pearson's correlation coefficient was used to determine the association between the

BMI of the Hispanic children, 36-59 months of age that were breastfed, as compared to

the age these infants were introduced to formula and the age these infants were

introduced to solid foods. The researcher chose to use correlation because it identified a

possible relationship between two variables; but not that one was the cause of the other

(Pallant, 2006). The visual description of the Pearson's *r* was shown as "a scatter plot

where scores for the two variables (from the same or different subjects) and plotted with

one variable on the *X-axis* (horizontal axis) and the other variable on the *Y-axis* (vertical

axis)."
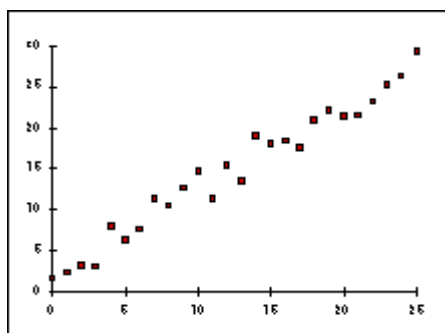


*Figure 6.* Example of scatter plot graph showing a positive correlation.

The Pearson's correlation coefficient provided an indication of the linear

relationship between the two variables. Use of the scatter plots diagram showed actual

points of data. The strong or positive relationship as pictured in Figure 3 indicates that

there is a close relationship between the data. Scatter plot graphs permitted a subjective

and general description of the relationships; the Pearson's correlation coefficient further

qualified the relationships (University of Michigan, 2002). Use of the scatter plot graph

was also used to check for outliers. The presence of outliers was important to check for

errors due to data entry. Pearson's *r* allowed the researcher to determine whether

knowing one variable would help predict the other variables and to calculate how much

closer the prediction would be (Babbie, Halley, & Zaino, 2007, p. 241).

*Table 4.*

Correlation values     *An example of how a correlation is evaluated*

| Correlation Value | Interpretation |
|:---:|:---:|
| ≤0.50 | Very low |
| 0.51 to 0.79 | Low |
| 0.80 to 0.89 | Moderate |
| ≥0.90 | High (Good) |

*Note*. University of Michigan, 2002, adapted with permission from the author.

If the *r* value for the Pearson's correlation coefficient is statistically significant, it will

differ from 0.00 which would imply that when the same variables were measured on

another group of similar individuals the results would be similar.  The values of *r* always

fall between -1 and +1 and the value does not change if all values of either variable are

converted to a different scale" ( University of Michigan, 2007, p.7)

*Table 5.*

An example of the numerical range and interpretation of correlation *r*

| Numerical range | Interpretation of the numerical range |
|---|---|
| + .00 to + .30 | No positive correlation between the two variables |
| + .00 to + .30 | No negative correlation between the two variables |
| +.40 to + .70 | Mild positive correlation between the two variables |
| + .40 to + .70 | Mild negative correlation between the two variables |
| + .80 to + .99 | Strong positive correlation between the two variables |
| + .80 to + .99 | Strong negative correlation between the two variables |

$H_0{}^7$    There is no statistically significant predictive relationship between the

independent variables gender, birth weight and length, duration of breastfeeding,

age of introduction to formula and age of introduction to solid foods for Hispanic

children enrolled for benefits in the Special Supplemental Nutrition Program for

Women, Infants and Children (WIC) in Philadelphia, Pennsylvania and the

dependent variable BMI at 36-59 months of age.

*Analytical Process 7:*

Multiple regression analysis was used to test the relationship between the BMI of

Hispanic children and the variables gender, birth weight and length, duration of

breastfeeding, age of introduction to formula and age of introduction to solid

foods.
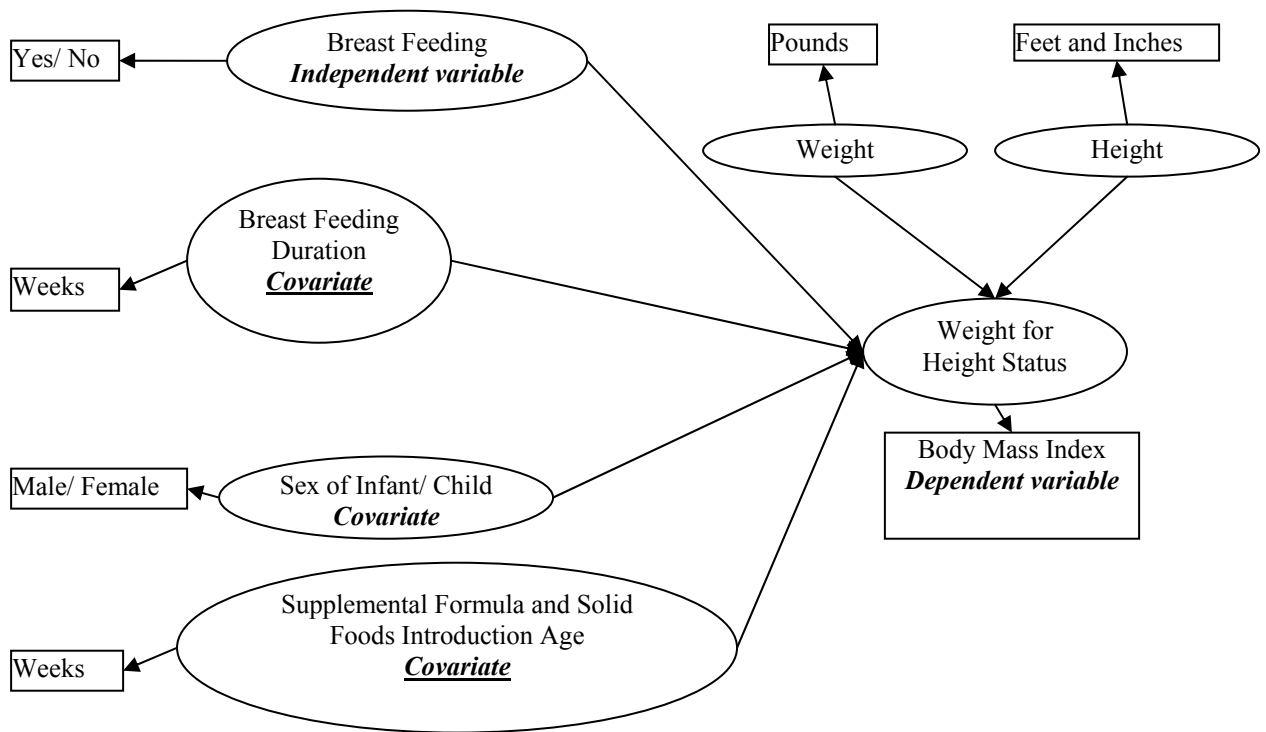
*Figure 7*. Multiple linear regression, many continuous or dichotomy predictor variables and one continuous outcome variable.

*Note*. By W. Barker, 2008, Indiana University of Pennsylvania, adapted with permission from the author.

The researcher completed the following steps to calculate and examine appropriate measures of association and tests of statistical significance for each coefficient and for the equation as a whole; (a) accepted or rejected the null hypothesis, (b) rejected or accepted the research or alternate hypothesis, (c) assessed each variable separately to obtain measures of central tendency and dispersion, frequency distributions and graphs; (d) assessed the relationship between each of the independent variables and the dependent variable through the calculation of the correlation coefficient, (e) printed a scatter plot to

see the linear relationship between the variables, (f) assessed the relationships between all of the independent variables with each other to obtain a correlation coefficient matrix for all the independent variables, (g) calculated the regression equation from the data collected, and (h) explained the practical implications of the findings (California State University, Long Beach, n.d., p.1).

Analysis was performed using the Statistical Package for the Social Sciences (SPSS) Graduate Package, version 17, SPSS REGRESSION and SPSS EXPLORE for evaluation and assumptions and helped the researcher learn "how much of the variance in the dependent variable could be explained by the independent variables. It also gave an indication of the relative contribution of each of the independent variables" (Pallant, 2006, p.145).

Use of regression analysis allowed the researcher to produce an equation that was correct for the sample of observed values. In this social science study the researcher was interested in generalizing the findings to a larger sample of Hispanic preschool children. To generalize findings from a smaller study, it was important to know that the underlying assumptions had been met, and that the accuracy of the model across different samples had been assessed (Field, 2005, p. 169). It was also important to collect enough data to obtain a reliable regression model because the estimate of $R$ that the researcher got from the regression was dependent on the number of predictors, $k$, and the sample size, $N$, ($k/(N-1)$ (Field, 2005, p. 172). "$R$ is a measure of the multiple correlations between the predictors and the outcome and the $R^2$ indicates the variance in the outcome for which the predictors account" (Field, 2005, p. 174).

Paired height and weight measurements were used in this study to generate the BMI for each child. The computerized WIC data base automatically generated a BMI growth chart by gender for each child using the birth measurements. A child was documented at risk for overweight status with a BMI level between the 85th and 89th percentile; documented as overweight with the BMI level is between the 90th and 94th percentile and at risk for obesity with the BMI level at or greater than the 95th percentile.

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3$$

*Figure 8.* Multiple regression equation

## Threats to Validity

The major threat to the validity of this research was the use of secondary data previously collected by multiple individuals as a part of the WIC assessment eligibility process in fourteen WIC offices located in Philadelphia County. In addition, the lack of data related to the maternal medical history including maternal pre-pregnancy weight, maternal age, maternal smoking and maternal level of education, all which have a negative effect on the mother's choice to breastfeed were not available.

## Measures Taken to Protect Participant's Rights

IRB Approval Number: 03-19-09-0304007

Prior to beginning this research study the investigator discussed the project with key members of the two major stakeholder communities, the Board of Directors of NORTH, Inc. the parent agency managing the Philadelphia WIC Program and the Pennsylvania Department of Health, Division of WIC, grantor for the program; and

obtained written consent to collect the data and to complete the research project. Copies of the final project were shared with these agencies. Internal Review Board approval was obtained because this type of study has been completed by other members of the research community and the study does not pose any risk to a protected population group and did not require consent forms from participants. There was no physical or emotional harm to the children because the study use historical records as the source of anthropometric and feeding data that contained no personal identification of the children used in the study.

## Summary

The purpose of this chapter was to provide a complete disclosure of the methods and procedures used to conduct the study. The researcher discussed the design of the study, the population sample and the sampling process. Specific information concerning the sample size and the process used to collect the data were discussed in detail.  The techniques used to test the hypotheses of the study were also described and in conclusion the researcher discussed the measures taken to protect the participant's rights in this study.

The rising prevalence of obesity in Hispanic preschool children has shown a need for more information about the association between breastfeeding duration and obesity in this age group; it is suggested that this study will provide additional information concerning this public health problem. Significant social change is anticipated through the distribution of technical reports and presentations of the resulting data at professional meetings including the National WIC Association Annual Meeting and the Society for Nutrition Education Annual Meeting. Data will be shared with the members of the medical and nutrition professional community. By making the message clear, simple and

action oriented, it will be easier to develop more appropriate teaching materials and to share information about the importance of breastfeeding with members of the Hispanic community in an effort to increase the incidence and duration of breastfeeding among Hispanic women.

Chapter 4 discussed the study results and provided data on the techniques used to test each hypothesis of the study. And finally Chapter 5 provides an interpretation of the findings, implications for social change, and recommendations for further actions and study.

CHAPTER 4:

STUDY RESULTS

Introduction

This chapter reports the results of this retrospective, cohort study. The BMI of two groups of Hispanic children were compared, those that were breastfed and those that were not breastfed. The aim was, to identify factors associated with increased BMI in Hispanic children, 36-59 months of age, who were enrolled for WIC benefits in the Special Supplemental Nutrition Education Program for Women, Infants and Children (WIC) in Philadelphia, PA.

*Overview of Data*

The descriptive statistics of the variables used in this study are presented in Table 6.

Table 6

*Descriptive Statistics for Hispanic WIC Children in Study*

| Characteristics | n ( % ) [a] | Mean | Std. Deviation | Std. Error |
|---|---|---|---|---|
| Gender | | | | |
|    Male | 2237 (50.22) | | | |
|    Female | 2217 (49.78) | | | |
| Breastfeeding Status | | | | |
|    Never breastfed | 3273 (73.48) | | | |
|    Breastfed | 1181 (26.52) | | | |
| Birth Weight | 4454 | 7.077 | 1.26 | .019 |
| Birth Height | 4454 | 19.718 | 1.44 | .022 |
| Age [months] | 4454 | 47.652 | 7.04 | .106 |
| Breastfeeding Duration [weeks] | 1181 | 5.49 | 8.58 | .250 |
| Age of Introduction to Formula [weeks] | 1181 | 38.58 | 60.03 | 1.74 |
| Age of Introduction to Solids [weeks] | 4454 | 20.13 | 9.61 | .144 |
| BMI at 36-59 months [b] | 4454 | 17.047 | 2.18 | .033 |

[a] n = 4454
[b] Body Mass Index is weight in pounds divided by height in inches squared x 703

Of the 4,454 records reviewed, 2,237 or 50.22% were male infants and 2,217 or 49.78% were female infants and only 1,181 (26.52%) of these infants were breastfed. The duration of breastfeeding was 5.49 weeks (SD 8.58), the age at which the breastfed infants were introduced formula was 38.58 weeks (SD 60.03), and the age at which all infants were introduced to solid foods was 20.13 weeks (SD 9.6). The mean BMI for this population at 36-59 months of age was at the 85th percentile, 17.04 (SD 2.18).

Data were electronically transferred from the Pennsylvania Department of Health, Division of WIC in a Microsoft EXCEL format for all active Hispanic children, 36-59 months of age as of April 1, 2009. These data included the following information: date of birth, birth weight, birth length, birth BMI, gender, breastfeeding (y or n); date formula was introduced to breastfed infants, date solid foods were introduced to all the infants, weight, height and BMI as of April 1, 2009.

```
┌─────────────────────────────────────────────────┐
│  ┌───────────────────────────────────────────┐  │
│  │          SELECTION CRITERIA               │  │
│  │  Hispanic children between 36-59 months    │  │
│  │         as of 4/1/2009                     │  │
│  │             n= 7176                        │  │
│  └───────────────────────────────────────────┘  │
│                      │                           │
│                      ▼                           │
│  ┌───────────────────────────────────────────┐  │
│  │          EXCLUSION CRITERIA               │  │
│  │  Date of most recent height/weight less    │  │
│  │         than 6 months ago.                 │  │
│  │             n= 6019                        │  │
│  └───────────────────────────────────────────┘  │
│                      │                           │
│                      ▼                           │
│  ┌───────────────────────────────────────────┐  │
│  │          EXCLUSION CRITERIA               │  │
│  │        Match Data Pairwise[a]             │  │
│  │             n= 4672                        │  │
│  └───────────────────────────────────────────┘  │
│                      │                           │
│                      ▼                           │
│  ┌───────────────────────────────────────────┐  │
│  │          EXCLUSION CRITERIA               │  │
│  │          De-duplicate[b]                  │  │
│  │             n= 4454                        │  │
│  └───────────────────────────────────────────┘  │
└─────────────────────────────────────────────────┘
```
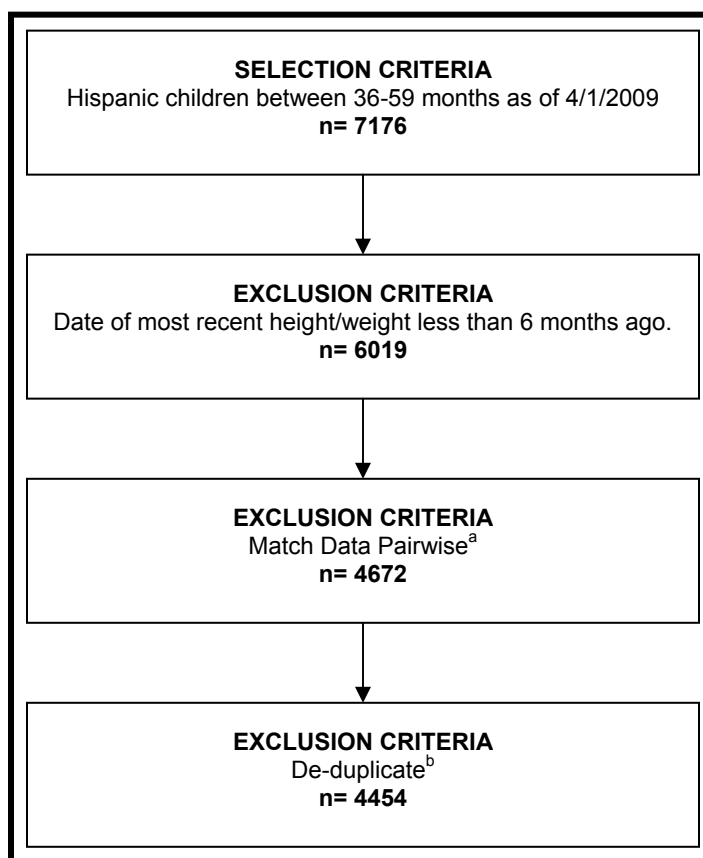
[a] – Match pair wise: [Each variable must be present in the set of variables] birth weight, birth length, current height, current weight, date of birth, date of introduction to formula, date of introduction to solids, breastfed status, duration of exclusive breastfeeding.
[b] – The same participant is recorded on multiple occasions.

*Figure 9.* Selection/Exclusion criteria for study

With the use of Microsoft EXCEL the researcher examined and cleansed the data.

Duplicate records (218), the same participants' data recorded on multiple occasions,

records with incomplete (did not include all variables) or incorrect data (1,347) and

records of participants that did not have height or weight measurements recorded within

six months prior to collection (1,157) were eliminated.  The data base was reduced from

7,176 records to 4,454 records. The excluded data was further analyzed for specific

patterns (geographic office, recorder, etc) but none were clearly defined therefore the data

was not salvageable. The Statistical Package for Social Sciences (SPSS), version 17

software program was used to analyze the data collected from these historical WIC

records using *t*-statistics, Pearson's correlation coefficient, and multiple regressions.

Study Results

Of the 4,454 WIC preschool Hispanic children in the study, 1,897 (42.60%) were

recorded as being overweight or obese.  This is greater than four times the national

average of 10% as reported by Ogden and associates in 2002 (Ogden et al., 2002).  While

most of the published studies addressed overweight and obesity for children of Mexican-

American heritage, the Hispanic children in this study were from a cultural group with

limited data available. In this study the Hispanic preschool children were predominately

from Puerto Rico, and Central and South Americas, where the prevalence of overweight

and obesity is extremely high. The findings in this study aligned with those of other

studies which failed to observe a significant, protective effect of exclusive breastfeeding

for children of Hispanic heritage (Kersey et al., 2005).

$RQ_1$

What is the relationship between Hispanic preschool children enrolled for benefits

in the WIC program in Philadelphia, PA who were breastfed and their BMI at 36-59

months of age?

$H_0{}^1$

There is no statistically significant relationship between  Hispanic children

enrolled for benefits in the WIC program in Philadelphia, Pennsylvania who were

breastfed and their BMI at 36-59 months of age.

Table 7.

*Descriptive statistics for $H_0{}^1$*

**Group Statistics**

| | BF Status | n | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| BMI | No | 3273 | 17.0724 | 2.2488 | .0393 |
| | Yes | 1181 | 16.9747 | 2.0072 | .0584 |

Table 8

*t test for $H_0{}^1$ (BF/BMI)*

| | | Levene's Test for Equality of Variances | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | F | Sig. | T | Df | Sig. (2-tailed) | Mean Difference | Std. Error Difference |
| BMI | Equal variances assumed | 3.161 | .075 | 1.317 | 4452 | .188 | .0978 | .0743 |
| | Equal variances not assumed | | | 1.389 | 2319.343 | .165 | .0978 | .0704 |

An independent samples *t* test analysis was conducted to test null hypothesis 1 based on

the breastfeeding status (yes or no) as compared to the BMI of the Hispanic children 36-

59 months of age. The variables are breastfeeding status with ('no' coded as 1 and 'yes'

coded as 2) and BMI at 36-59 months of age. The researcher found that the WIC

community defines breastfeeding as "ever breastfed yes or no" (Pennsylvania Department

of Health, 2004); therefore the coding revealed only if the child had been breastfed but

did not reflect duration. There was no significant difference in BMI values for the 3,273

participants who were not breastfed (M=17.07, SD = 2.25) as compared to the 1,181 who were breastfed (M=16.97, SD = 2.01; t (4452) = 1.32, *p* = .188). The magnitude of the difference in the means was small but there was a difference, therefore, the null hypothesis 1 was accepted.

RQ$_2$

What is the relationship between the gender of Hispanic preschool children enrolled for benefits in the WIC program in Philadelphia, PA and their BMI at 36 – 59 months of age?

$H_0{}^2$

There is no statistically significant relationship between the gender and the BMI of Hispanic children; ages 36-59 months, enrolled for benefits in the WIC program in Philadelphia, Pennsylvania.

Table 9

*Descriptive statistics for $H_0{}^2$*

|  | GenCd | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| BMI | Female | 2217 | 16.9801 | 2.28541 | .04854 |
|  | Male | 2237 | 17.1124 | 2.08447 | .04407 |

Table 10

*t test for $H_0{}^2$ (gender/BMI)*

| | | Levene's Test for Equality of Variances | | | | | Sig. (2-tailed) | Mean Difference | Std. Error Difference |
|---|---|---|---|---|---|---|---|---|---|
| | | F Sig. | | t | Df | | | | |
| BMI | Equal variances assumed | 3.469 | .063 | -2.018 | 4452 | | .044 | -.13223 | .06553 |
| | Equal variances not assumed | | | -2.017 | 4407.293 | | .044 | -.13223 | .06556 |

An independent samples *t* test analysis was conducted to compare the BMI values for the children by gender to determine if there was a relationship between the gender of the children and their BMI at 36–59 months of age. The p value is less than 0.05 showing that there was a significant difference between gender values, when observing the mean values for females (M = 16.9801, SD = 2.28541) as compared to the males (M = 17.1124, SD = 2.08447). The Sig. 2-tail value is .044, therefore, the $H_0{}^2$ for this study was rejected.

RQ$_3$

What is the relationship between the birth weight and length of Hispanic preschool children enrolled for benefits in the WIC program in Philadelphia, PA and their BMI at 36-59 months of age?

$H_0{}^3$

There is no statistically significant relationship between birth weight and length and the BMI of Hispanic children; ages 36-59 months, enrolled for benefits in the WIC program in Philadelphia, Pennsylvania.

An independent samples *t* test analysis was not conducted for this null hypothesis to compare the BMI values for the children at 36-59 months of age with their birth weight and length.  The researcher chose not to use multiple *t* tests to thoroughly compare the relationship between the birth weight and length for children in the four weight category groups (underweight, normal, overweight and obese). Instead an analysis was conducted using a one-way between groups analysis of variance (ANOVA) to explore the impact of birth weight and birth length on the BMI of the Hispanic children 36-59 months of age. Subjects were divided into the four groups according to their BMI at 36-59 months of age (Group 1: underweight; Group 2: normal; Group 3: overweight; and Group 4: obese). The researcher chose to use ANOVA because this analytical process would provide information on how the independent variables would interact with the dependent variable and also show the effects the interactions would have on each other (Field, 2005).  Use of ANOVA also produces an *F-statistic* or *F-ratio* which is similar to the *t statistic* and has been used when "the researcher has two or more groups and wishes to compare their mean scores on a continuous variable" (Pallant, 2006, p.97).

Table 11

*Descriptive statistics for $H_0{}^3$*

|  |  | N | Mean | Std. Deviation | Std. Error |
|---|---|---|---|---|---|
| Birth Weight | Underweight | 66 | 6.4091 | 1.53435 | .18887 |
|  | Normal | 2491 | 6.9250 | 1.25322 | .02511 |
|  | Overweight | 871 | 7.2292 | 1.20003 | .04066 |
|  | Obese | 1026 | 7.3587 | 1.24154 | .03876 |
|  | Total | 4454 | 7.0768 | 1.26139 | .01890 |
| Birth Length | Underweight | 66 | 19.2519 | 1.94633 | .23958 |
|  | Normal | 2491 | 19.6474 | 1.43702 | .02879 |
|  | Overweight | 871 | 19.7859 | 1.64310 | .05567 |
|  | Obese | 1026 | 19.8623 | 1.23135 | .03844 |
|  | Total | 4454 | 19.7181 | 1.44851 | .02170 |

Table 12

*$H_0{}^3$: ANOVA for $H_0{}^3$ (birth weight/ birth length/ BMI)*

|  |  | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| Birth Weight | Between Groups | 188.584 | 3 | 62.861 | 40.561 | .000 |
|  | Within Groups | 6896.567 | 4450 | 1.550 |  |  |
|  | Total | 7085.152 | 4453 |  |  |  |
| Birth Length | Between Groups | 52.147 | 3 | 17.382 | 8.325 | .000 |
|  | Within Groups | 9291.107 | 4450 | 2.088 |  |  |
|  | Total | 9343.254 | 4453 |  |  |  |

The descriptive statistics shown in Table 11 for the birth weight and length have

been divided by the four weight categories designated by the National Heart, Lung and

Blood Institute (1998). Of the 4,454 children in this WIC study, the researcher found that

only 66 children (1.48%) were found to be underweight, 2,491 children (55.92%) were

within the normal weight range, 871 children (19.55%) were overweight, and 1,026

children (23.35%) were obese.

A statistically significant difference at the p <.05 level in birth weight for the four

BMI classifications is seen in Table 12 [F (3, 4453) = 40.56, p =.000]. Despite reaching

statistical significance, the actual difference in mean scores between the groups was quite

small. The effect size for birth weight, calculated using Eta squared was .03. Post-hoc

comparisons using the Tukey Honestly Significant Difference (HSD) test indicated that

the mean score for birth weight for group 1 (M=6.41, SD = 1.53) was significantly

different from groups 2, 3 and 4. Group 2 (M= 6.93, SD = 1.25) was significantly

different from groups 1, 3 and 4. Group 3 (M=7.23, SD = 1.20) was significantly

different from groups 1 and 2.  Group 4 (M=7.36, SD = 1.24) was significantly different

from groups 1 and 2. Group 3 did not differ significantly from group 4.

There was not as much of a difference at the p <.05 level between the four groups

for birth length [F, (3, 4450) = 8.325. p = .000]. The actual difference in mean scores

between the groups was quite small (within .61). Post-hoc comparisons using the Tukey

HSD test indicated that the mean score for birth length for group 1 (M=19.25, SD = 1.95)

was significantly different from groups 3 (M=19.79, SD = 1.64) and 4 (M=19.86, SD =

1.23).  Group 2 (M = 19.65, SD = 1.44) was significantly different from group 4 at the

p<.05 level. The effect size for birth length, calculated using Eta squared was .006.

Therefore the $H_0^3$ was rejected.

RQ$_4$

What is the relationship between the duration of breastfeeding for Hispanic children enrolled for benefits in the WIC program in Philadelphia, PA and their BMI at 36-59 months of age?

$H_0{}^4$

There is no statistically significant relationship between the duration of breastfeeding for Hispanic children enrolled for benefits in the WIC program in Philadelphia, Pennsylvania and their BMI at 36-59 months of age.

Table 13

*Descriptive statistics for null hypothesis 4*

| BF Code | | Mean | Std. Deviation | n |
|---------|-----|------|----------------|-----|
| Yes | BMI | 16.97 | 2.00 | 1181 |
| | Exclusive BF Weeks | 5.49 | 8.58 | 1181 |

Table 14

*Pearson's correlation coefficient for null hypothesis 4( duration of breastfeeding/ BMI)*

| BF Code | | | BMI | Exclusive BF Weeks |
|---------|---|---|-----|--------------------|
| Yes | BMI | Pearson Correlation | 1 | -.044 |
| | | Sig. (2-tailed) | | .129 |
| | | n | 1181 | 1181 |
| | Exclusive BF Weeks | Pearson Correlation | -.044 | 1 |
| | | Sig. (2-tailed) | .129 | |
| | | n | 1181 | 1181 |

a. Cannot be computed because at least one of the variables is constant.

In Table 13 there is a minimal difference in the mean for children that were

breastfed (16.97) as compared to those that were not breastfed (17.07). Statistically the

short duration of exclusive breastfeeding has had no impact on the BMI of the children at

36-59 months of age. The relationship, shown in Table 14, between the duration of

breastfeeding for the Hispanic children enrolled for benefits in this study and their BMI at

36 - 59 months of age was investigated using Pearson's correlation coefficient. There was

a weak, negative association between the two variables [r=.044, n=1181, p <.002]. As

such, the $H_0{}^4$ was accepted.
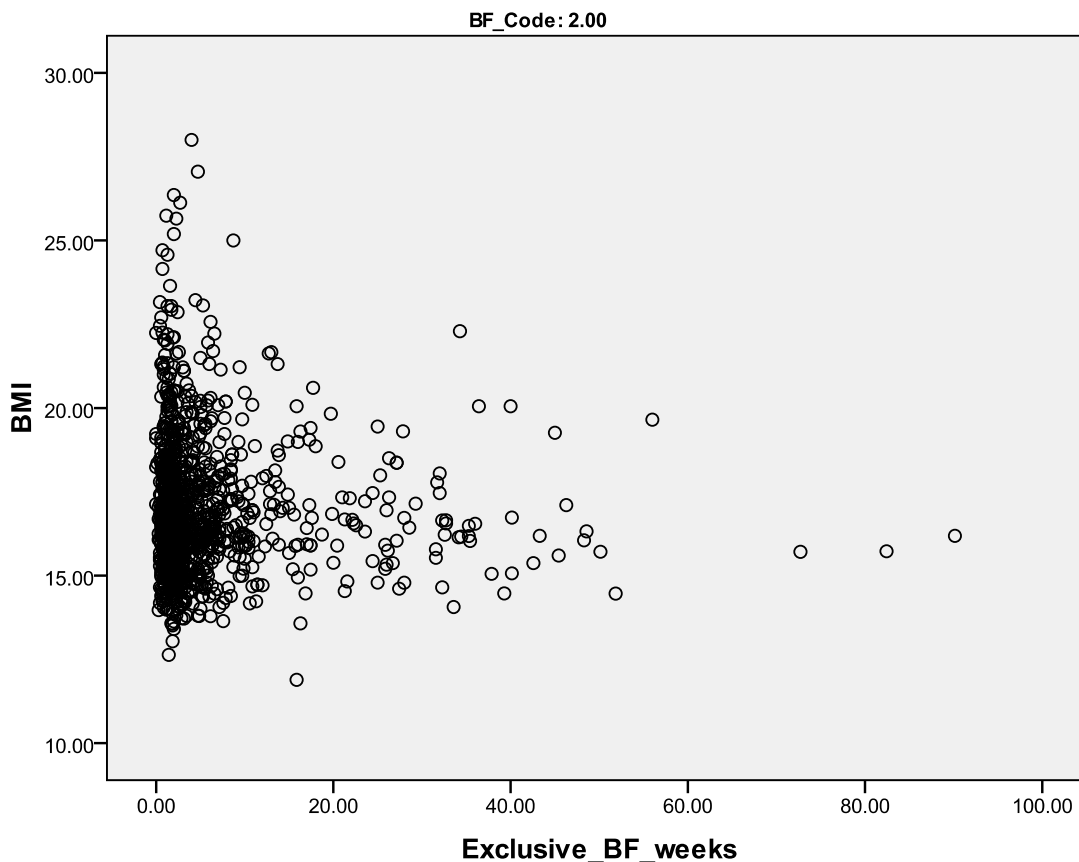
*Figure 10.* Scatter plot graph for $H_0{}^4$ showing relationship of variables in Table 14

In this diagram a negative or inverse relationship was indicated. The magnitude of this

correlation coefficient indicated that the strength between these two variables was

negative. WIC defines breastfeeding as "any woman who breastfeeds at least once per

day" (Pennsylvania Department of Health, 2004). Although 1,181 women initially chose

to breastfeed, the mean population did not breastfeed for more than six weeks. As a

result, breastfeeding did not have a significant impact on the BMI of the children at 36 -

59 months of age.

The fact that the WIC community defines breastfeeding as 'yes' or 'no' with no

requirement for the duration of breastfeeding to be documented made it necessary for the

researcher to define breastfeeding duration and to classify duration periods based on the

available data to prevent error in the research process. Based on previous studies

(Grummer-Strawn & Mei, 2004) the classifications used were:  Group 1 no duration (not

breastfeeding), Group 2 short duration (0 -1.99 weeks), Group 3 (mid range duration (2.0

– 7.9 weeks), Group 4 low normal duration (8.0 – 15.9 weeks), Group 5   upper normal

duration (16.0 – 31.9), and Group 6 long duration (32+ weeks).  When reviewing the

data, the researcher found that the available data did not specify duration dates for

exclusive breastfeeding. It was also discovered that the date for introduction to formula

often coincided with the date that the infant was enrolled in the WIC program, not the

date of birth. If the mother had chosen to breastfeed and then stopped prior to enrolling

the new infant, there was no documentation of breastfeeding; the records only

documented the date formula was given. The fact that duration of exclusive breastfeeding

was documented as having a more positive effect on the reduced risk of overweight for

preschool children (Kersey et al., 2005) and the data in the WIC records was limited, the

researcher chose to used the date of birth as the beginning date for exclusive

breastfeeding and the date of introduction to formula as the end date for exclusive

breastfeeding. This was done to eliminate possible error when document breastfeeding

duration.

$RQ_5$

What is the relationship between the age of introduction to formula for Hispanic

preschool children enrolled for benefits in the WIC program in Philadelphia, PA and their

BMI at 36-59 months of age?

$H_0{}^5$

There is no statistically significant relationship between the age of introduction to

formula for Hispanic children enrolled for benefits in the WIC program in Philadelphia,

PA and their BMI at 36-59 months of age.

Table 15.

*Pearson's correlation coefficient for $H_0{}^5$*

| | | Age of Intro | BMI |
|---|---|---|---|
| Formula | Pearson Correlation | 1 | - .041 |
| | Sig. (2-tailed) | | .157 |
| | N | 1181 | 1181 |
| BMI | Pearson Correlation | -.041 | 1 |
| | Sig. (2-tailed) | .157 | |
| | N | 1181 | 1181 |

Children that were not breastfed were given formula from birth therefore this calculation

only includes breastfed infants (1,181) and the age at which they were introduced to

formula. The relationship between the age of a child when introduced to formula and the

BMI at 36 – 59 months of age was investigated using Pearson's correlation coefficient.

Preliminary analyses were performed to ensure no violation of the assumptions of

normality, linearity and homoscedasticity. There was a weak, positive correlation

between the two variables (r=-0.041, n=1181, p<.0005), therefore $H_0{}^6$ was rejected.
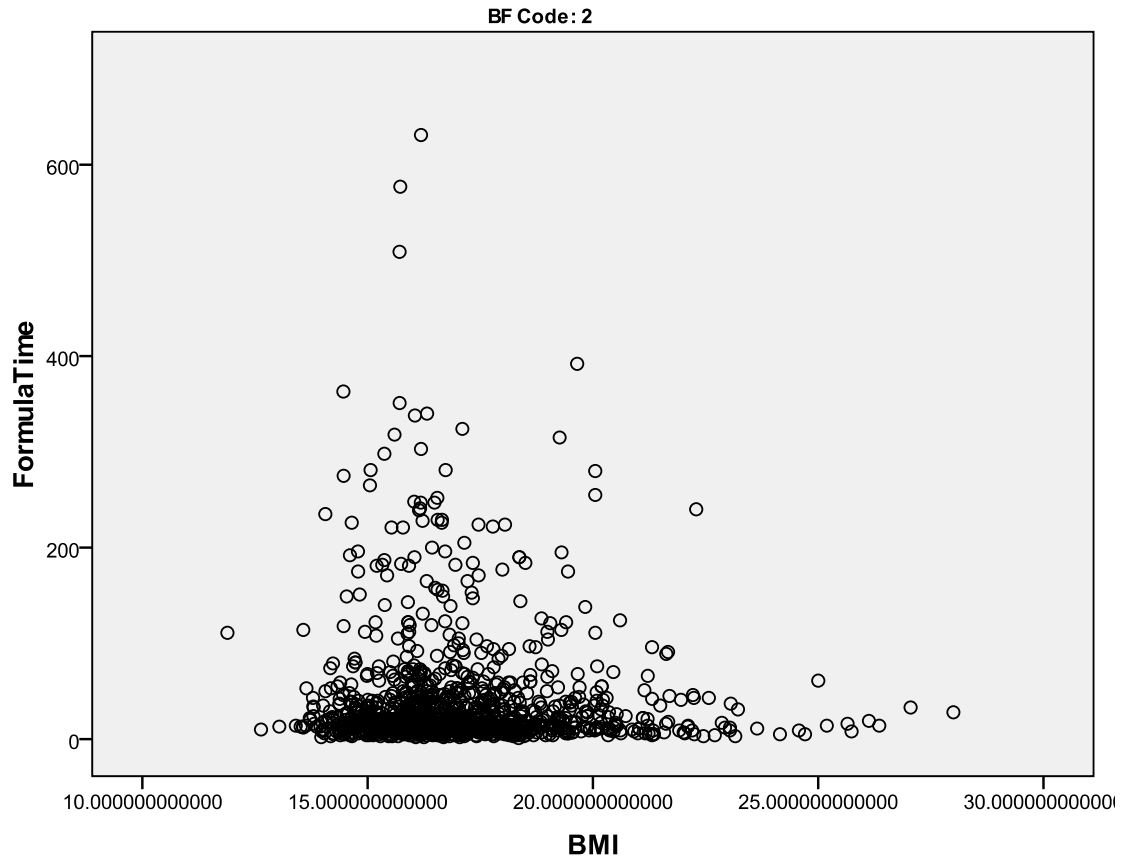
*Figure 11*. Scatter plot graph for null hypothesis 5 showing relationship of variables in Table 15

RQ$_6$

What is the relationship between the age of introduction to solid foods for Hispanic preschool children enrolled for benefits in the WIC program in Philadelphia, PA and their BMI at 36-59 months of age?

$H_0{}^6$

There is no statistically significant relationship between the age of introduction to solids for Hispanic children enrolled for benefits in the WIC program in Philadelphia.

Table 16

*Descriptive Statistics for $H_0{}^6$*

|  | Mean | Std. Deviation | N |
|---|---|---|---|
| BMI | 17.05 | 2.19 | 4454 |
| Solid Time [weeks] | 20.13 | 9.61 | 4454 |

The mean age in weeks for introduction to solid foods for all children was 20.13 weeks. Questions raised concerning the children that were introduced to solids at ≥32 weeks caused the researcher to look more closely at the data. Analysis of the lower level of granularity revealed that the data contained errors. Outliers in the scatter plot diagram (Figure 12) showed children that were 36 weeks or older when introduced to solids. The date used as date of introduction to solids for infants on the WIC program is usually a date that is six or more months from the date of birth because the WIC program does not provide solid foods until 16 weeks of age or older. Sixty-six children were recorded as beginning solid foods at greater than 36 weeks of age.  For children older than 36 weeks of age, this date was found to be the date that the child was first enrolled for WIC benefits. A child enrolled for the first time at age 36 weeks or more would have no history of feeding as an infant. There is no data for these children prior to the WIC enrollment date. The delta used for solid time introduction was artificially high. Therefore these data are not statistically significant.

Table 17

*Pearson's correlation coefficient for $H_0{}^6$ (solids/ BMI)*

|  |  | BMI | Solid Time [weeks] |
|---|---|---|---|
| BMI | Pearson Correlation | 1 | -.011 |
|  | Sig. (2-tailed) |  | .475 |
|  | n | 4454 | 4454 |
| Solid Time [weeks] | Pearson Correlation | -.011 | 1 |
|  | Sig. (2-tailed) | .475 |  |
|  | N | 4454 | 4454 |

The relationship between the age of introduction to solid foods for the Hispanic children

enrolled for benefits in this study and their BMI at 36-59 months of age was investigated

using Pearson's correlation coefficient. Table 17 presents a comparison of BMI and age

in weeks when the infant was introduced to solid foods. There was a weak, negative

correlation between the age of introduction to solids and the BMI for these children at 36-

59 months of age. The older the child was before being introduced to solids, the greater

the probability that they would be at or lower than the 85th percentile for BMI at 36-59

months of age. The test for $H_0{}^6$ was rejected.
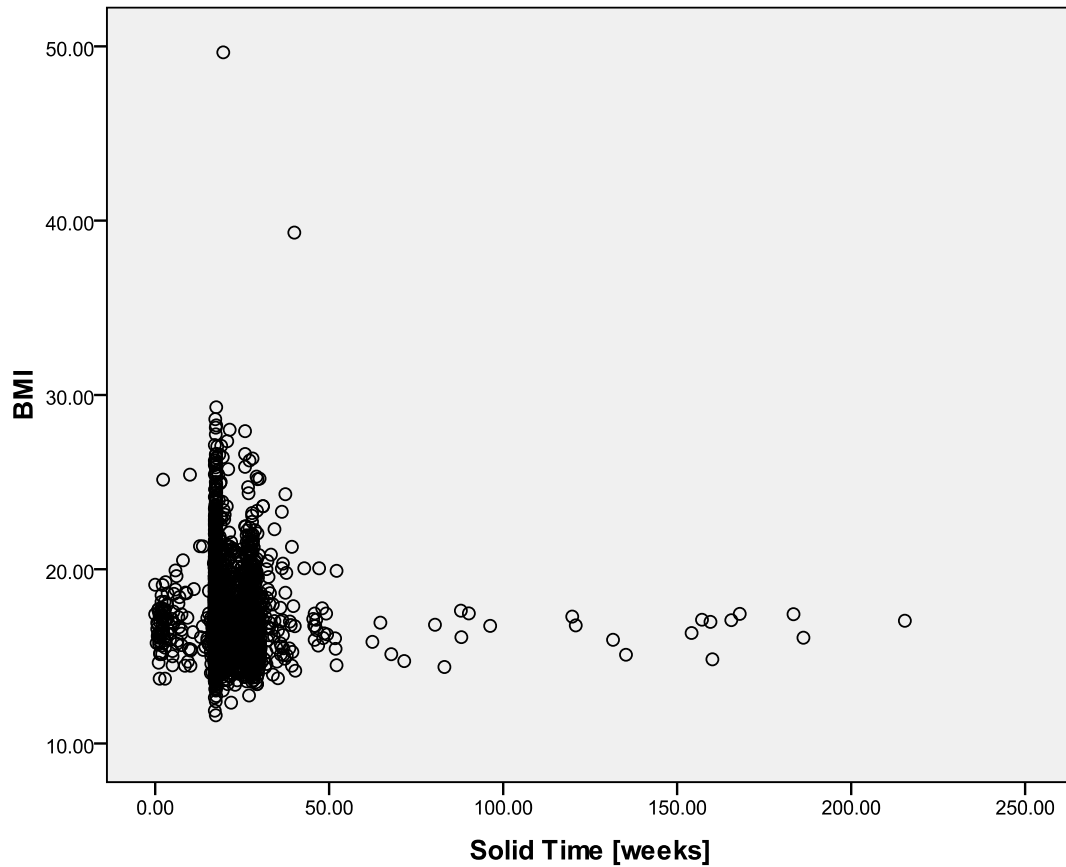
Figure 12. *Scatter plot graph for null hypothesis 6 showing the relationship between variables in Table 17*

In this diagram the age of the children when they were introduced to solid foods is shown in weeks. The tight clusters in the scatter plot graph show that the majority of the population introduced their children to solid foods about the same time, between 10 and 21 weeks of age.

RQ$_7$

Which of the variables are the best predictors of the BMI being within the normal range for Hispanic children?

$H_0{}^7$

There is no statistically significant relationship between the independent variables gender, birth weight and length, duration of breastfeeding, age at which the child was introduced to formula and age at which the child was introduced to solid foods for Hispanic children enrolled for benefits in the WIC program in Philadelphia and their BMI at 36-59 months of age.

Multiple linear regression analysis was used to develop a model for predicting BMI for Hispanic children aged 36-59 months of age from their birth weight, birth length, birth BMI, duration of breastfeeding, length of time until formula was introduced, and the length of time until solid food was introduced. Basic descriptive statistics are shown in Table 18.

*Table 18*

Descriptive Statistics for $H_0{}^7$

| | Mean | Std. Deviation | N |
|---|---|---|---|
| BMI | 17.04655816370666 | 2.187553445233605 | 4454 |
| Birth Wt | 7.07677 | 1.261387 | 4454 |
| Birth Ht | 19.71812 | 1.448514 | 4454 |
| Birth BMI | 12.82 | 3.284 | 4454 |
| Exclusive BF [weeks] | 1.46 | 5.039 | 4454 |
| FormulaTime | 10.23 | 35.286 | 4454 |
| Solid Time [weeks] | 20.12919366219750 | 9.609606093949983 | 4454 |

The researcher expected the duration of exclusive breastfeeding to be one of the best predictors of the BMI for the children to be ≤85th percentile. This finding was expected because earlier research had suggested exclusive breastfeeding for at least 4 months to be associated with a protective effect against overweight or with a reduced rate of overweight for non-Hispanic White children (Gummer-Strawn & Mei, 2004). The mean duration of breastfeeding for the Hispanic children in this study was 5.49 weeks. Based on previous research which included Hispanic preschool children ages 2-6 by Kersey and Associates (2005), each additional month that the child is breastfed is associated with a 10% decrease in the odds ratio for overweight after controlling for variables similar to this study of WIC children.

Kersey & Associates also suggested that a longer duration of breastfeeding may be helpful in overcoming the problem of overweight. The 1,181 Hispanic breastfed children in this study were not breastfed long enough to make a significance difference in their BMI.

The Model Summary in table 19 shows that the model, the complete set of variables in the study, explains only 2.7% of the variance in BMI. This further supports the acceptance of $H_0{}^7$.

*Table 19*

Model Summary$^{b}$ for $H_0{}^7$

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .163$^{a}$ | .027 | .025 | 2.16 |

a. Predictors: (Constant), Solid Time [weeks], Birth Wt, FormulaTime, Birth BMI, Birth Ht, Exclusive BF [weeks]

b. Dependent Variable: BMI

The ANOVA test produced a Sig value of .000 indicating that there was no significant difference among the mean BMI values across the six variables.

*Table 20*

ANOVA$^{b}$ for $H_0{}^7$

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 564.920 | 6 | 94.153 | 20.184 | .000$^{a}$ |
| | Residual | 20744.422 | 4447 | 4.665 | | |
| | Total | 21309.342 | 4453 | | | |

a. Predictors: (Constant), Solid Time [weeks], Birth Wt, FormulaTime, Birth BMI, Birth Ht, Exclusive BF [weeks]

b. Dependent Variable: BMI

As we compare the contributions of each of the six independent variables we see listed in the Standardized Coefficients table, we see the largest Beta values are associated with the duration of exclusive breastfeeding in weeks and the length of time before formula was

introduced for the children and their effect on the BMI of the children at 36-59 months of

age.

*Table 21*

Pearson's Correlation Coefficient for $H_0{}^7$

| Model | | Unstandardized Coefficients | | Standardized Coefficients | | |
|---|---|---|---|---|---|---|
| | | B | Std. Error | β | t | Sig. |
| 1 | (Constant) | 16.919 | .675 | | 25.070 | .000 |
| | Birth Wt | .348 | .046 | .201 | 7.489 | .000 |
| | Birth Ht | -.109 | .040 | -.072 | -2.751 | .006 |
| | Birth BMI | -.009 | .014 | -.013 | -.629 | .529 |
| | Exclusive BF [weeks] | -.326 | .164 | -.751 | -1.990 | .047 |
| | FormulaTime | .045 | .023 | .726 | 1.923 | .054 |
| | Solid Time [weeks] | -.002 | .003 | -.011 | -.727 | .467 |

a. Dependent Variable: BMI

This study agrees with the earlier research "that no single factor has been shown

to protect a child from overweight, and accordingly, no single trait or practice can be

identified as the cause of childhood overweight" (Procter & Holcomb, 2008, p. 110).

Although hypotheses $H_0{}^1$, $H_0{}^2$, and $H_0{}^4$ were accepted and $H_0{}^3$, $H_0{}^5$, and $H_0{}^6$ were

rejected, the researcher did not find that any one of these variables were the best predictor

of the BMI for the Hispanic children 36-59 months of age to be ≤85th percentile. $H_0{}^7$ was

accepted.

Summary

In Chapter 4 the results of the BMI of two groups of Hispanic children were compared, those that were breastfed and those that were not breastfed. The aim was, to identify factors associated with increased BMI in Hispanic children, 36-59 months of age, who were enrolled for WIC in Philadelphia, PA. Regression analysis revealed that in this model, there is no one variable that significantly predicted the child's BMI being $\geq 85^{th}$ percentile (17.2 for females and 17.4 for males). The implications of these conclusions are presented in chapter 5 along with recommendations for implementation in the public health community and implications for social change. Recommendations for further research that address changes needed in the Hispanic community to reduce the rates of overweight in preschool children are also discussed.

CHAPTER 5:

DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

Overview

Obesity has become a significant public health problem for preschool children.

Studies that address early determinants for overweight in preschool children have either

been small or have not addressed the relationship between breastfeeding and the BMI of

Hispanic children (Bogen, Hanusa, & Whitaker, 2004; Dubois & Girard, 2006; Flegal,

Ogden, & Carroll, 2004). If the public health community is to succeed in making a

difference with the members of low income Hispanic families, it will be necessary to

rethink the methods used to provide information and education. The purpose of this

chapter is to interpret the findings in chapter 4. This study was important because there is

a limited amount of research that has attempted to address the relationship between

breastfeeding duration and overweight in preschool children of Hispanic heritage from

Puerto Rico, Central and South America. Although previous studies have suggested

breastfeeding to be protective against childhood overweight (Arenz, Rückerl, Koletzko,

& von Kries, 2004; Bogen, Hanusa, & Whitaker, 2004; Kramer et al., 2003; Dewey,

2003; Clifford, 2003; Gillman et al., 2001; Hediger et al., 2001; von Kries et al. 1999;

Dewey, et al., 1995; Kramer, 1981) it has not been well documented in this Hispanic

WIC population (Grummer-Strawn & Mei, 2004). In this study the researcher focused on

the association between the BMI of WIC Hispanic preschool children, ages 36 -59

months and their birth weight and length, gender, duration of exclusive breastfeeding and

age of introduction to formula and solid foods. This quantitative, retrospective cohort

study was designed to investigate the association between two groups of Hispanic

preschool children, those that were breastfed and those that were not breastfed and their BMI at 36-59 months of age.

<div align="center">Interpretation of the Findings</div>

In this study the WIC records for Hispanic preschool children 36 - 59 months of age at the time of data collection (April 1, 2009) were reviewed to compare the BMI of the children that were breastfed (1,181) to those that were not breastfed (3,273). The study found no significant relationships to support the hypotheses that any one variable was associated with the BMI of these children at age 36-59 months being ≤85th percentile. Although hypothesized, the duration of breastfeeding was not found to be associated with a reduced risk of overweight. The most significant findings revealed that the Hispanic women in this study did not breastfeed for a long enough period of time (5.49 weeks) to be associated with a decrease in the risk of overweight for their children.

The population studied was almost equally divided by gender: 2,217 females and 2,237 males. Statistically there was no difference between their BMI scores. The magnitude of the mean was extremely small (.03); therefore, there was no statistical significance. The mean birth weight scores for the children were compared and the effect of the weight groups (underweight, normal, overweight, and obese) was analyzed. No significant difference between the mean scores of the groups was found. Post hoc comparisons using the Tukey HSD test observed very slight differences in the mean birth length scores.

Previous research indicated that at least 4 months duration of breastfeeding was associated with decreased risk of overweight in children 2 to 5 years of age (Kersey et al., 2005). However, children of Hispanic heritage were twice as likely to be overweight at

age 3 (Kimbro, Brooks-Gunn, & McKanahan, 2007). In a study by Grummer-Strawn & Mei (2004) it was observed that children who were breastfed for longer periods were found to have a lower risk of overweight, but this protection against pediatric overweight was only seen when the child was breastfed for at least 3 months (12 weeks). In this study of WIC Hispanic children, the initial data revealed that 3,273 mothers reported "no" when asked if they breastfed; and 1,181 reported "yes" they did breastfeed at least once after the infant was born. The majority of the 1,181 women who reported "yes" to breastfeeding, breastfed for less than 3 weeks; the mean duration was only 5.49 weeks. The comparison of the mean BMI between the children that were breastfed (16.97) versus those that were not breastfed (17.07) was virtually the same.

Additional limitations included (a) the use of secondary data, (b) lack of data recorded in the computerized data base, (c) incorrect measurements, (d) misclassification of race and ethnicity, and (e) confounding on the data from multiple sources including genetics, physical and dietary habits of parents. Previous research suggested that the mother's weight prior to pregnancy in addition to her choice not to breastfeed could be an additional risk to the preschool child becoming overweight (Li et al., 2005). Procter and Holcomb further state that "children of mothers with pre-pregnancy BMIs in the overweight or obese categories were most likely to be overweight at age 4 years" (Procter & Holcomb, 2008, p. 110).The WHO and AAP both recommend exclusive breastfeeding for the first 6 months of life. Previous research (Eckhardt, Rivera, Adair, & Reynaldo, 2001) has shown that there may be benefits associated with exclusive breastfeeding for at least the first 4 months of life, but that it is difficult to document. Kramer & Associates reviewed a cluster randomized trial of a breastfeeding promotion intervention based on

the WHO/UNICEF Baby-Friendly Hospital Initiative. No significant intervention effects were observed on height, BMI, adiposity measures, or blood pressure in children 6 ½ years old in Canada (Kramer et al., 2009).

In this study the length of a specific duration for exclusive breastfeeding was not documented in the WIC records. The researcher learned that it was necessary to use the date of introduction to formula as compared to the date of birth to generate the duration of exclusive breastfeeding.  Although many mothers continued to breastfeed after the introduction to formula, the documentation recorded in the Quick WIC participant records was not consistent in reporting the date when breastfeeding ended. The data available on the age of introduction to solids was slightly skewed. For approximately 23 children, the date for introduction to solids was more than 52 weeks from the date of birth. Further analysis of these data revealed that this date was actually the date the child was enrolled for WIC benefits and there was no previous data available on the child's eating history as an infant. It was determined that further qualitative research was needed to follow up with mothers to discuss the infant feeding process in more detail. The data suggested that changes were needed in the methods used to educate and support mothers of Hispanic heritage and to help them to choose to breastfeed their infants for longer periods of time before introducing other foods.

Implications for Social Change

To address the problem of obesity in preschool Hispanic children living in the northern and mid-Atlantic regions of the US in a more effective manner, will require public health professionals, especially dietitians and nutritionists, health educators, physicians and nurses working in community health centers and WIC offices to provide

information and support that is designed for this population in a matter that they can understand and implement. If change is to be made in the breastfeeding incidence and duration in the Hispanic community, health educators must be prepared to provide "education, encouragement and support at the family and community levels" (Quinn et al., (2005), p. 352). Methods must be designed to develop more innovative approaches that will give the mothers and families the support needed so that they are able to (a) breastfeed for the period of time needed to ensure the health of the new infant and the mother and to (b) ensure the best possible development and psychosocial outcomes for the infant. To help the mother establish and sustain exclusive breastfeeding for the infant during the first months of the infant's life, the prenatal and post natal classes must be changed. Educators must design curriculum that include (a) specific information on the importance of breastfeeding as the only source of nutrition for the new infant, (b) ways for the mother to become and remain physically active, (c) teach the importance of weight control, (d) provide information on the relationship of BMI $\leq 85^{th}$ percentile and chronic diseases related to obesity. All of these topics must be provided in an interesting and interactive manner so that the women feel comfortable asking questions and discussing their concerns.

The data from this study suggested that public health professionals need to be able to translate their knowledge about outcomes associated with obesity into productive educational techniques that would help parents understand why obesity prevention is so important to the health of their young children. Cultural awareness is essential if there is to be change in the outcomes for these children. This study may influence positive social change by enhancing the knowledge, skills, and self-confidence of Hispanic families to

choose to breastfeed their infants and to set nutrition and physical activity goals that would lead to the reduction in the BMI of Hispanic preschool children.

Recommendations for Action

Obesity is a public health problem that is affecting the health of infants and children at an earlier age (Ogden et al., 2002). Public health professionals, especially those working with members of the WIC community, must be willing to learn more about the needs of the parents of Hispanic preschool children. They must be willing to change their approach in working with these parents and to provide education that is applicable to them as they become acclimated to living in the United States (Eckhart, Rivera, Adair, & Martorelli, 2001; Perez-Escamilla et al., 1998). These members of the professional community must understand that acculturation does not always mean that traditional health practices must be changed. More creative techniques should be used to present information to the community that will help them to understand that breastfeeding is not only the best nutrition for their new infant but that it is an acceptable method of feeding infants in the US This information should address the risk factors associated with obesity in addition to documenting the benefits of breastfeeding as it relates to the BMI of preschool children. Goal setting and positive reinforcement must be developed to help parents and extended family members ensure that their children have weights that are within normal BMI ranges.

Recommendations for Further Study

It is imperative that further research be conducted on ways to reduce childhood obesity among Hispanic preschool children. Future research studies should be both qualitative and quantitative and should include questionnaires and focus groups for

pregnant and breastfeeding women enrolled for WIC benefits and their families. These group sessions should be conducted prior to and after the birth of the child. Research that includes more cognitive interviewing may help identify the mother's thoughts about breastfeeding and why she chooses to breastfeed or not to breastfeed the infant. Focus group discussions and individual interviews may help to determine if the mother understands the information that is being provided during the prenatal period and learn more about the type of changes that should be made in the materials designed for women to increase their choice to breastfeed. Information secured during these focus group discussions and individual interviews should be used to design more appropriate print and visual materials to be used with these women as a part of education and support to encourage breastfeeding for the new infants during the first six months of life. It would also include information to help the health professionals address the cultural influences of the extended family on the feeding practices for the infant and young children. Audio and visual materials should be designed to encourage parents to share information about routine feeding choices as taught by the older members of the family and to address the modifications that could be made without eliminating all of the cultural beliefs and values associated with the practices. In addition to breastfeeding, the families should be encouraged to introduce fruits and vegetables to the infant after six months of age, eliminate the introduction of sugary liquids until after the first birthday and to understand that overfeeding until the child "spits up" is not recommended. These changes that address specific cultural themes that influence the infant feeding choices would be needed to help these Hispanic families make healthier changes to help reduce the BMI of the preschool children.

Due to the limitations of the Quick WIC system, a questionnaire is needed that would allow the health care professional to collect the additional data needed from the mother during individual interviews. These data should include information that impacted on the mother's knowledge, skills, and level of self-confidence needed to initiate and continue to breastfeed the infant. It is projected that the women who are taught the benefits and importance of breastfeeding for their infants during the prenatal period and who receive individual support in the early post partum period will develop the confidence they will need to breastfed.

The data in the questionnaire should include: (a) age of mother at birth of child, (b) pre-pregnancy BMI of mother, (c) did mother breastfeed previous children (y or n), (d) education level of mother, (e) status of current pregnancy (previous # children), (f) was mother breastfed, (g) length of time of acculturation, (h) number of visits to home country in past 12 months, and (i) date of most recent visit to home country.

The size of this study and the results of the data collected make this study one that can be generalized to the larger Hispanic population within the WIC programs in the northern and mid-Atlantic regions of the US. Changes will be needed in the methods used by the WIC staff to collect and record additional data. Use of a prospective research methodology, could increased the ownership of the data by the staff and reduce the number of errors due to incorrect data entry and lack of complete data available.

Summary

Obesity among preschool Hispanic children in the Philadelphia WIC community has increased to epidemic proportions. The findings in this study reveal that genetics, environment, and influences of extended family members may have more of an impact on

the children's weight status than the use of breast milk. Support and approval from the family may be more important than the support provided by health and social service agencies (Perez-Escamilla et al., 1998). Exclusive breastfeeding during the first 4 to 6 months of life maybe just the beginning of the change that is needed in the lives of these children if positive change is to be seen in this public health problem.

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Appendix A

Letter of Permission and Support – Pennsylvania Department of Health

**pennsylvania**
DEPARTMENT OF HEALTH

(717) 783-1289

August 28, 2008

Letter to IRB Committee from Gregory P. Landis

This letter is in support of the research project concerning Hispanic children that Linda M. Kilby, MS, RD, LDN, the principal investigator is completing as a part of her dissertation process. As the Director of the Division of Women, Infants and Children (WIC), in the Commonwealth of Pennsylvania I have known and worked with Linda for the past 14 years. As the Executive Director and WIC Program Director for NORTH, Inc. she has been responsible for the outstanding WIC service that she and her staff provide to more than 58,000 women and preschool children in Philadelphia. She has discussed her project with me and members of our IT staff. As the manager of the largest single county WIC program in Pennsylvania she successfully manages a staff of more that 160 employees and has worked closely with students from the many universities and colleges in her area. She has served as a member of the State WIC Data Users Committee since 1984 and was very instrumental in the design, implementation and initial training of WIC office staff statewide when the Quick WIC program was introduced in 2002.

Linda has described her research project and asked permission to use the WIC participant historical records to identify data needed to complete her study. She has permission to work with the members of our IT staff to secure the data needed for her study. The data Linda reports will be aggregate data and cannot identify any individual WIC participants. My staff and I trust her ability to conduct this research in a professional manner and look forward to hearing the results that can be shared with the other members of the WIC community in Pennsylvania.

Please contact me at 717-783-1289 if you have any other questions.

Sincerely,

Gregory P. Landis
Director
Division of Women, Infants and Children (WIC)

Appendix B

Letter of Permission and Support – NORTH, Inc. Board of Directors

# N.O.R.T.H.

Managers of the Philadelphia WIC Program

NORTH CENTRAL ORGANIZED
REGIONALLY FOR TOTAL HEALTH, Inc.
642 N. Broad Street, Suite 101
Philadelphia, Pennsylvania 19130

Telephone: 215-978-6100
Telephone: 800-743-3300
Facimile: 215-236-4743
Internet: www.northwic.org

Linda M. Kilby, MS, RD, LDN
Executive Director

Demonso A. Waters
President

Clarice Burke-Floyd
Vice-President

Anne Ayella
Secretary

Frederick Tolbert
Treasurer

Shelley Applegate, MS, RN
Michael F. Coates, Esquire
Maria A. Kim
Vanessa A. Mosee
Mona R. Sutnik, Ed.D, RD
Vivian VanStory

August 25, 2008

Internal Review Board
Walden University

Dear Sirs/Madame:

This letter serves as official notification that the board of directors and I,
DeMonso A. Waters, President of the Board of Directors for Northcentral
Organized Regionally for Total Health, Inc. (NORTH, Inc.) support Linda
M. Kilby in completion of her research project. NORTH, Inc. manages
the Philadelphia WIC Program and has supported many students in
completing community health and dietetic internship projects. As the
Executive Director of the agency Ms. Kilby has supported their research
activities that involved the WIC Program and its participants and that
provide additional information to be shared in the public health
community.

Linda has served as the director of the Philadelphia WIC program since
1986. When she described her research project and asked permission to
use the WIC participant historical records, the board and I felt very
comfortable in supporting her. She will also communicate and work
closely with members of the Pennsylvania WIC Program to complete the
processes necessary to secure and analyze the records of the Hispanic
children enrolled for benefits in Philadelphia, PA. We are confident in her
ability to conduct herself in a professional, ethnically sound manner.

Should you have additional questions or concerns, please do not hesitate to
contact me at 215-978-6100. If I am not in the office, please leave a
message and I will return your call.

Sincerely,

DeMonso A. Waters
President
Board of Directors

Appendix C

H511.850.1 (6/07)     **NUTRITION RISK CRITERIA FOR INFANTS & CHILDREN**

Name:_____ Address: _____ Zip Code: _____
Phone: _____

| Date (I) | Date (C) | Description | Documentation |
|---|---|---|---|
| 1AA | 3AA | Low Hemoglobin/Hematocrit: Hgb<11.0 mg/dl_____ Hct<32.9%_____ | Date: _____ |
| 1FE | 3FE | Blood lead level ≥10 mcg/dl within past 12 months_____ mcg/dl; date _____ | Date of Birth: _____ |
| 1DB | - | Large for gestational age:  Infant born ≥9 lbs. Or as diagnosed by physician | Birth Wt.:_____ |
| 1DC | 3DC | LBW and VLBW (≤5 lb 8 oz): allowed up to age 2 | Birth Ht:. _____ |
| 1DE | 3DE | Prematurity: infant or child born ≤37 weeks gestation: allowed up to age 2 | Gestational age _____ wee |
| 1DF | 3DF | Inadequate growth or failure to thrive (diagnosis required) | Growth chart |
| 1DG | 3DG | At risk of becoming overweight: children ≥24 mo. & ≥85 & <95 percentile BMI **or** infants <12 mo. born to woman with prenatal BMI ≥30 or father with BMI ≥30 **or** children ≥12 mo. with biological mother or father with BMI ≥30 at time of certification. | Growth chart Mother's or father's wt. & ht. _____ |
| – | 3DH | Overweight: ≥95% BMI or weight/length (allowed for children ≥ 24 months only). | Current Wt.: _____ |
| 1DK | 3DK | Underweight or at risk of becoming underweight: ≤10% wt/length or BMI | Current Ht.: _____ |
| 1DL | 3DL | Small for gestational age (diagnosis required) Birth weight: _____Gestational age _____ Low head circumference: <5% head/age (Infants only – use adj age for premature infants) | SGA allowed up to 2 yrs Growth chart |
| 1DM | 3DM | Short stature or risk of short stature: stature/age ≤10%  (use adj age until age 2 if premature) | Growth chart |
| 1DJ | 3DJ | Fetal alcohol syndrome (diagnosis required) | |
| 1BP | 3BP | Medical conditions such as diabetes, GI disorders, thyroid disorders, hypertension, renal disease, cancer, genetic/congenital disorders, inborn errors of metabolism, hypoglycemia, pyloric stenosis, etc. | Diagnosis_____ |
| 1BT | 3BT | Recent major surgery, trauma, burns, and other conditions severe enough to affect nutritional status, such as juvenile rheumatoid arthritis, lupus erythematosus, cardiorespiratory diseases, heart disease, cystic fibrosis, moderate/severe persistent asthma requiring daily medication. | Diagnosis_____ |
| 1FA | 3FA | Infectious diseases severe enough to affect nutritional status such as TB, pneumonia, meningitis, parasitic infections, hepatitis, bronchiolitis (3x in past 6 months), HIV/AIDS | Diagnosis_____ |
| 1FJ | 3FJ | Central nervous system disorders, such as epilepsy, cerebral palsy, Parkinson's, MS, NTD (spina bifida or myelomeningocele); or developmental delays interfering with the ability to eat. | Diagnosis_____ Dietary assessment |
| 1FD | 3FD | Drug nutrient interactions (antibiotic use ≥30 days in past 6 months): from_____ to _____ ; medications: _____ from_____ to _____ ; medications: _____ from_____ to _____ ; medications: _____ | Medications used & timeframes |
| 1FL | 3FL | Dental problems | Specify_____ |
| CD | – | Breastfeeding infant of a woman at nutritional risk (same priority as mother) | Mother's risk _____ |
| 1BF | – | Breastfed infant with inadequate stooling & wetting patterns. Number of dirty/wet diapers/day: _____ | Diagnosis required for inadequate stooling. |
| 4HI | – | Inappropriate infant feeding practices | Dietary assessment & bottle feeding checklist |
| | 5HC | Inappropriate Nutrition Practices for Children | Dietary assessment & bottlefeeding checklist |

*Inadequate Growth in Infants and Children*
*Applicable to Risk Code DF*

| Date (I) | Date (C) | Description | Documentation |
|---|---|---|---|
| 1CM | 3CM | Food allergies, celiac disease, or lactose intolerance | Diagnosis_____ |
| 4HP | 5HP | Dietary risk associated with Complementary Feeding Practices (I: 4-12 months old, C: 12-23 months) Failure to meet Dietary Guidelines for Americans (C: ≥2 years old) | Dietary assessment |
| 4FM | 5FM | Primary care giver with limited ability to make feeding decisions and/or prepare food; foster care Date entered current foster home:_____ | Specify_____ |
| 1FN | – | Infant born to a woman with diagnosed mental retardation or who abused alcohol/drug during the most recent pregnancy | Specify_____ |
| 2FP | – | Infant of WIC mother or woman who would have been eligible during pregnancy (≤6 mos old). | Mother's risk: _____ |
| – | 3DA | Possibility of regression | Complete assessment required |
| 4HB | 5HB | Migrancy or homeless: (circle one) | |
| 1HZ | 3HZ | Transfer of certification | VOC card |

**REFERRING AGENCY INFORMATION**

Date: _____ Health Care Professional's Signature: _____

Name (Please Print): _____ Title: ☐ MD      ☐DO
            ☐RN                                              ☐RD                                              ☐ Other

| BMI Table for Parents of Infants/Children | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Height | Wt = BMI 30 | Height | Wt = BMI 30 | Height | Wt = BMI 30 | Height | Wt = BMI 30 | Height | Wt = BMI 30 |
| 58 inches | 143 lbs. | 62 inches | 164 lbs. | 66 inches | 186 lbs. | 70 inches | 209 lbs. | 74 inches | 233 lbs. |
| 59 inches | 148 lbs. | 63 inches | 169 lbs. | 67 inches | 191 lbs. | 71 inches | 215 lbs. | 75 inches | 240 lbs. |
| 60 inches | 153 lbs. | 64 inches | 174 lbs. | 68 inches | 197 lbs. | 72 inches | 221 lbs. | | |
| 61 inches | 158 lbs. | 65 inches | 180 lbs. | 69 inches | 203 lbs. | 73 inches | 227 lbs. | | |

| Birth Weight | Excessive Loss OR Current Weight | |
|---|---|---|
| 4 lbs | >5 oz | ≤3 lbs 11 oz |

| | | |
|---|---|---|
| 4 lbs 4 oz | >5.5 oz | ≤3 lbs 14.5 oz |
| 4 lbs 8 oz | >5.75 oz | ≤4 lbs 2 oz |
| 4 lbs 12 oz | >6 oz | ≤4 lbs 6 oz |
| 5 lbs | >6.5 oz | ≤4 lbs 9.5 oz |
| 5 lbs 4 oz | >6.75 oz | ≤4 lbs 13 oz |
| 5 lbs 8 oz | >7 oz | ≤5 lbs 1 oz |
| 5 lbs 12 oz | >7.25 oz | ≤5 lbs 5 oz |
| 6 lbs | >7.75 oz | ≤5 lbs 8.5 oz |
| ≥6 lbs 4 oz | >8 oz | |

**For infants 0-6 months of age (need 2 weights taken at least 1 month apart):**

| AGE | MINIMUM WEIGHT GAIN | | |
|---|---|---|---|
| Birth – 1 month | 18 gm/day | 4½ oz/week | 19 oz/month |
| 1 – 2 months | 25 gm/day | 6¼ oz/week | 27 oz/month |
| 2 – 3 months | 18 gm/day | 4½ oz/week | 19 oz/month |
| 3 – 4 months | 16 gm/day | 4 oz/week | 17 oz/month |
| 4 – 5 months | 14 gm/day | 3½ oz/week | 15 oz/month |
| 5 – 6 months | 12 gm/day | 3 oz/week | 13 oz/month |

**For infants and children 6-59 months of age (need 2 weights taken at least 3 months apart):**

| AGE | MINIMUM WEIGHT GAIN | | |
|---|---|---|---|
| 6 – 12 months | 2¼ oz/week | 9½ oz/month | 3 lbs 10 oz/6 month period |
| 12 – 59 months | 2/3 oz/week | 2 2/3 oz/month | 1 lb/6 month period |

Appendix D

# The Easy-Glide Bearing Infantometer
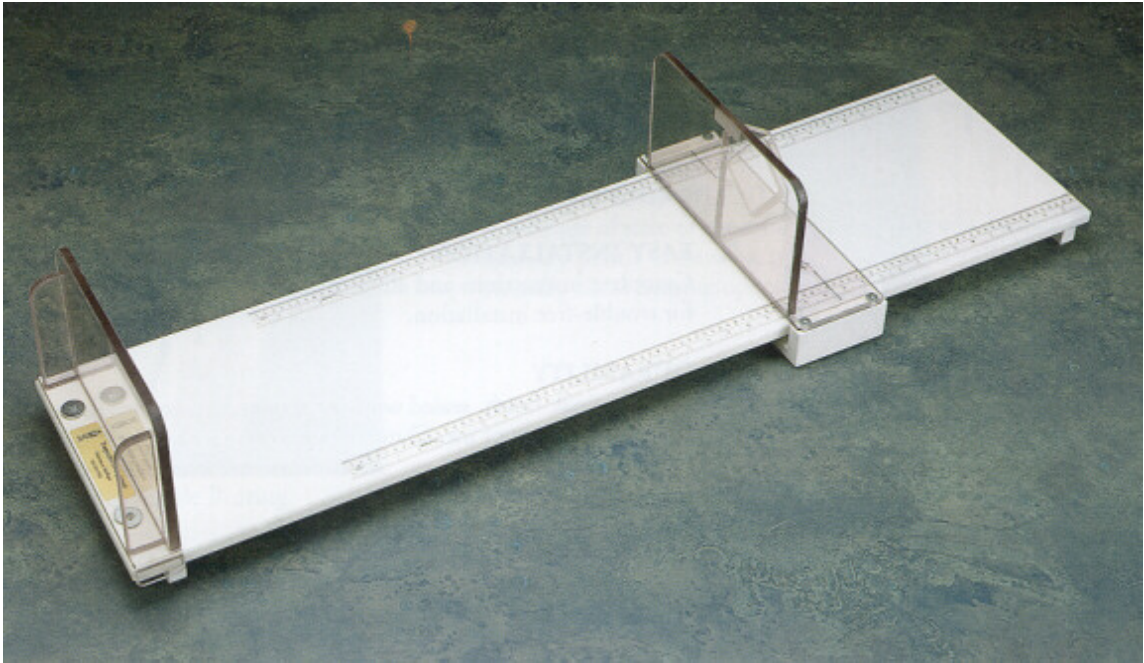


**SUPREME ACCURACY**
Double bearing-mounted foot piece affords precise measurements. Fixed head piece and sliding foot piece are sturdy and maintain their perpendicularity with measuring surface, assuring precision year after year.

**SMOOTH AND SILENT OPERATION**
A marriage of state-of-the-art anodized aluminum and high lubricity plastic extrusions produce ultra-smooth and virtually silent bearing operation.

**SPEED AND CONVENIENCE**
"Read-Here" mark, offset on transparent foot piece, facilitates quick unobstructed reading prior to removing infant. Double calibration allows convenient reading from either side of infantometer.

**DURABILITY**
High quality, vinyl laminated board resists staining and holds up to harsh germicidal cleansers. Polycarbonate head and foot pieces are break-resistant. Simplistic bearing mechanism provides years of maintenance-free use.

| SPECIFICATIONS | | |
|---|---|---|
| Model No.: | PE-RILB-STND | PE-RILB-BRG2 |
| Measurement Range (in): (cm): | 5 - 39 12.5 - 99 | 5 - 39 12.5 - 99 |

| Accuracy | | |
|---|---|---|
| (in): | 1/8 | 1/16 |
| (mm): | 3 | 1 |
| Support Capacity | | |
| (lb): | 150 | 50 |
| (kg): | 68 | 23 |
| Length/Width/Height | | |
| (in): | 43 1/2 x 12 x 8 3/4 | 46 1/2 x 12 x 8 3/4 |
| (cm): | 110 x 31 x 22 | 118 x 31 x 22 |
| Weight | | |
| (lb): | 15 | 17 |
| (kg): | 6.8 | 7.7 |
| Finish | Natural Maple | Clinical White |
| Custom lengths and ranges available | | |

Appendix E:  Infant Digital Scale

# Tanita Model 1583
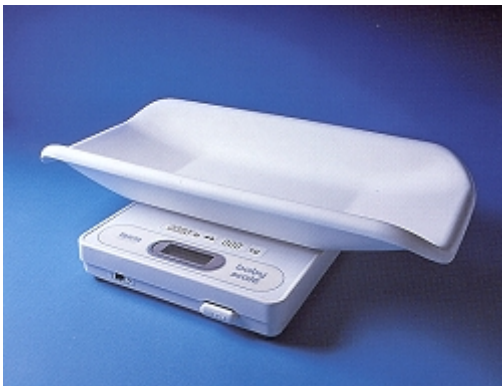


| Capacity: | 40 lbs (20 kg) |
|---|---|
| Graduation: | 0-20 lbs x 0.5 oz (0-10 kg x 10 g), 20-40 lbs x1 oz (10-20 kg x 20 g) |
| Display: | 5 digits LCD 5/8 " (16 mm) high |
| Dimensions: | Tray: 10 5/8 " x 21 1/2" (270 x 546 mm)<br>Scale unit: 10 1/2 " x 11 1/2" x 11 1/2" x 2" (267 x 293 x 53 mm)<br>Height: 5 3/8" (135 mm) scale with tray |
| Unit Weight : | 6 lbs (2.7 kg) |
| Power Supply : | 6 "AA" batteries (included) |

**Optional Case**



- Portable baby/infant scale
- Easy to read LCD display
- Accurate and instant display
- Zero/tare function
- Lock-in weight
- Auto power off function

# Call for pricing

Appendix F:

The Easy-Glide Bearing Stadiometer
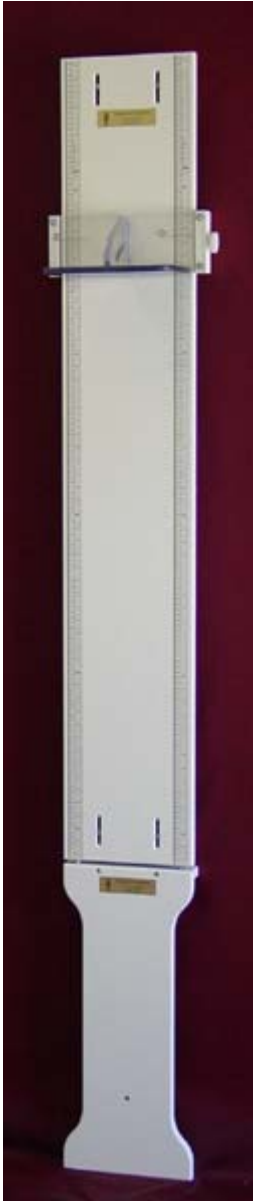


**SUPREME ACCURACY**
Double bearing-mounted head piece affords precise measurements. Sliding head piece is sturdy and maintains its perpendicularity with measuring surface, assuring precision year after year.

**SPEED AND CONVENIENCE**
"Read-Here" marks, offset on transparent head piece, facilitate quick unobstructed reading while subject is against Stadiometer. Double calibration allows convenient reading from either side of board. Positioning knob immobilizes head piece when not in use.

**DURABILITY**
High quality, vinyl laminated board holds up to harsh germicidal cleansers. Polycarbonate head piece is impact-resistant.

**SMOOTH AND SILENT OPERATION**
A marriage of state-of-the-art anodized aluminum and high-lubricity plastic extrusions, produce ultra-smooth and virtually silent bearing operation.

**EASY INSTALLATION**
Included, is the installation and calibration device which extends Stadiometer to floor, facilitating installation, ensuring continually accurate calibration, and providing a heel block.

**Optional Accessories:**

<u>Standing Base</u> - Model PE-WM-BASE
For carpeted or uneven floors.

<u>Installation and Calibration Device</u>
Can be ordered separately to fit existing Stadiometer to ensure continually accurate calibration and provide a heel block.

Model PE-ICD-60-76-BRG2
     PE-ICD-60-84-BRG2

| SPECIFICATIONS | | |
|---|---|---|
| **Model No.:** | **PE-WM-60-76-BRG2** | **PE-WM-60-84-BRG2** |
| Measurement Range: (in): | 27 5/8 - 76 | 35 5/8 - 84 |
| | 73 - 193 | 94 - 213 |
| Accuracy (in): | 1/16 | 1/16 |
| (mm): | 1 | 1 |
| Assembled Length/Width/Height (in): | 84 x 10 x 9 3/4 | 92 x 10 x 9 3/4 |
| (cm): | 152 x 25 x 25 | 152 x 25 x 25 |
| Weight (lb): | 23 | 23 |
| (kg): | 10.3 | 10.3 |
| Finish | Clinical White | Clinical White |
| Custom lengths and ranges available | | |

Appendix G   Adult and Child Digital Scales

# Tanita BWB 800S or 800P



**BWB 800P**

**BWB 800S**

| Capacity: | 440 lbs |
|---|---|
| Graduation: | 440 lbs x 0.2 lbs (200 kg x 100 g) |
| Display: | Digital 1" LCD |
| Power Supply: | A/C adaptor (included) or 6 AA batteries (not |
| Dimensions: | Platform Size:<br>11.8 x 13.25 x 3.12 inches |

- High-capacity scale platform
- Tare feature and weight lock
- Lb/Kg Switch
- Wall/desk mount display OR post mount display
- 3 year warranty

Appendix H:

Example of how sample BMI numbers would be interpreted for a 10 year old boy.



**Body mass index-for-age percentiles: Boys, 2 to 20 years**

A 10-year-old boy with a BMI of 23 would be in the overweight category (95th percentile or greater).

A 10-year-old boy with a BMI of 21 would be in the at-risk-of-overweight category (85th to less than 95th percentile).

A 10-year-old boy with a BMI of 18 would be in the healthy weight category (5th percentile to less than 85th percentile).

A 10-year-old boy with a BMI of 13 would be in the underweight category (less than 5th percentile).

95th Percentile
85th Percentile
5th Percentile

Age (years)

Appendix I

WIC BMI Growth Chart for Girls 3-5 years:  Pennsylvania



**Female Child Body Mass Index (BMI) For Age Chart -**
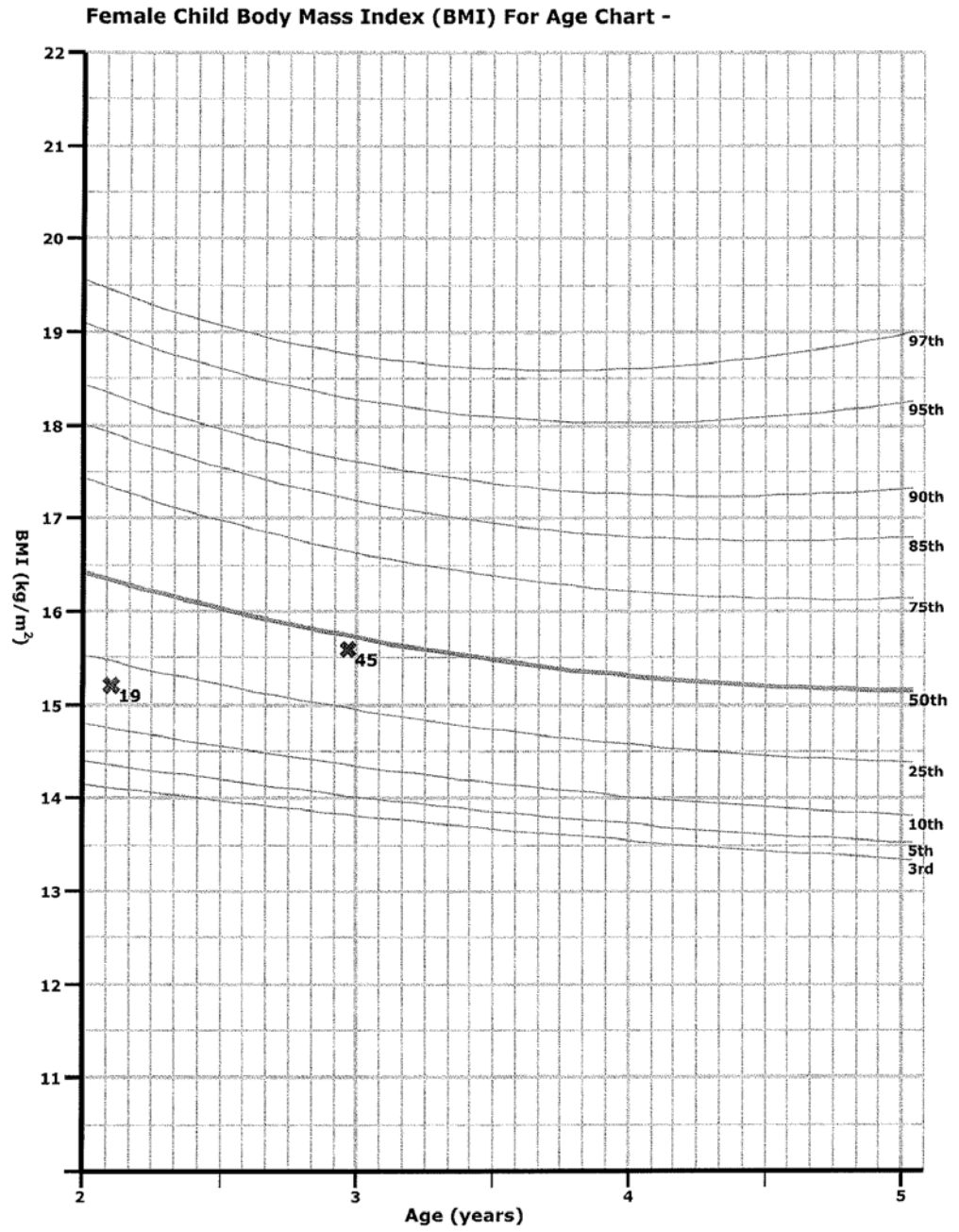
Appendix J

WIC BMI Growth Charts for Boys 3-5 years:  Pennsylvania
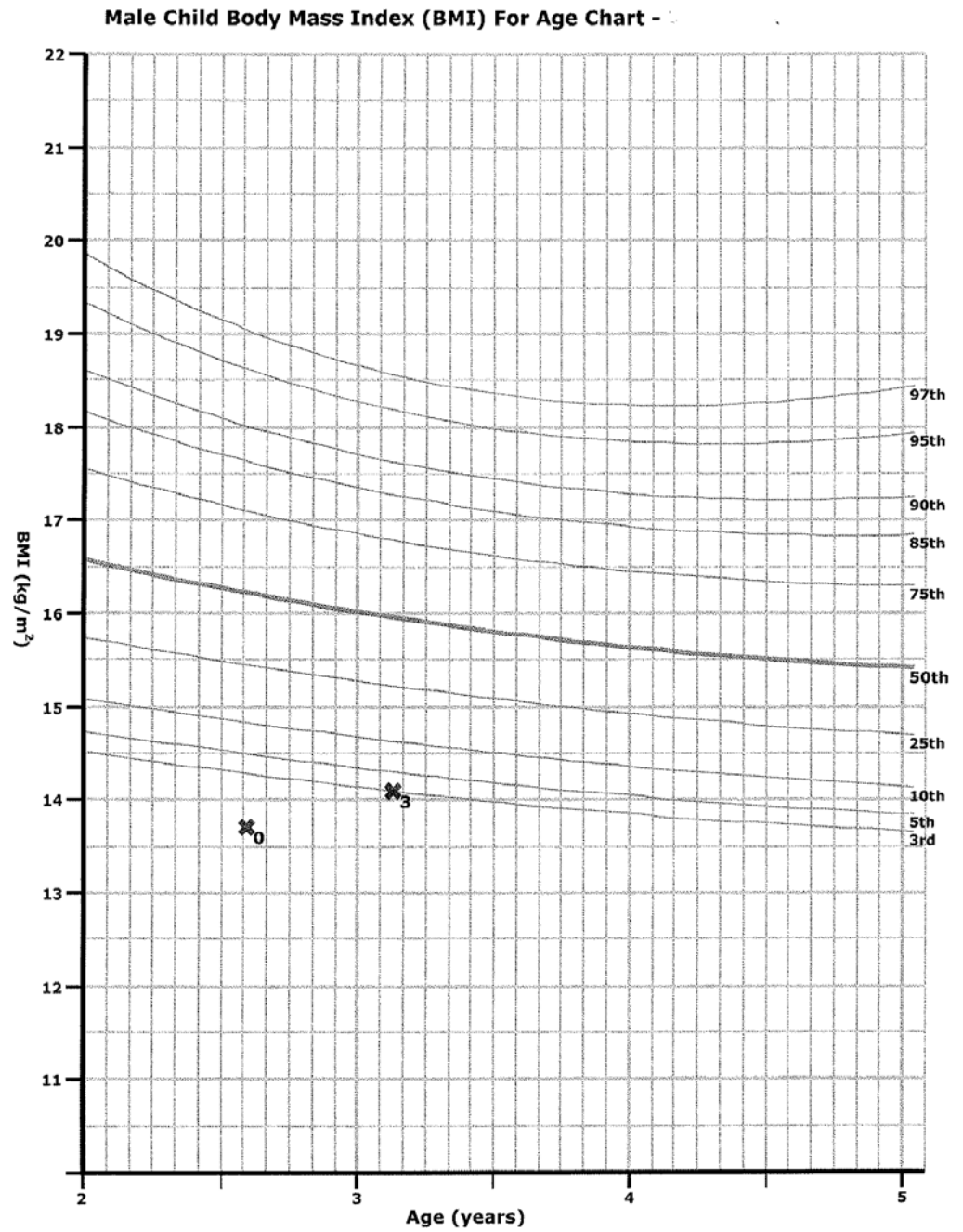
Appendix K

Letter of Permission and Support: William Francis Barker, Ph.D.,

Professor, Department of Education and School Psychology, Indiana

University of Pennsylvania

From: William F. Barker

To: Linda Kilby

Date: Sunday, July 13, 2008

Linda,

You have permission to use the diagram I sent to you.

Bill

CURRICULUM VITA

Linda Marie Kilby, MS, RD, LDN

*PERSONAL*

|  |  |
|---|---|
| Home Address: | 298 Wabash Avenue, Lansdowne, PA 19050 |
| Home Telephone: | 610-623-7541 |
| Business Address: | NORTH, Inc. 642 North Broad Street, Suite 101 Philadelphia, PA 19130 |
| Business Telephone: | 215-978-6100 ext.13 |
| Birthplace/Citizenship: | Sacramento, CA, USA; USA |

*EDUCATION and TRAINING:*

**Undergraduate School**
| | **Degree/Subject** | Dates |
|---|---|---|
| Columbia Union College Takoma Park, MD | BA, 1966, Home Economics | 1962-66 |
| Howard University Freedman's Hospital | RD, 1971 Registered Dietitian | 1970-71 |

**Graduate School**
| | | |
|---|---|---|
| St. Joseph's University Philadelphia, PA | MS, 1988, Health Administration | 1985-88 |
| Walden University Minneapolis, MN | Ph.D. | 2005-09 |

**Honors and Awards**

NORTH, Inc.,
Certificate of Appreciation, Recognition of 25 years of valuable service            2005

Pennsylvania WIC Program                                                                                      2004
Certificate of Appreciation, Recognition of 24 years of valuable contributions

Commonwealth of Pennsylvania                                                                    2000
Certificate of Appreciation, National WIC Conference Planning Committee

US Department of Agriculture                                                                      1994
Certificate of Appreciation, Mid-Atlantic WIC Conference Planning Committee

The Points of Light Foundation                                                                   1994
Changing the Paradigm Project

Commonwealth of Pennsylvania                                              1988
Department of Health, Certificate of Appreciation, WIC Retail Store Training Committee

American Dietetic Association                                            1975
Young Dietitian of the Year

*STUDENTS SUPERVISED*

Preceptor for Undergraduate and Graduate Students:

    Crystal Lippincott, Dietetic Intern                                     2008
    University of Delaware, Newark, DE

    Leslie Kling, Dietetic Intern                                          2008
    University of Delaware, Newark, DE

    Jeanmarie McCray, Dietetic Intern                                      2007
    University of Delaware, Newark, DE

    Sahima Rosul, Dietetic Intern                                          2007
    Drexel University, Philadelphia, PA

    Carol Phillips, Dietetic Intern                                        2007
    University of Medicine & Dentistry of New Jersey,  Scotch Plains, NJ

    Natalie Brown-Hunter, MS, Public Health                                2006
    Arcadia University,    Glenside, PA

    Jamie Buss, MS, Public Health                                          2006
    Arcadia University, Glenside, PA

    Lauren Huminiski, Dietetic Intern                                      2006
    Utah State University Extension, Salt Lake City, UT

    Gavrielle Kestenbaum, Dietetic Intern                                  2005
    University of Delaware, Newark, DE

Jean Falk, Dietetic Intern                                          2005
University of Delaware, Newark, DE

Beth Dowshen, Dietetic Intern                                       2005
University of Delaware, Newark, DE

Judith M. Khanuja, Dietetic Intern                                  2004
Utah State University Extension, Salt Lake City, UT

Ruth Rodgers, Dietetic Intern                                       2004
LaSalle University, Philadelphia, PA

Elizabeth Chandy, Dietetic Intern                                   2004
LaSalle University, Philadelphia, PA

Caroline Michel, Restaurant and Hospitality                         2004
Johnson & Wales University, Providence, RI

Jane Marshall, Dietetic Intern                                      2004
University of Delaware, Newark, DE

Patricia Sacchetti, Dietetic Intern                                 2003
Utah State University Extension, Salt Lake City, UT

Christina Riccardo, Dietetic Intern                                 2002
University of Delaware, Newark, DE

Valerie Grant, MS, Nutrition Science                                1997
Hampton University, Hampton, VA

Karen D. Smith, MPH, Public Health                                  1990
Temple University, Philadelphia, PA


Undergraduate Students:

Meredith Sine, BA Anthropology                                      2007
Haverford College, Philadelphia, PA

Kay Fox, RN and Vicky Brzoza, RN
Southside Regional Medical Center                                   2007
Petersburg, VA

Shae Ann McNab, BS, Public Health                                   2006
Temple University, Philadelphia, PA

Rachel Caesar, BS, Public Health                                         2003
Temple University, Philadelphia, PA


*INVITED PRESENTATIONS*

Wyeth Pharmaceuticals, 2007          WPVI Girl Scout Career Day

National WIC Association, 2007        Participated on panel discussing Succession
                                     Planning from the federal government, state
                                     government and non-profit agency levels
                                     Pittsburgh, PA

Wyeth Pharmaceuticals, 2006          WPVI Girl Scout Career Day

National WIC Association, 2006        Participated on Panel discussing Outreach to
                                     Community, St. Louis, MO

Wyeth Pharmaceuticals, 2005          WPVI Girl Scout Career Day

National WIC Association, 2005        Spoke to attendees on subject of Outreach to
                                     Grandparents and Older Caregivers, Anaheim, CA

Seventh-day Adventists Dietetic Association 2002
                                     Spoke to attendees on the subject of WIC Program
                                     in Philadelphia, PA

*PROFESSIONAL ORGANIZATION MEMBERSHIPS*

American Public Health Association                        2005-present
Society for Nutrition Education                           2002-present
Seventh-day Adventist Dietetic Association               1994-present
American Dietetic Association                             1971-present

*COMMUNITY SERVICE*

Teaching plant based meal planning classes at community churches
Teaching bread making to children ages 3-16 at community churches
Member of local hunger coalition
Member of local and state breastfeeding coalition
Mentor to young women at local church
Teaching quilting to women and girls at local church