A Comparison of BMI Percentiles and Predictor Variables for Two Head Start Childhood Obesity Prevention Programs

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DEDICATION

This is dedicated to my husband and children, who gave me the support I dearly needed to be successful in this endeavor.

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ABSTRACT

A COMPARISON OF BMI PERCENTILES AND PREDICTOR VARIABLES FOR TWO HEAD START CHILDHOOD OBESITY PREVENTION PROGRAMS

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A Head Start program enhancement, “I am Moving, I am Learning” (IMIL), is intended to 1) increase the amount of time per day that children participate in moderate to vigorous physical activity (MVPA); 2) improve the quality of structured movement activities that are led by teachers and other adults; and 3) promote and model healthy food choices for children. A quantitative study was conducted to determine if IMIL was effective in maintaining a healthy BMI in 354 four-year-old preschool children. Head Start secondary data were used to analyze and compare two groups of children: one group received the IMIL intervention; the control group received a standard Head Start nutrition program. T-tests, regression, and Chi-square analysis were conducted to compare improvement of BMI scores from baseline for the two groups. Results indicated that there was no significant improvement in BMI scores between (t= -25, df= 109.88, p= .81) and within the two groups of preschool children (IMIL group: t= -1.61, df= 257, p= .11; Control: t= -.70, df= 95, p= .49). Although there were several significant correlations between some of the variables, regression analysis for program variables indicated that the overall model did not significantly predict for BMI percentile change scores (R^2 = .001, $R^2_{adj.}$ = -.007,

$F(3, 350) = .17$, $p = .91$). Chi-square analysis for demographic variables indicated that only race/ethnicity had a significant relationship with BMI percentile scores ($X^2 = .011$). Future studies of the IMIL obesity intervention should be conducted using a larger sample size composed of several Head Start regions in the U.S.

CHAPTER 1

Introduction

For the first time in a century, it is plausible that children today in the U.S. may have a shorter life expectancy than their parents (Daniels, 2006; Olshansky et al., 2005; Pardee, Norman, Lustig, Preud'homme, & Schwimmer, 2007). This is due to the epidemic of childhood obesity, which contributes to many medical conditions that shorten the lifespan. Some of these health conditions are: diabetes; high blood pressure; gallbladder disease; elevated cholesterol; stroke; osteoarthritis; asthma; liver disease; depression; and many cancers (Paxson, Donahue, Orleans, & Grisso, 2006).

Currently, 25% of U.S. children are overweight (having a Body Mass Index [BMI] for age above the 85^{th} percentile and less than the 95^{th} percentile) and 11% are obese (BMI for age equal to or above the 95^{th} percentile) (Center for Disease Control [CDC], 2008; Dehghan, Akhtar-Danesh, & Merchant, 2005). In addition, the prevalence for overweight in preschool children ages two to five years has increased from 7% in 1997 to approximately 24.4% in 2006 (Ogden, Carroll, & Flegal, 2008; Small, Anderson, & Melnyk, 2007).

The rates for childhood obesity are even higher in ethnic minority, low-income, and immigrant populations (Kumanyika & Grier, 2006). In 2006, 29.9% of Hispanic children were found to be overweight compared to 23.2% for non-Hispanic whites and 24.8% of African Americans (Ogden et al., 2008). Since one in five children in the U.S.

are from ethnic minority families, the health of the nation will be greatly impacted by the health of these children (Babington, 2007; Hernandez-Valero et al., 2007).

The rise in childhood overweight and obesity has coincided with a sharp rise in childhood Type 2 diabetes mellitus (T2DM) (Babington, 2007; McGarvey, Collie, Fraser, Shufflebarger, Lloyd, & Oliver, 2006; Nathan & Moran, 2008). Children who develop T2DM at the age of 10 or 12 are likely to experience the complications of this disease when they are 20 to 30 years old. Consequently, overweight and obese children have an increased risk of heart attack as young adults and may need coronary bypass surgery before they reach thirty years of age (Nathan & Moran, 2008; Pardee et al., 2007).

Many factors have been associated with the increase in childhood obesity. Some of these are: larger portion sizes, increased consumption of fast food, juices and soft-drinks, eating out in restaurants more, decreased meals as a family, increased amounts of time viewing TV and playing video games, and the elimination of daily indoor and outdoor physical activity in schools. There is evidence from studies that many children's diets are high in calories and fats and low in nutrients from vegetables and fruits (Bluford, Sherry, & Scanlon, 2007; Campbell, & Hesketh, 2007). These factors have contributed to an alteration in energy balance for children in the U.S. (Council on Sports Medicine and Council on School Health, 2006; Paxson et al., 2006).

Preschool Childcare and Childhood Obesity

More than 95% of U.S. children age 5-17 attend school, and over 13 million preschool children spend a substantial portion of their day in childcare facilities (Story, Kaphinst, & French, 2006). Thus, these settings can play a major role in shaping a child's education regarding nutrition, physical activity, and how to achieve energy balance (Pate et al., 2006; Story et al., 2006). Childhood obesity has an impact on the ability to learn for children of all ages, and there is evidence that overweight students do not perform as well academically as average-weight students (Roblin & Dombrow, 2004; Story et al., 2006; Schwimmer, Burwinkle, & Varni, 2003; Yang, Sheu, Chen, Lin, & Huang, 2007).

Targeting the 13 million preschool children who spend a substantial part of their day in a preschool or childcare facility can be a major force in combating the obesity epidemic. Preschool facilities can help to shape a young child's behavioral habits concerning nutritional intake, physical activity, and energy balance, thereby improving health, and the ability to learn for a generation of children (Reifsnider, Keller, & Gallagher, 2006; Story et al., 2006).

Head Start and Childhood Obesity

Not all childcare facilities have uniform quality standards for nutrition and physical activity programs (Story et al., 2006). However, Head Start, a program for disadvantaged preschool children that is regulated by the federal government, presents a unique opportunity to break the cycle of obesity for children, as well as their families (National Child Care Information and Technical Assistance Center [NCCIC], 2007). Four years ago, Head Start introduced a new childhood obesity prevention program, *I am Moving, I am Learning* (IMIL), which was designed to enhance classroom practices regarding nutrition education and physical activity (Department of Health and Human

Services [DHHS], 2007). The program was not implemented in all Head Start locations. Instead, many locations use the standard Head Start nutrition program. The standard program provides at least one-third to two-thirds of a preschool child's nutritional needs, depending on length of the program day; however, the amount of time children must spend in physical activity is not specified (DHHS, 2007; U.S. Administration for Children and Family Services, 2007). The primary difference between the two programs is that the IMIL program seeks to improve healthy food choices for children, increase the amount of time children spend in moderate to vigorous physical activity (MVPA), and improve the quality of teacher-led, structured movement physical activity (DHHS, 2007).

Most licensed preschool facilities, including Head Start, participate in the federal Child and Adult Care Food Program (CACFP), which provide grants to states for meals and snacks (Child and Adult Care Food Program, 2006). CACFP meals and snacks are not required to meet any specific nutritional standard for preschool children. In addition, there is no regulation to prevent preschool providers from serving additional energy dense (high calorie and poor nutritional value) food and beverages for which they are not requesting reimbursement (Ritchie, Crawford, Hoelscher, & Sothern, 2006). For example, many preschool providers provide and/or allow parents to provide high-sugar soft drinks and high calorie snacks, such as chips, candy, cupcakes and pizza for students either for special occasions such as, birthdays, or on a daily basis for in-between meal snacks (Reifsnider et al., 2006; Story et al., 2006). However, all Head Start preschool facilities must adhere to federal performance standards for nutrition, which follow the stringent recommendations of the American Dietetic Association (ADA) (DHHS, 2005).

The higher standard for nutrition at Head Start makes it an important source of healthy food for low-income children, who are likely to have poor-quality nutrition at home (Frisvold, 2007). These children also tend to live in neighborhoods with limited physical activity resources, such as playgrounds and parks, which limit their outdoor activities and increase the amount of time they watch television (Council on Sports Medicine and Council on School Health, 2006; Paxson et al., 2006). These environmental factors increase the risk for obesity in low-income children, who may benefit from the Head Start nutrition education and obesity intervention programs (DHHS, 2005).

Summary

Currently, there is a scarcity of research regarding the nutrition and physical activity environment of preschool and childcare settings regarding childhood obesity prevention strategies (Story et al., 2006). In addition, there is a gap in the clear articulation of the predictors involved in childhood obesity, and for the identification of the best strategies for prevention. Therefore, studies to evaluate programs that influence and help children develop healthy nutrition and exercise behaviors are needed in order to build on the limited base of current evidence (Campbell & Hesketh, 2007; Saunders, 2007; Sharma, 2006; Stanojevic, Kain, & Uauy, 2008; Summerbell et al., 2008; Wofford, 2008). Moreover, childhood obesity prevention studies that include minority, low-income preschool children are of particular importance due to the increased incidence of obesity in these populations (Kimbro, Brooks-Gunn, & McLanahan, 2007).

Statement of the Problem

In the past decade, childhood obesity has increased dramatically in the U.S., particularly for ethnic minority children from low-income families (Frisvold, 2007). Research has shown that the preschool years are the most important time to apply childhood obesity prevention strategies to improve health behaviors (Ogden et al., 1997; Salsberry & Reagan, 2005; Story et al., 2006). However, few researchers have studied Head Start-based preschool obesity interventions, which focus on low-income, minority children, and their families. In particular, the *I Am Moving, I am Learning* (IMIL) initiative, which promotes nutrition education and increased physical activity in preschool children, has not been fully addressed in the current body of research literature.

Rather than evaluating the Head Start childhood obesity initiatives that are already utilized, several studies in the literature focused on the implementation of their own intervention programs (Fitzgibbon et al., 2005; Fitzgibbon et al., 2006; Hafetz, 2007; Young, 2004). Other studies were designed to influence and measure only one specific factor, such as lowering serum cholesterol (Kools, Kennedy, Engler, & Engler, 2008) or amount of television-viewing time (Robinson, 1999). Several studies from the literature utilized an intervention to influence preschooler BMI; however, there was a lack of evidence of a significant impact on dietary or physical activity outcomes (Campbell & Hesketh, 2007).

It is evident in the available literature that there is a gap in research concerning the recent IMIL Head Start childhood obesity program. This dissertation will add to the body of research by conducting a comparison study of two Head Start programs, the *I am Moving, I am Learning* (IMIL) and the standard nutrition program.

Purpose

The purpose of this quantitative study was to assess the relationship of a comprehensive childhood obesity intervention and healthy BMI percentiles in four-year-old children who are enrolled in Head Start. The intervention, *I am Moving, I am Learning* (IMIL), incorporates constructs from Social Cognitive Theory for its education component, which promotes the maintenance of healthy BMI levels for children. In general, social cognitive theory assumes that an individual learns how to regulate his health through external supports, such as the social modeling and feedback techniques that are used in the IMIL program.

This dissertation study utilized a secondary analysis of data previously collected by Head Start on the enrolled four-year-old preschool children in two adjoining Virginia counties, which had similar socio-economic status. Data (weight, height, gender, age, ethnicity, BMI, physical activity) on approximately 300 four-year-old children enrolled in Head Start from September 2008 to June 2009 were obtained from a proprietary database. Data regarding nutrition education, amount of physical activity and school menus, were obtained from the same proprietary database.

Significance

There is evidence that prevention of overweight in preschool children involves a wide range of environmental factors such as energy density of nutritional intake, parental, teacher, and child nutrition education, amount of physical activity, and amount of TV viewing time (Newell, Zlot, Silvey, Ariail, 2007; Wen, Baur, Rissel, Wardle, Alperstein, & Simpson, 2007; Wofford, 2008). While there is wide variety regarding preschool efforts to control environmental factors, Head Start is one of the few agencies that must adhere to specific written child nutrition protocols (DHHS, 2007). More importantly, the Head Start standard nutrition program includes parent education, which incorporates opportunities for cooking meals and food preparation, as well as teaching about nutrition.

The IMIL program is more stringent than the standard nutrition program and was designed to increase the quantity of time children spend in moderate to vigorous physical activity (MVPA), improve structured physical activities initiated by teachers, and teach healthy food choices for children. The IMIL Head Start childhood obesity program enhancement is not currently in use in all Head Start agencies. In addition, a recent review of the literature revealed that there is a lack of studies that have compared results from the standard Head Start program with the IMIL initiative.

Understanding how the Head Start IMIL program might shape a child's education regarding nutrition, physical activity and how to achieve energy balance may contribute important information for the prevention of childhood obesity. Interventions aimed at preschool children can help them learn health behaviors that may assist them to avoid overweight and obesity in adulthood (Babington, 2007; Wofford, 2008). In addition, new evidence regarding successful childhood obesity interventions is critical for school nurses, health care providers, and policy leaders to reverse the obesity trend and curb the resulting health consequences (DHHS, 2000; Institute of Medicine, 2004).

The knowledge gained from the present study may provide insightful guidance for nurses who provide care for children at Head Start and in clinics, family care practices, and schools, in which there is an urgent need for interventions regarding childhood overweight and obesity. Nurses may use evidence from this study for patient education, recommendations on obesity prevention strategies for parents, and for the development of practice protocols to improve the weight management outcomes for overweight and obese preschool children.

This research supports the recommendations of the Institute of Medicine (IOM) Committee on Childhood Obesity (2004), and of the Healthy People 2020 objectives for childhood obesity prevention. Both organizations have recommended research regarding early childhood obesity prevention (DHHS, 2009a; IOM, 2004). Healthy People 2020 objectives include reducing the proportion of children aged two to five who are overweight or obese. Other objectives are to increase the consumption and variety of fruits, vegetables, whole grains, and calcium, while reducing saturated fat and sodium in the diets of children aged two years and older.

In summary, there are gaps in research concerning the efficacy of the Head Start IMIL preschool nutrition and physical activity initiative, and a lack of research to determine the predictors for early childhood overweight and obesity. A comparison study of Head Start childhood obesity prevention strategies, including an investigation of appropriate program characteristics on which to focus for preschoolers, will provide new evidence to fill in the gaps of nursing research.

Research Questions

1) Are there differences in BMI Percentile Change scores between the children enrolled in Head Start preschools that participated in the IMIL program (Group I) and the children enrolled in preschools that used a standard Head Start program (Group II)?

2) Is there a difference between BMI percentile scores obtained pre-and post-intervention within the two groups?

3) Are any of the following variables significant predictors of BMI percentile change?

   a. Amount of nutrition education for children.

   b. Amount of nutrition education for teachers.

   c. Amount of moderate to vigorous physical activity (MVPA) for children.

   d. Amount of structured classroom physical activity (SCPA) for children.

4) What are the relationships between BMI percentile change and the demographic factors for the children enrolled in Head Start?

Description of Participating Head Start Groups

The county that implemented the IMIL Head Start program (Group I) served approximately 150 families and had preschool classrooms located in four high schools and twelve elementary schools. The county that implemented the standard program (Group II) served about 100 families and had classrooms located in two high schools and four elementary schools. The director for each program measured and recorded the children's height and weight measurements in October and March of the 2008-2009 school year. Demographic data were collected at the beginning of the school year. Data were also available regarding program characteristics. All of the data for the two programs were accessible from a proprietary database at each of the program director's offices.

BMI Percentile for Age Calculation

BMI percentiles were calculated from height and weight measurements obtained from the Head Start proprietary database. The formula for the BMI calculation used to calculate BMI is: kg/m^2 (weight in kilograms divided by height in meters squared). The age and BMI of each child was used to compute the BMI percentile for comparison to U.S. children of the same age and gender. The CDC standardized weight status categories and percentile ranges that were used in this dissertation are depicted in Table 1 (CDC, 2008).

Table 1
Weight Status and Percentile Ranges

Weight Status Category	Percentile Range
Underweight	Less than the 5^{th} percentile
Healthy weight	5^{th} percentile to less than the 85^{th} percentile
Overweight	85^{th} to less than the 95^{th} percentile
Obese	Equal to or greater than the 95^{th} percentile

Theoretical Framework

Obesity Research and Theory

In health behavior research, numerous theories have been used to predict health behaviors and to design and evaluate interventions for behavioral change (Glanz, Rimer & Lewis, 2002). In general, theories of health behavior posit that mediating variables (such as, children's nutrition and physical exercise knowledge) predict behavior, and interventions facilitate change in the mediating variables (Baranowski, Cullen, & Baranowski, 1999). Subsequently, individuals who acquire significant change in the target variable (such as, BMI percentiles) may also acquire significant changes in the mediating variables. Thus, theory defines the variables that influence the target behavior, describes the interactions among these variables, specifies how to promote behavior change, and supplies predictability for anticipated outcomes (Achterberg & Miller, 2004).

Social Cognitive Theory

Social cognitive theory (SCT) defines three factors that uniquely determine an individual's self-regulation of behavior: personal, behavioral, and environmental factors. These factors form a triadic model, which posits that individuals self-regulate their health through the use of self-care strategies, setting health goals, and monitoring feedback regarding the effectiveness of strategies in meeting their goals. SCT contends that behavior is largely self-regulated through cognitive processes, which involve the use of consequences of behavior to form expectations of behavioral outcomes. The ability to form these expectations permits individuals to predict their behavioral outcomes before actually performing the behavior. In essence, humans can learn through observation, rather than through direct reinforcement (Bandura, 1997).

Social cognitive theory assumes that an individual learns how to regulate their health through external supports, such as social modeling and feedback. SCT suggests that one's mind is actively constructing one's reality, while selectively encoding information, performing behaviors based on values and expectations, and imposing a framework on its own actions. As a result of feedback, an individual's own reality is developed through the interaction of the environment and one's cognitions. Additionally, cognitions change over time as a person develops and gains experience. SCT emphasizes that it is through an understanding of the processes involved in each individual's framing of reality that allows human behavior to be understood, predicted, and changed (Bandura 1997).

Theoretical Model

Based on the evidence reviewed in the literature, the Bandura social cognitive theory (SCT) of self-regulation will be used to evaluate the Head Start *I am Moving, I am Learning* (IMIL) intervention for this dissertation (Bandura, 1997).

Social cognitive theory is used in the design of the model for this study, which describes the Head Start program influences on obesity in preschool children (Figure 1). The model describes the framework in this study, in which pre-test outcomes for Group 1 and Group II are initially affected by demographic factors (race, ethnicity, gender, age, weight, height, and BMI percentiles). Mediating factors (program characteristics such as amount of physical activity, school meal nutritional content, and amount of nutrition education) are depicted in the model as influencing the post-test outcomes for each group. The final outcome variable is BMI. According to the model, through nutrition education, physical activity, and learning about healthy eating in school and at home, the preschool child can gradually achieve the ability to perform health-related behaviors that can help him or her to successfully maintain a healthy BMI.

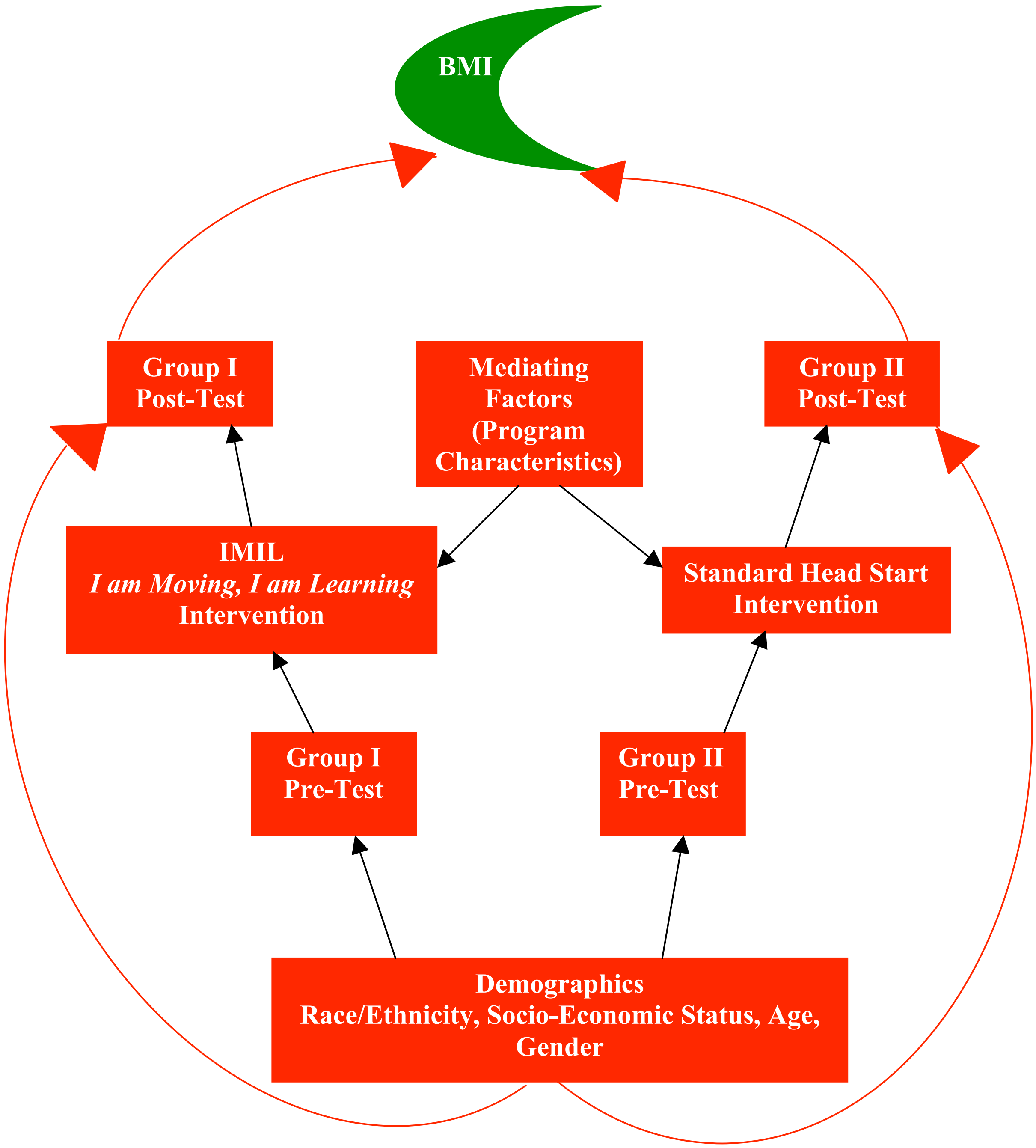


Figure 1. Theoretical Framework Used in this Study: Head Start Childhood Obesity Initiatives. The model is based upon social cognitive theory and describes the effect of mediating factors on BMI percentile for Head Start children.

Table 2. Theoretical, Operational, and General Definitions

Conceptual Definitions	Operational Definitions
Perceived self-efficacy: This construct refers to beliefs in one's capabilities to produce the desired plan of action. The most effective way to create a strong sense of efficacy is through mastery of experiences. Social modeling experiences, through which competent models transmit knowledge and teach effective skills and strategies for overcoming obstacles strengthens self-beliefs of efficacy. The stronger the perceived self-efficacy, the more likely an individual will be to sustain the effort needed to maintain health-promoting behavior.	Several factors were used to measure perceived self-efficacy: Average number of hours per month for children's, parents, and teachers' nutrition education; average number of years of teacher education; and average number of minutes per month of classroom structured activity (SCA) and of moderate to vigorous activity (MVA), and BMI. These factors were measured to demonstrate that the models (teachers, parents, and other students) obtained the knowledge to model appropriate healthy behaviors.
Self-Regulation: A construct that refers to the self-management of habits that enhance health and the reduction of habits that impair health.	The self-regulation component of SCT will not be measured directly in this study. Measuring this concept would require the 4-year old students to identify what habits they have changed to enhance their health.
Perceived barriers: this construct refers to the impediments to adopting healthy lifestyle habits and maintaining them.	The perceived barriers construct will not be measured in this study. To measure this concept, the preschool students would need to identify their barriers and receive assistance to reduce the influence of the barriers. Teaching an individual to reward himself after performing a needed behavior promotes self-regulation.

Percentile: The value of a factor below which, a certain percent of observations fall.
BMI Percentile: The BMI number is plotted on the CDC BMI-for-age growth chart to obtain a percentile ranking, which indicates how the child's BMI compares to typical values for children of the same sex and age (CDC, 2008).

BMI Formula: kg/m^2 (weight in kilograms divided by height in meters squared) (CDC, 2000).
Body Mass Index (BMI): an index calculated from a child's weight and height (CDC, 2008).

CHAPTER 2

Review of the Literature

The literature review will be presented in the following order: search strategies, inclusion criteria, and background (nutrition, physical activity, Head Start, and IMIL). Next, childhood obesity research from the literature is presented on the following topics: social cognitive theory (SCT), elementary school children, preschool children, nursing research, and use of secondary data analysis in dissertation research. A summary follows the literature review.

Search Strategies

The integrative literature review for the present study focused on U.S. childhood obesity experimental or quasi-experimental preventive intervention studies written in English, using BMI as the outcome variable, published from 1982 to 2010, which involved children in preschool and in elementary school. Databases selected included Medline, CINAHL, Dissertations and Thesis, Academic Search Complete, PsycINFO, and Health Source: Nursing and Academic Edition. Keywords included: Social Cognitive Theory, Nurses, secondary data analysis, Head Start, preschool, children, obesity, overweight, prevention, intervention, programs, and body mass index (BMI).

Inclusion Criteria

Research studies were included if they implemented nutrition and physical activity strategies for prevention and intervention of elementary and preschool child obesity and had a measured outcome variable of BMI percentile, weight status, nutrition behavior change, or amount of physical activity. A total of 68 childhood obesity intervention studies were found, of which 23 met the inclusion criterion. Eleven of these studies were focused on Head Start children. The research articles were divided into five main topics: social cognitive theory (SCT), elementary school children, preschool children, nursing research at Head Start and secondary data use in dissertations. The studies that were conducted at Head Start facilities and in elementary schools employed similar variables and predictors to those used for this dissertation: amount of physical activity, child and family demographics, and program variables.

Background

Overview

The prevalence for overweight in preschool children ages two to five years has increased from 7% ten years ago to approximately 21% in 2007 (Berg-Smith et al., 1999; Lyznicki, Young, Riggs, & Davis, 2001; Ogden, Flegal, Carroll, & Johnson, 2002; Small, Anderson, & Melnyk, 2007; Summerbell et al., 2003). There is a higher prevalence of obesity for non-Hispanic Black and Hispanic ethnic groups and for low-income children than for their peers (Council on Sports Medicine and Council on School Health, 2006; Kumanyika & Grier, 2006; Paxson et al., 2006).

The prevention of overweight and obesity in children and adults has not been a priority in the U.S. because the health care system is predominately focused on the co-morbidities associated with obesity. Consequently, there is a lack of evidence from clinical trials regarding overweight and obesity prevention, as well as a lack of physician training regarding how to address this sensitive issue with patients and children's parents (Caprio, 2006). However, if obesity prevention is not given high priority now, the increase in co-morbidities will add to health care costs that will nearly double every decade to 860.7 – 956.9 billion U.S. dollars by 2030 (Wang, Beydoun, Liang, Caballero, & Kumanyika, 2008).

Contributing to the paucity of prevention initiatives is the evidence that physicians offer weight loss recommendations to overweight and obese patients, or to parents of young patients, regarding losing weight only about half the time (Galuska, Will, Serdula, & Ford, 1999). The omission to inform parents of their child's weight status highlights a missed opportunity for clinicians to educate parents and teenagers regarding overweight and obesity. Additionally, it is important for clinicians to intervene while children are younger and can be influenced by their parents to improve their diet since there is evidence that an earlier onset of childhood overweight is linked to a higher BMI in adulthood (Canning, Courage, & Frizzell, 2004; Freedman, Khan, Dietz, Srinivasan, & Berenson, 2001; Nathan & Moran, 2008).

In fact, epidemiological and experimental research has determined a relationship between fetal and early infant phases of life and the later development of childhood and adult adiposity. This relationship has been depicted in a model known as the

Developmental Origins of Health and Disease (DOHaD), which illustrates how the fetus adapts to antagonistic environmental cues *in utero* with permanent adaptations in homeostatic systems to ensure survival (Vickers, Krechowec, & Breier, 2007). There is evidence that the homeostatic adaptations, whether due to under-or-over-nutrition, may result in the *in utero* programming of obesity and other metabolic diseases (Gillman, Rifas-Shiman, Kleinman, Oken, Rich-Edwards, & Taveras, 2008). Additionally, research has shown that fetal exposure to gestational diabetes, maternal cigarette smoke, shorter breastfeeding duration, as well as rapid infant weight gain predicted a higher BMI in childhood (Lamb et al., 2010; Vickers et al., 2007).

Nutritional Factors

Hesitance and uncertainty on the part of clinicians to counsel parents of young children reflects, in part, a lack of concordance regarding the cause of childhood overweight and obesity. Physiologically, childhood overweight and obesity is a result of an imbalance between nutrition and physical activity; however, lifestyle, environment, and genes also add to this complex health issue (Newell et al., 2007; Wen et al., 2007; Wofford, 2008). Two enormous societal alterations in energy balance for the U.S. that contribute to childhood overweight and obesity are the abundance of high-fat, high-sugar, low-fiber convenience foods and the elimination of physical education programs in schools (Anderson & Butcher, 2006; Kaphingst, & French, 2006; Story et al., 2006; Trickey, 2006). However, less is known about the relationship between nutritional content of foods provided to preschool children and the development of overweight; thus, more research is needed to help inform legislators on key policy changes for the prevention of early childhood overweight (Paxson et al., 2006).

Physical Activity

The recommended amount of physical activity per day for preschool children is least 120 minutes per day (National Center for Sport & Physical Education [NASPE], 2002). Research has shown that infants, toddlers, and preschoolers should engage in a minimum of 60 minutes of physical activity each day, and should not be sedentary for more than 60 minutes at a time, unless they are sleeping (Gunner, Atkinson, Nichols, & Eissa, 2005; NASPE, 2002). Additionally, the American Heart Association recommends 60 minutes of moderate to vigorous play or physical activity daily for individuals two years and older (AHA, 2005). Some states have taken steps to increase physical activity for school children through legislation. In 2008, bills were passed that require daily physical exercise during school hours in Virginia, Connecticut, Indiana, and Oklahoma (National Conference of State Legislators, 2009).

Most states do not have specific curriculum requirements for the amount of time students spend in gym class. Recent research shows that only 8% of elementary schools, 6.4% of middle schools and 5.8% of high schools provided the recommended amount of physical education (PE) time per week (Burgeson, Wechsler, Brener, Young, & Spain, 2001; National Coalition for Promoting Physical Activity [NCPPA], 2007). However, it is not known whether preschool and childcare facilities in the U.S. consistently follow these guidelines; therefore, more research is needed to evaluate these programs in light of the childhood obesity epidemic (Pate, Pfeiffer, Trost, Zieglar, & Dowda, 2004).

Head Start

Since its creation in 1965 as part of the war on poverty, Head Start's goal has been to improve the school readiness, social competence, learning skills, health, nutrition, and social-emotional development of disadvantaged children (Frisvold, 2007). The program is based on "whole child" model, which entails the provision of comprehensive services that include preschool education, medical, dental, nutrition, mental health services, and assistance to parents to help foster their child's development. The services at Head Start are designed to include diverse cultural, ethnic, and linguistic relevance that is appropriate for each child and their family (Department of Health and Human Services [DHHS], 2009b).

The Office of Head Start (OHS), Administration for Children and Families (ACF), and DHHS administers the program. Grants are awarded by the ACF Regional Offices and the Office of Head Start's American Indian-Alaska Native, and Migrant and Seasonal Program Branches directly to local public agencies, private non-profit and for-profit organizations, Indian Tribes and school systems for the purpose of operating Head Start programs at the community level. Grantees apply annually for funds (DHHS, 2009b).

During the 2005-2006 school year, 86 Head Start and Early Head Start Programs were sponsored by faith-based organizations. Nearly 48,000 children were enrolled in home-based Head Start services. In addition, 12.2 percent of the Head Start enrollment consisted of children with disabilities, such as mental retardation, health impairments, visual and auditory handicaps, emotional and learning disabilities, speech and language impairments, and orthopedic handicaps (DHHS, 2009b).

The Head Start program has enrolled more than 25 million children since it began in 1965. In 2007, Head Start (including Early Head Start) had a $6,888,363,725 budget and enrolled 908,412 children.

The target population of Head Start is three and four year olds from families with incomes below the federal poverty level (Tables 3-5) or from families that are eligible for public assistance. Until recent legislation, however, funding for Head Start has been insufficient for providing services to all eligible children. In order to rectify this issue, President Obama signed into law the American Recovery and Reinvestment Act on February 17, 2009, which included two billion dollars for additional Head Start funding. In addition to increasing the number of children served by Head Start, the increased funding will allow enrollments for Early Head Start to quadruple to include a quarter of a million at-risk children (Hass, 2009).

Early Head Start (EHS) is the primary early education program for children from low-income families from birth to age three. Like Head Start, EHS enables communities to design flexible programs, including home-based services, and requires that programs adhere to evidence-based standards and principles to best support disadvantaged children and their families (DHHS, 2009b). The Early Head Start program for low-income families with infants and toddlers was established by the 1994 reauthorization of the Head Start Act. In fiscal year 2007, $689 million was used to fund more than 650 programs, which provided the Early Head Start child and family support services in the U.S. and Puerto Rico. Early Head Start provided services to nearly 62,000 children under the age of three in 2007 (DHHS, 2009b).

The Obama administration recently announced plans to establish a new committee, the Presidential Early Learning Council, which will consist of state legislators, business leaders, community and religious leaders, as well as researchers and scientists. The goal of the council will be to coordinate the services of Head Start and other early childhood learning programs across all levels of government and within the private and nonprofit sectors and ensure that disadvantaged children and families will have access to the highest-quality programs ("Barack Obama," 2008).

Head Start has the potential to have lasting effects on the nutritional health and education of minority and disadvantaged preschool children due to its involvement of the whole family, particularly the parents (DHHS, 2005; Frisvold, 2007). Since children with low socioeconomic status are more likely to have parents who are overweight, or obese, with limited education, significant parental stress, poor nutrition, and poor access to health care, targeting the whole family may extend the effects of Head Start interventions (DHHS, 2009b; Story et al., 2006).

In addition, these families tend to reside in neighborhoods and enroll in schools that have limited facilities for physical activity, such as playgrounds, and also have safety issues that limit outdoor activities. As a result, these children tend to spend more time watching television and playing video games than their peers with higher socioeconomic status. Consequently, higher rates of overweight and obesity have been found in children with low socioeconomic status compared to their peers (Frisvold, 2007; Kimbro et al., 2007).

Effective obesity intervention programs at Head Start are important to mitigate childhood obesity at the preschool level. There are several studies in the literature that address obesity prevention programs among Head Start participants, however, very few have addressed the programs of Head Start. Currently, the Head Start IMIL initiative has received little review by researchers. The program, *I am Moving, I am Learning* (IMIL), will be the focus of this dissertation.

Table 3
The 2009 Poverty Guidelines for the 48 Contiguous States and the District of Columbia

Persons in family	Poverty guideline
1	$10,830
2	14,570
3	18,310
4	22,050
5	25,790
6	29,530
7	33,270
8	37,010

For families with more than 8 persons, add $3,740 for each additional person.

Table 4
2009 Poverty Guidelines for Alaska

Persons in family	Poverty guideline
1	$13,530
2	18,210
3	22,890
4	27,570
5	32,250
6	36,930
7	41,610
8	46,290
For families with more than 8 persons, add $4,680 for each additional person.	

Table 5
2009 Poverty Guidelines for Hawaii

Persons in family	Poverty guideline
1	$12,460
2	16,760
3	21,060
4	25,360
5	29,660
6	33,960
7	38,260
8	42,560
For families with more than 8 persons, add $4,300 for each additional person.	

SOURCE: Federal Register, Vol. 74, No. 14, January 23, 2009, pp. 4199–4201

Research in the Literature

Social Cognitive Theory

An integrative research review of the literature provided evidence of the use of social cognitive theory in obesity and preventive health care research on children ranging from ages 4-12 years old. The literature search revealed that SCT was used as the theoretical framework for 15 out of 23 of the school-based nutrition interventions relating to this dissertation (Bellows, 2007; Brownell & Kaye, 1982; Coppen, 2008; Davison, Cutting, & Birch, 2003; Figueroa-Colon, Franklin, Lee, von Almen & Suskind, 1996; Fitzgibbon et al., 2005; Fitzgibbon et al., 2006; Foster, Wadden, & Brownell, 1985; Gortmaker et al., 1999; Hampson, Andrews, Peterson, & Duncan, 2007; Henry, 2006; Horodynski & Strommel, 2005; McGarvey et al. 2006; Robinson, 1999; Young et al., 2004). A dissertation by Henry (2006) combined SCT with the Piaget and Inhelder (1969) theory of cognitive development. Of these studies, six were focused on Head Start children (Young et al., 2004; Fitzgibbon et al., 2005; Horodynski & Strommel, 2005; Fitzgibbon et al., 2006; McGarvey et al., 2006 & Bellows, 2007).

The remaining seven studies either incorporated the ecological systems theory (Hudson, Cherry, Ratcliff, & McClellan, (2009); a logic model (Hafetz, 2007); or did not discuss a theoretical framework (Carrel et al., 2005; Gable & Lutz, 2001; Hollar et al., 2010; Pate, 2004; Zhai, 2008).

Evidence of the use of the social cognitive perspective was seen in the design of the interventions through the involvement of parents and peers, self-monitoring, and through fun, noncompetitive physical exercise curricula. While parental influences at home can create the foundation for a child's exercise and dietary practices, the child also receives influences from school and peers. According to SCT, eating and exercise patterns evolve over childhood, with a gradual relinquishment of parental control of the child, who in turn, becomes more able to self-regulate their health (Kools, Kennedy, Engler, & Engler, 2007). The use of the principles of SCT, such as modeling, demonstrating, and rehearsing behaviors by teachers, parents, peers, and the students themselves were important components of these school-based interventions. It is evident from the following literature review that this multi-directional approach may help contribute to successful outcomes for childhood obesity research.

Elementary School Children

Intervention studies conducted with elementary school students were included in the literature review in order to obtain a wider range of successful obesity prevention strategies, since relatively few preschool studies with positive outcomes were found.

Brownell and Kaye (1982) conducted an SCT-based controlled trial using a school-based program that emphasized both social and educational factors. The sample consisted of 77 children ages 5-12 who were at least 10% overweight (greater than 85^{th} percentile for height and weight). Sixty-three were in the experimental group fourteen were controls. The average child in the experimental group was 34.2% overweight, which was heavier than the control children at the start of the program (45.9 versus 37.5 kg) ($F_{1,75} = 3.4$, $p < 0.07$). The two schools were similar in socioeconomic factors and race ratios.

The 10-week intervention program was based on social and educational factors that emphasized positive support from parents, school nursing aides, teachers, physical education instructors, peers, food service providers, and school administrators. The nurse's aide coordinated the program, weighed the students, maintained graphs of weight changes, and praised the children for progress. The aide also met with parents, distributed educational materials, and coordinated program activities with other school personnel.

The educational materials consisted of four detailed guides, one each for the students, parents, teachers, and school leaders. The guides contained information on behavior modification such as, recording food intake, slowing the rate of eating, and rewarding changes in eating and exercise. In addition, each guide discussed balanced nutrition, and exercise activities. The program aim was to maximize the obese child's support in both school and home.

Results indicated that the experimental group lost more weight than the control group. Sixty children (95.2%) of the 63 total students who received the intervention lost weight, compared to three (21.4%) of the 14 students in the control group ($x^2 = 54.2$, $p < 0.0001$). The mean percentage overweight in both girls and boys decreased by 15.4% for the intervention children, and increased by 2.8% for the controls. In the experimental group, 44% lost 10 pounds or more, yet 71% of students in the control group gained weight. The use of nonrandom sampling and the small sample size limit the generalizability of this study, however, the results support the effectiveness of SCT-based interventions for reducing childhood obesity (Brownell & Kaye, 1982).

Similar to the Brownell and Kaye (1982) study, Foster, Wadden, and Brownell (1985) incorporated support from peers and parents in their 12-week SCT-based study, in which 89 overweight children ages six through ten participated in a peer-led program for the treatment and prevention of obesity. Forty-eight children were in the intervention group and 41 students were in the control group. The control received weight measurements and no other treatment. The intervention group received counseling and support provided primarily by peers, who were eighth-grade students chosen by the teachers and principal.

The sixteen peer counselors were trained to perform weight measurements, check lunchboxes for nutritious foods, and to suggest changes in diet and exercise habits. Each peer counselor was assigned three or four children, and was monitored by the researchers once a week. The children in the intervention group met thrice weekly with their peer counselors, who examined their lunch boxes and gave rewards (stickers and verbal praise) to students who had nutritious, low-fat foods. Students recorded their nutrition intake and physical exercise in notebooks, were weighed weekly, and were given sticker rewards for weight loss. The children also participated in a weekly 15-minute exercise class, which demonstrated fun ways to be physically active.

Fifty percent of the treatment group parents attended two informatory meetings and 50% participated in five intensive educational sessions in which they were given materials on nutrition and exercise, as well as taught principles of positive reinforcement and behavior modification.

Findings revealed that the intervention group had a 5.3% decrease in percentage overweight (after accounting for changes in height), whereas the control group increased 0.3% in percentage overweight, F (1, 82) = 27.65, $p < .0001$. No interactions or effects were found for sex or grade. The intervention group also showed a 3.6% reduction in their percentage overweight from pretreatment to the 18-month follow-up, compared to the control group who remained the same percentage overweight. The difference between the groups for at the 18-month follow-up was significant, F (1, 76) = 7.02, $p < .01$. Unlike in the Brownell and Kaye (1982) study, parental involvement was not found to have an effect on weight loss for either of the two groups of children.

This study revealed that weight stabilization, rather than weight loss, can be a realistic goal for school-based interventions. In addition, the researchers recommended that a weight loss maintenance program should follow treatment in order to achieve weight stabilization. Similar to the Brownell and Kaye study, nonrandom sampling, as well as a small sample size limited the generalization of the study results.

In the Figuera-Colon et al. (1996) study, a weight loss intervention for super-obese (greater than or equal to 140% of ideal body weight for height) children ages 8 to 13 was implemented in two schools. Nineteen obese children selected from both schools were randomized to either the intervention (12 children) or control groups (seven children), and were followed for six months. The intervention group was placed on a 600 to 800 calorie, protein-sparing diet, which was increased by 100 calories every two weeks until a 1200 calorie per day balanced diet was obtained. Height and weight were obtained at baseline, 10 weeks, and six months for both groups as well as biochemical measurements at six months. A physician monitored the children for clinical complications.

The children in the intervention group had a significant weight loss from baseline after six months (-5.6 + /- 7.1 kg, ANOVA p, < 0.02); a significant lowering of BMI percentages (-24.3 +/- 20%, ANOVA $p < 0.002$); and also had positive linear growth velocity Z-scores (1.3 +/- 1.6 kg, ANOVA $p < 0.05$). Six of the 12 children in the intervention group were not super-obese after six months, and no clinical complications were observed in any of the children. In fact, a decrease in blood pressure and serum lipids was observed. The seven control super-obese children gained weight from the baseline at six months (2.8 +/- 3.1 kg, ANOVA $p < 0.008$).

The children had close medical supervision, as well as parental, peer, and teacher support to help the children maintain the diet protocols. This study demonstrated successful outcomes with an intervention that required intense monitoring of the subjects for untoward health effects; however, the interventions implemented in the studies by Brownell and Kaye (1982) and by Foster et al. (1985) demonstrated similar successful results with less potential health risks for the children. In addition, the Figuera-Colon et al. (1996) reported that only 12 out of 44 super-obese children volunteered to participate in the intervention group, which may indicate a recruitment problem for any future studies that may be conducted to confirm these findings.

A two-year study by Gortmaker et al. (1999) was conducted to evaluate the impact of a school-based health behavior intervention known as Planet Health on obesity among 1295 children ages 10-13 in 10 schools. The intervention consisted of teaching sessions, which were incorporated into the existing school curricula, and focused on decreasing television time, decreasing high-fat food intake, increasing fruit and vegetable intake, and increasing moderate-to-vigorous physical activity. SCT constructs related to behavior modeling from peers and teachers were incorporated into the intervention.

Measurements included BMI and triceps skin-fold values, which were accessed at baseline and after two years of implementation of the intervention. Findings revealed that the prevalence of obesity was reduced among girls in the five intervention schools compared to the girls in the five control schools (odds ratio, 0.47; 95% confidence interval, 0.24-0.93; $p = 0.03$), with no differences among boys. There was also significant remission of obesity among girls in the intervention group compared to the controls (odds ratio, 2.16; 95% confidence interval, 1.07-4.35; $p = 0.04$). Television time was reduced for both boys and girls, and there was an increase fruit and vegetable consumption. It was found that reductions in television time predicted and mediated the intervention effect and obesity change. Each hour of reduction in television time for girls predicted reduced obesity prevalence (odds ratio, 0.85; 95% confidence interval, 0.75-0.97; $p = 0.02$).

The results of earlier studies by Brownell and Kaye (1982), Foster et al. (1985) and Figuera-Colon et al. (1996) did not show differences between the sexes for the intervention effects, which may be due to their comparably much smaller sample sizes.

A later study using SCT also revealed the detrimental effects of time spent watching television upon children's physical activity levels (Robinson, 1999). The six-month randomized controlled school-based trial involved 192 children aged seven through nine from two elementary schools. One school was randomly assigned as the intervention group, and the other was assigned as an assessments-only control school.

The intervention involved eighteen 30 to 50 minute classroom lessons that were based on Bandura's social cognitive theory, and were designed to reduce television, video, and video game use. Similar to Gortmaker et al. (1999), the lessons were incorporated into the school curriculum and were taught by schoolteachers. Following each classroom lesson, the children were challenged to watch no television, videos, or play video games for 10 days. Upon completion of each challenge, the children were encouraged to follow a seven-hour per week limit on these activities. The children were also taught to use viewing and video time more selectively, and encouraged to become advocates for reducing media use.

Parents were sent newsletters designed to help them motivate their children to limit media use. In addition, an electronic television manager (TV Allowance, Mindmaster, Inc, Miami, Florida) was distributed to each participant's household. These devices monitored and budgeted viewing time for each member of the household through use of personal identification codes. In addition, parents were interviewed by telephone at baseline and at the completion of the trial using a standardized method.

Assessments at baseline and at completion for the trial were height, weight, triceps skin-fold thickness, waist and hip circumference, and cardio-respiratory fitness. The 20-meter shuttle-run test (Leger, Mercier, Gadoury, & Lambert, 1988) was used to assess cardio-respiratory fitness. The test was found to be reliable (test-retest r = 0.73-0.93) (Leger et al., 1988). There were instruments for self-reports by children (test-retest reliability $r = 0.94$) and for parents (an instrument previously validated by Medrich, 1979) regarding media use, physical activity, dietary behaviors, and family behaviors. BMI was the primary outcome measure for adiposity.

Results of final anthropometric measures indicated that the intervention group had significant relative decreases in BMI (18.38 to 18.67 kg/m^2) compared to controls (18.10 to 18.81 kg/m^2); adjusted difference of -0.45 kg/m^2 (95% confidence interval, -0.73 to -0.17, $p < .001$).

Similar to the other reviewed studies that had small samples, there were no significant interactions by age or sex for the intervention strategies. There were also significant decreases in reported television viewing time in the intervention group (12.43 to 8.86 hours per week) versus the controls (14.90 to 14.75 hours per week) adjusted change -4.29 (-5.89 to -2.70, $p < .001$). These research results are in agreement with findings from the Gortmaker et al. study regarding the relationship of television viewing time with obesity prevalence.

SCT constructs regarding the modeling of behaviors may help children explore and try new foods and participate in new physical activities (Kools et al., 2007). Research has demonstrated that children are more likely to be physically active or eat new foods if they first observe an adult modeling the behavior (Davison, Cutting, & Birch, 2003). The Davison et al. (2003) study used a questionnaire to assess ways in which parents encouraged physical activity in a sample of 180 nine-year-old girls. The researchers measured the girls' physical activity using the Children's Physical Activity Scale, as well as their participation in sports, and physical fitness.

Using exploratory and confirmatory factor analysis, two factors were found that influenced the girls' activity practices: parents' support of the girls' activity and parents' modeling of the exercise behaviors. Results from regression analysis indicated that the fathers' explicit modeling ([beta] = 0.24, $p < 0.01$) and mothers' logistic support ([beta] = 0.21, $p < 0.01$) were independently associated with higher levels of physical activity among their daughters after controlling for body fat ([beta] = -0.38, $p < 0.01$) (R^2 for full model = 0.27; R^2 for model with only parenting variables = 0.12).

Further chi-square analysis revealed that when neither parent provided a high level of support for their daughter's activity, only 32% of the girls were classified as being highly active. This increased to 56% when one parent encouraged their daughter to be active, and increased to 70% when both parents encouraged their daughter to be active.

After logistic regression analysis, it was found that the percentage of girls who were highly active was higher when one versus no parents provided support (OR = 0.19, CI= 0.08-0.47). Further analysis determined that it did not matter whether it was the mother or the father who encouraged activity ([x^2] (2,67) + 0.60, $p = 0.43$). These findings suggest that in situations where support from only one parent is available, the positive influence of that parent's support may still be evident.

A study that had successful results after modifying a middle-school-based fitness program was conducted on 50 overweight students who were monitored for cardio-vascular (CV) fitness, BMI, and fasting insulin and glucose levels (Carrel et al., 2005). Smaller class size (14 versus 35-40 for the control group), more activity time (42 minutes versus 25 for the control group), and less competitive play (walking, cycling, snowshoeing) encouraged student participation.

Results indicated that the treatment group had a significantly greater loss of body fat (loss, -4.1% ± 3.4% versus -1.9% ± 2.3%; *p*= .04), greater increase in CV fitness (VO_2 max, 2.7 ± 2.6 versus 0.4 ± 3.3 mL/kg per minute; *p*< .001), and improvement in fasting insulin level (insulin level, -5.1 ± 5.2 versus 3.0 ± 14.3 µIU/mL [-35.4 ± 36.1 versus 20.8 ± 99.3 pmol/L]; *p*= .02).

From the Carrel et al. (2005), it is evident that small changes to school fitness programs can result in significant improvement for children's BMI and general health.

Evidence from other research supports the theory that children who had favorable social images (modeling) of physical exercise in early childhood had subsequently higher levels of athleticism and were less likely to become obese as they age (Hampson, Andrews, Peterson, & Duncan, 2007).

The cohort sequential design study by Hampson et al. (2007) assessed the effect of social images children received on their own subsequent development of physical activity after the children observed peers engaged in physical activity. In addition, the related increase in physical activity was compared to levels of obesity over the following two years. The mostly Caucasian (86%) stratified random sample was composed of 846, 50% female, 6-10 year old children from 15 elementary schools. Five grade cohorts (grades 1-5) were assessed annually over four years until they were in the fifth through eighth grades.

The assessments included measures of the latent constructs of social images, athleticism, and obesity. Indicators of the latent construct of social images were measured using either a face-to-face interview (for children in second and third grades) or a questionnaire (for older children). The content of both methods was the same: children were shown a picture of a child playing soccer, and were asked if they thought that children who exercise are “cool or neat”, “liked by others”, and “exciting”. The response options were: no, maybe, and yes.

Athleticism was measured starting at grade four and five, in which children rated themselves on “Gets exercise such as playing soccer”, “Good at sports” (response options were: *not true, sometimes true*, or *very true*) and “Compared to others of your age and sex, how much exercise (such as rollerblading, or riding a bike) do you get?” (1 = *much less than others,* to 5 = *much more than others*).

Obesity was measured using mothers’ reports of their child’s height and weight, from which the researchers derived BMI percentiles using the Center for Disease Control (CDC) age and sex adjusted tables (CDC, 2008).

Path analysis results indicated that both the intercept and slope of athleticism predicted obesity at a later time point. In other words, higher levels of athleticism (and the less decline in athleticism over time) predicted lower obesity from baseline to eighth grade ($p < .001$). In addition, the model revealed that early social images did not directly determine later obesity; rather, they had an indirect effect on the child’s level of athleticism. There was no difference in structural paths between girls and boys.

The findings suggested a positive contribution of the SCT construct of modeling behaviors on the activity practices, and a decrease in obesity, of young children. The study concluded that the development of a cognitive-behavioral mechanism involving children's social images (peer modeling) of physical activity should be a target for obesity prevention interventions (Hampson et al., 2007). Limitations of the study concern the primarily Caucasian sample, which may limit how the results are generalized to other ethnic groups. In addition, the use of self-reports from mothers of their child's weight and height may have contributed inaccurate or erroneous data.

The final elementary school-based study was conducted over a two-year period on 4, 588 students (48% Hispanic). Anthropometric and demographic data were collected twice a year, and academic data were collected at the end of the two school years (Hollar et al., 2010.

The intervention, Healthier Options for Public Schoolchildren (HOPS) included nutrition (such as adding whole foods to school lunches) and activity components (such as, desk-side exercise in classrooms). The study demonstrated that significantly more intervention than control students stayed within normal BMI ranges both years (p= .02). In addition, more obese students in the intervention (4.4%) than in the control (2.5%) decreased their BMI, although this was not statistically significant. Finally, math scores were significantly improved for the treatment group (p< .001).

The Hollar et al. (2010) research demonstrated successful results using changes in diet and exercise that were matched with school programs, which not only provided efficient use of classroom time, but also elevated the academic success of low-income children (Hollar et al., 2010).

Preschool Children

Most of the obesity interventions and prevention studies in the U. S. literature are directed towards adolescents. However, research has shown that the preschool years are the most important time to apply prevention strategies to improve nutrition and activity health behaviors (Ogden et al., 1997; Salsberry & Reagan, 2005; Story et al., 2006). Therefore, research regarding obesity prevention strategies for children ages two to five years it is of paramount importance (Campbell & Crawford, 2001; DHHS, 2000).

A series of studies that focused on preventing obesity in preschool children incorporated SCT in the studies' framework. A community-based obesity prevention program for Head Start minority preschool children incorporated the SCT construct of modeling healthy behaviors to help children try new foods and engage in new activities (Fitzgibbon et al. 2005; Fitzgibbon et al. 2006). The intervention program, "Hip Hop to Health, Jr.," was modeled after "Hip Hop to Health," a community-based cardio-vascular risk reduction intervention for 6-10 year-old African-American children and their families (Fitzgibbon, Prewitt, Blackman, Simon, Luke, Keys, Avellone, & Singh, 1998).

The Fitzgibbon et al. (2005) study, a 6-month intervention (with two follow-up measurements) for minority preschool children, was conducted in 12 Head Start programs. Six Head Start sites were randomized to either the 14-week nutrition/physical activity intervention, or a general health program. There were 197 children in the sample, which was 80.7% African American, 12.7% Latino and 6.6% multi-racial or other races.

The intervention was composed of 40-minute, three times weekly lessons on healthy eating, with 20 minutes of physical exercise. Handheld puppets were used to represent the seven food groups of the food pyramid, and to lead the children through various activities. Parents were sent newsletters on healthy eating and exercise, as well as homework assignments each week.

The main outcome variable was change in BMI and the secondary outcome measure was amount of physical activity, television viewing time, and caloric, fat, and fiber nutritional intake. Baseline, post-intervention, and one-and-two-year follow-up measurements were obtained.

Post-intervention changes in BMI were not significantly different between the two groups (0.06 kg/m^2 versus 0.59 kg/m^2, $p < .234$). At the one-year follow-up, the BMI for the intervention group showed a significantly smaller increase than for the control group (0.06 kg/m^2 versus 0.59 kg/m^2, difference of -0.53 kg/m^2 (95% CI -0.91 to -0.14), $p < 0.01$). At the two-year follow-up, there was a significantly smaller increase in BMI for the intervention group compared to the control group (1.14 kg/m^2 versus 0.48 $kg/\ m^2$ ($p < 0.008$) respectively. Nutrition intake, physical activity, and television viewing time were not significantly different among intervention and control groups post-intervention and at both follow-up measurements.

The results obtained in the Fitzgibbon et al. (2005) study were somewhat better than the findings from a later study by Fitzgibbon et al. (2006), which focused on Latino children. The Hip Hop to Health Jr. intervention study with Latino preschool children, which used the same intervention, revealed no significant differences between the intervention and control groups for primary or secondary outcomes. The results for the intervention group versus the control group for BMI increases were not statistically different ($p < 0.89$) post-intervention, nor were BMI increases for the one ($p < 0.46$) and two-year follow-ups ($p < 0.34$).

The authors reported that adjustments for baseline age and BMI scores did not substantially change the results. Nutrition intake, physical activity, and television viewing time were not significantly different among intervention and control groups post-intervention and at both follow-up measurements.

There may be several reasons for the lack of success with the Hip Hop to Health Jr. program for Latino preschool children. The researchers noted that the preschool children's parents were low-acculturated Latinos, who may have required a more intensive nutrition and physical activity component than did the parents in the 2005 Hip Hop to Health Jr. study, who were primarily African American. This may be due to cultural factors, in which other studies have found that Mexican-American children and their parents spend less time participating in physical activities than Anglo-Americans and African Americans (Kimbro, Brooks-Gunn, & McLanahan, 2007; Sallis et al., 1993). In addition, the intervention may not have focused on ethnic foods, and the cultural aspects of eating and physical activity, in ways that were appropriate for low-cultured Latinos.

The researchers also noted that the Latino children in their 2006 study had higher BMI scores at baseline than the African-American children in their previous (2005) study (mean (SD) 17.2 (2.5) kg/m^2 versus 16.6 (1.8) kg/ m^2 ($p < 0.001$). Therefore, the Latino children may have required a more intensive intervention in order to alter their trajectory toward overweight. The results also indicate that more studies are needed to determine how differences in rates of obesity between ethnic groups are affected by culturally based choices for foods and physical activities.

Analogous to other research found in the literature, the Fitzgibbon studies evaluated the effectiveness of the Hip Hop to Health Jr. intervention, but not that of any Head Start developed childhood obesity interventions. Similarly, a pilot study conducted by Young et al. (2004) incorporated a SCT-based 12-week intervention to improve food choices in disadvantaged children at four Head Start agencies using a blend of educational and marketing strategies. Control and experimental classrooms were included in the study of 67 three-to-five year old Head Start participants. Nutrition education classes for children supported developmental learning skills such as fine and gross motor control, problem solving, sensory evaluation, listening and language skills, and also reinforced the program theme to try new foods.

The intervention required three 20-minute nutrition education activities each week, which were incorporated into the school curriculum by teachers. Activities included tasting parties, fruit and vegetable mystery bags (for sensory evaluation), and reading nutrition-themed storybooks. Central to the Young et al. (2004) program was a set of seven "Food Friends" puppets, which were utilized in all the program components.

Although the time requirements for the intervention were much shorter than for the Fitzgibbon et al. (2005 & 2006) interventions, there was no physical activity component to the Young et al. (2004) study. In addition, parents were sent four articles during the 12-week program to help reinforce nutrition knowledge, which provided less parental involvement than for the Fitzgibbon intervention.

Data were gathered using a modified version of Birch's food preference panel (Birch & Sullivan, 1991) administered to the children's parents at pretest, posttest, and a 10-day follow-up to assess the willingness of preschool children to try new foods. Perceptions of teachers indicated improved acceptance of new foods by students, and acceptance on first exposure as the weeks progressed. Further research is indicated to validate the reported results from this pilot study, and additional outcome measurement components are needed to determine its effectiveness for reducing preschool children obesity levels.

A doctoral dissertation by Bellows (2007) built upon the Young et al. (2004) pilot study by developing and evaluating a physical activity program component, *Food Friends Get Movin' with Mightly Moves* [TM] within Head Start agencies. The program was an 18-week initiative that focused on physical fitness, gross motor development, and physical activity in the preschool classroom environment. SCT was embedded within a social marketing framework to enhance behavioral change.

The study was a randomized controlled trial of 201 three-to-five year olds enrolled in 18 Head Start agencies in Colorado. Measures included BMI, physical fitness tests (number of sit-ups and timed runs), and gross motor skill (Peabody Developmental

Motor Scales) assessments. Physical activity was measured with pedometers over a six-day period, and parents recorded step-counts.

Results indicated that the intervention did not have an effect on BMI percentiles; however, there was an improvement on gross motor skills and fitness levels. No significant difference in amount of physical activity ($p > .05$) for children resulted from the intervention. This study has a similar intervention time frame as the Fitzgibbon study, with similar results, which may indicate the need for further research to determine whether results can be improved by using a longer intervention time period.

Hafetz (2007) conducted a study for a doctoral dissertation, which was based on a logic model that illustrated a sequence of cause-and-effect relationships. The study evaluated the impact of the *Go!Kids* obesity prevention program for Head Start students and their parents. The six-month initiative teaches parents and children how to prepare and cook nutritious food, how to make conscious food choices, and how to become conscious consumers. The intervention for the children consisted of 24 weekly, 30-minute sessions conducted in Head Start classrooms.

The goal of the program is to increase the knowledge of healthy eating, nutrition, and activity levels in parents and in children to prevent obesity and promote positive health outcomes. It was hypothesized that parent's knowledge of healthy nutrition and exercise would have a positive effect on child eating behavior and television watching. Cultural assimilation was hypothesized to be a moderator.

The program was pre-and-post-tested in eight Head Start programs in 2004, with 128 three-to-four year old children from three schools. A Parent Lifestyle Survey (RLS) consisting of 56 items in four sections was developed to assess parent dietary knowledge, parent health beliefs, parent behavior, and child behavior. The Child Computer-Based Test (CBT) consisted of 15 items, with questions related to healthy and unhealthy foods.

Results from the study revealed that there was not a main effect for parents' knowledge on children's eating behavior and time spent watching TV. In addition, cultural assimilation was not found to moderate the relationship between parent knowledge of health and nutrition and children's eating behavior. However, there was improvement in children's knowledge of health and nutrition. A one-way repeated measures ANOVA analysis was conducted to compare children's knowledge on pre-test and post-test scores. There was a significant main effect for the intervention (Wilk's Lambda = .68, F (1, 128) = 59.84, p = .000, multivariate eta squared = .32).

The short intervention period was a limitation for this study. In addition, the Parent Lifestyle Survey was changed in content and structure from pre-test to post-test, which created the possibility that pretest and posttest score changes may have occurred due to differences in the measures, rather than due to changes in knowledge. Validity and reliability measurements for the instruments were not reported. The lack of an experimental or quasi-experimental design limits the generalizability of the study results. Lastly, more direct measures and observation of parent and child behaviors may lend more credibility to the results.

Previous research regarding the effects of the standard Head Start program on preschool children have reported positive and significant gains in some health indicators, such as a decreased likelihood of smoking cigarettes (Garces, Thomas, & Currie, 2002).

However, there are few significant findings for Head Start program effects upon BMI percentiles and exercise as reported in the literature (Gable & Lutz, 2001; Pate, Pfeiffer, Trost, Ziegler, & Dowda, 2004).

Research by Gable and Lutz (2001) compared adult nutrition attitudes and mealtime behavior with preschool children's eating behavior and BMI. No theoretical framework was reported for the study, which involved 46 child-parent pairs, and eight Head Start teachers. BMI percentiles were calculated for the children, and parental attitudes were calculated with the Nahikian-Nelms nutrition attitudes survey, from which items could be summed into positive or negative mealtime behaviors.

Teachers also completed this survey, and were assessed during mealtimes at Head Start facilities regarding: physical environment, such as size of tables and chairs and eating utensils; mealtime routines, such as whether teachers sat with the children and ate the same meals; and teaching behaviors, such as discussing nutrition or allowing sufficient time for the children to eat.

Results indicated that when parents reported more inappropriate feeding and mealtime practices, such as hurrying the child to eat, or requiring the child to eat everything on their plate, then their children had higher BMI percentile scores ($r = 0.38$; $p =< .01$). Teacher behavior scores varied widely between teachers and between classrooms, with some teachers exhibiting much higher rates of positive strategies than teachers in other classrooms (8.3 per 5 minutes compared to 3.2 per 5 minutes). The researchers concluded that teaching during mealtime by Head Start teachers was infrequent (only once every 15 minutes).

The study evaluated the standard nutrition education program for Head Start preschool children and their parents. The findings suggest that there are shortcomings in the standard program, which may be addressed and corrected by the in the IMIL program.

Head Start preschools were included in another study on physical activity, in which the theoretical framework was not apparent (Pate et al., 2004). The researchers classified all preschools in one metropolitan area into three groups: private, church-based, or government funded (Head Start). The sample size consisted of 247 child participants, of whom 53% were female and 65% were African American. The purpose of this study was to determine the variability in physical activity among the preschools, and to identify associated demographic factors.

An Actigraph monitor, which recorded activity counts per 15-second interval, was attached to the hip of the children and worn during the preschool day. Data were analyzed to determine 1) total counts per hour of monitoring, 2) number of intervals of light physical activity per hour, 3) number of intervals of moderate-to-vigorous physical activity (MVPA) per hour, and 4) number of intervals of vigorous physical activity (VPA) per hour. BMI was calculated for each child and a questionnaire was administered to parents to gather demographic data.

Findings revealed that boys spent significantly more time in MVPA and VPA than did girls (MVPA: males = 7.8 versus females = 7.0, p = .01;VPA: males = 2.1 versus females = 1.7, p = .001). No gender differences were noted for time spent in sedentary and light activity. Black children were found to be more physically active than White children; but only the time spent in VPA was statistically significant (VPA: African American = 2.0 versus white = 1.7, $p = .04$).

The study found that the average amount of time the preschool children spent in moderate to vigorous physical activity (MVPA) was approximately 7.7 minutes per hour, which fails to meet recent guidelines for preschool children, which recommend at least 120 minutes per day (National Center for Sport and Physical Education, 2002).

Gender, race, and ethnicity were significant predictors of MVPA, however, the study findings suggest that the greatest variance in preschool child physical activity depended largely upon the type of preschool attended (MVPA: 4.4 to 10.2 minutes per hour; VPA: 0.6 to 3.4 minutes per hour). It was not evident which type of preschool (private, church-based or Head Start) offered the greatest amount of MVPA or VPA. The Pate et al. (2004) study did not examine nutrition policies and protocols between preschool types and data collection was not uniform among preschools, both of which serve as limitations for this study.

Nursing and Head Start

The Nursing profession and Head Start have many health-related initiatives in common, including disease prevention, risk reduction, and health promotion, including decreasing the prevalence of childhood obesity (Kulewicz, 2001; Department of Health and Human Services, 2007). In addition, many schools of nursing provide service-learning experiences for nursing students as a part of their pediatric curricula (Kulewicz, 2001; Bently & Ellison, 2005; Kushto-Reese, Maguire, Silbert-Flagg, Immelt, & Shaefer, 2007).

Over the past thirteen years, there has been a wide range of Head Start participation in nursing research. Nurses have conducted studies on topics related to childhood obesity, blood pressure, upper respiratory infections, attention deficit disorder, over-the-counter medications, and service learning for undergraduate nurses (Ulione & Donovan, 1996; Canuso, 1997; Ecklund & Ross, 2001; Kulewicz, 2001; Horodynski & Strommel, 2005; King, Meadows, Engelke, & Swanson, 2006; McGarvey et al., 2006; Kushto-Reese et al., 2007; Hudson, Cherry, Ratcliffe, & McClellan, 2009). This review will focus on the nursing research studies that pertain to the topic of childhood obesity.

An SCT-based, grounded theory study using focus groups that consisted of Head Start parents was conducted to demonstrate that beliefs and attitudes, as well as family and personal knowledge, might contribute to or impede health behavior change. (McGarvey et al., 2006).

The goal of the study was to collect cross-cultural perspectives on maternal feeding practices and beliefs for future intervention development. There were facilitator questions for topics related to: what children should eat; how parents decide what foods to feed children; knowing when a child has been fed enough; controlling a child’s eating behaviors; overweight children concerns; food as incentives; involvement of parents in physical activity; and methods for learning about a child’s health issues.

Twenty-five parents of children enrolled in Head Start and in the Women, Infants and Children (WIC) programs were recruited to participate in the focus groups. There were four focus groups: African American (6 members), Caucasian (8 members), Hispanic (6 members), and Vietnamese (5 members), which were conducted in the native languages for each group by trained facilitators.

Content analysis was used to inform the approach to the qualitative analysis of the focus group data. Each focus group was audiotaped and transcribed, and reviewed by two independent researchers and two researchers from the study.

The study findings indicated that there was a need for childhood obesity interventions and government nutrition programs that enhance parent self-efficacy specific to ethnic groups (e.g. using client's language, beliefs and traditions). The findings lend support to the inclusion of the social cognitive theory (SCT) component of reciprocal determination, which entails helping parents to identify their own personal barriers and facilitators in order to change the nutritional environment at home.

A recent childhood obesity study conducted by Hudson et al. (2009) examined lifestyle behaviors, parental perceptions of their children's weight, and BMI of children enrolled in Head Start. A self-reported survey design was employed with 96 parent-child dyads. The conceptual framework utilized the Ecological Systems theory, which posits that environmental influences (social, biological, or physical) can provide either positive or negative influences on characteristics (such as, BMI) (Paquette & Ryan, 2001).

Results indicated that the participating children's obesity prevalence (15.6%) was higher than the national average (10.4%). However, most parents did not perceive their child to be obese; in addition, nutrition and activity levels did not meet recommended guidelines for children aged 3-5. It was also found that the less active children were more likely to eat snacks (N = 96, $x^2 = 6.24$, $p \leq .04$).

The researchers suggested that nurses should be active in the development of interventions to address the health needs of the Head Start children and in the provision of health consultations to Head Start (Hudson et al., 2009). The study did not address the IMIL initiative; rather, it assessed the standard nutrition education programs at Head Start centers.

An earlier SCT-based nutrition program for parents and toddlers in the Midwest Early Head Start programs was designed to enhance parent-toddler feeding practices and promote healthy eating (Horodynski & Strommel, 2005). There were 135 participants in the baseline interview (62 in the experimental group and 73 in the control group). The average age of the toddlers in the intervention and control groups was 19.3 months; the average weight was 26.2 pounds. Post-intervention, 96 parents participated in the final interview (43 in the experimental group and 53 in the control group).

The study employed the Nutrition Education Aimed at Toddlers (NEAT) intervention consisting of four 90-minute group-based nutrition lessons for parents and 18 individually structured reinforcement activities. A trained Early Head Start (EHS) home visitor provided the 18 reinforcement lessons over a six-month period.

Three instruments were used to measure outcomes for the study. The toddlers' feeding self-regulation was assessed with the Child-Parent Mealtime Behavior Questionnaire (CPMBQ), which consisted of 44 items designed to measure parent and child mealtime behaviors. Cronbach's Alpha ranged from .67 to .83 following exploratory factoring.

The second questionnaire for parents was the 16-item Facts on Feeding Children tool, which was created by the study researchers. An example of one item on the dichotomous response tool was "Toddlers need snacks between meals." Each correct item was scored as one point, with a total of 16 possible points. The researchers did not describe any tests for validity or reliability.

The third tool used in the study was the Feeding Self-Efficacy Questionnaire, which consisted of eight items designed to measure parents' self-efficacy in feeding their toddler. No description of validity or reliability was reported.

A repeated measures analysis of variance was used to examine the impact of the intervention on Toddler Feeding Self-Regulation. Results indicated that there were no significant differences between the intervention and control groups for any of the five groups of items scored on the questionnaire. In contrast, there was a significant difference between the two groups regarding responses on the Facts on Feeding tool (intervention group: 15.0 average correct answers compared to 13.9 average correct answers for the control group).

Parents self-efficacy scores increased slightly for both groups following the intervention, suggesting that content of the intervention played less of a part than mere participation in the study. This may have occurred due to the Hawthorne effect, in which research subjects change their behavior simply because they are subjects in a study, and not because of an intervention (Polit & Beck, 2008). However, the percentage of parents who left the television on during meals declined for the intervention group (58% to 39%) compared to the control group (46% to 48%).

The NEAT intervention demonstrated that participants gained nutrition knowledge; however, it did not specifically change parent's feeding behaviors or self-efficacy. In addition, validation of parent behaviors with direct observation by researchers, rather than with self-reports from the parents, may provide reliable evidence of the efficacy of the NEAT intervention.

Analysis of Secondary Data in Dissertation Research

A recent doctoral dissertation used secondary data analysis to evaluate a SCT-based weight loss and activity program for children (Coppen, 2008). The intervention program, "U Got 2 Move It" was designed to increase physical exercise in students, and to help students become proficient at increasing their energy levels, thereby decreasing the risk for obesity.

The study purpose was to assess the efficacy of the activity and nutrition intervention on reducing Metabolic Syndrome (MetS) among 135 children and adolescents who completed the 10-week weight loss program. Thirty-nine percent of the children (53) had MetS. Various risk factors were analyzed pre and post intervention (blood pressure, cholesterol levels, BMI, and blood sugar levels, and other anthropometric measures).

The researcher used secondary data analysis of information that was in a proprietary database at medically supervised weight loss clinics to evaluate the program.

Findings indicated that there was a significant improvement in many risk factors, including BMI from pre-test (*M* = 33.63, *SD* = 6.52) to post-test (*M* = 30.17, *SD* = 6.53, $p < .01$); systolic blood pressure pre-test (*M* = 111.24, *SD* = 13.49) to post-test (*M* = 105.46, *SD* = 9.62, $p < .01$); diastolic blood pressure pretest (*M* = 71.24, *SD* = 8.68) to post-test (*M* = 67.90, *SD* = 6.74, $p < .01$).

Findings also indicated that MetS remission occurred in 40 of the 53 children and adolescents, which supported clinical observations that losing weight can reduce MetS risk factors (Coppen, 2008).

Another doctoral dissertation utilized secondary data analysis to determine the relationship between children's overweight status and the amount of time they spend in physical activity, the amount of healthy lifestyle education they received in school, and content of school lunches (Henry, 2006). The theoretical framework for the study was based on SCT in combination with the Piaget cognitive-development theory, which involves stages of learning.

The sample consisted of 59 elementary, middle and high schools, which had an average of 666.75 students enrolled at each school. BMI data for students were obtained from secondary data sources at each school. Sociodemographic data were obtained from the U. S. Census Report (2000) and the National Center for Education Statistics (NCES) (2004). Academic achievement data were obtained from the National Department of Education (2004) and the NCES (2004). Data on student readiness for kindergarten were obtained from the county education department. Caloric and nutritional content of school lunches were calculated using a U.S. Department of Agriculture (2004) nutritional analysis tool. Information regarding available playground equipment was obtained from the maintenance departments of the school districts. A data-collection tool was used to record the information from the schools. All of the secondary data was compiled into a database created by the researcher.

Analysis included descriptive statistics; scatter plot and correlation statistics for ethnicity and obesity prevalence; percentage of overweight students and their academic achievement; and percentage of school lunches sold and corresponding overweight status of students. Multiple regression analysis was performed to determine factors that might explain the variance in the prevalence of overweight children.

A second analysis using Geographic Information Systems (GIS), ArcView 3.2, was completed as a method to display the obtained data and the relationships found among the data. Geographical mapping was created for bus and walking routes to schools, ethnic percentages of each school, prevalence of overweight kindergarten and third grade students, percentage of school lunches sold, and percentage of children who are in the free lunch program.

Findings indicated that school lunches were associated with percentage of overweight children (Kindergarten (K): $r = 0.543$, $p = .001$; Third grade (3^{rd}): $r = 0.682$, $p = .000$). Additionally, ethnic percentages in schools were associated with percentage of overweight children (White- Kindergarten: $r = -.57$, $p < .001$; White- 3^{rd} Grade: $r = -.72$, $p < .001$; African American- K: $r = .56$, p < .01; African American-3^{rd}: $r = .66$, $p < .001$; Hispanic- K: $r = .36$, $p < .01$; Hispanic- 3^{rd}: $r = .60$, $p < .001$).

Playgrounds were found to be inadequate, as well as nutrition education. There was also an association between overweight students and low-performance on standardized tests that are used to determine readiness to learn and acquired learning for third grade students (Reading: $r = -0.577$, $p = .000$; Math: $r = -0.511$, $p = .001$).

The study highlighted the important roles that school nurses and public health nurses have in the epidemic of childhood obesity. Nurses are strategically positioned to combat obesity by educating children and their parents, developing school-based interventions, and becoming involved in policy changes to prevent unhealthy nutrition and to increase physical activity for school children.

Another recent dissertation that used secondary data analysis focused on children who were enrolled in Head Start and their subsequent BMI levels in third and in fifth grades (Zhai, 2008). There was no discussion of a theoretical framework for the study.

The data was obtained from the Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 (ECLS-K) database. The sample consisted of 5,656 third grade students and 3,878 fifth grade students.

The findings indicated significant positive effects of Head Start on reducing overweight and obesity for former Head Start children who had reached the third and fifth grades, compared to other preschool childcare arrangements. Children who were enrolled as preschoolers in other center-based care were 1.69 to 1.94 times as likely to be overweight and 1.52 to1.58 times to be obese in the third grade and 2.40 times to be overweight in the fifth grade compared to former Head Start students. Additionally, Head Start students who participated in one or more types of non-parental care were more likely to be overweight and obese in both third and fifth grades than children who were only enrolled in Head Start. In addition, the effects were not found to vary significantly by ethnicity, gender, or English speaking at home.

The findings from the study indicate that Head Start may help children and their parents to develop healthy eating habits, which appear to increase in magnitude from the third to fifth grade. The results also imply that children who have multiple child care arrangements may have erratic eating, nutrition, and physical activity habits and thus may have an increased risk for obesity.

Summary

In conclusion, the literature review revealed no studies that investigated results from the recent IMIL childhood obesity prevention initiative developed by Head Start as compared to the standard program. Several studies were found that evaluated interventions developed by U.S. researchers and tested within Head Start settings (Fitzgibbon et al., 2005; Fitzgibbon et al., 2006; Young et al., 2004; Bellows, 2007; & Hafetz, 2007). Other research studies examined components of the standard Head Start nutrition and physical activity programs (Gable & Lutz, 2001; Pate et al., 2004).

Social cognitive theory was used in 15 of the 23 reviewed obesity intervention studies as a method to enhance the impact of health interventions and to understand the process of behavioral change. The studies revealed various methods for intervention implementation, such as classroom lessons, discussions, and reading materials. Teachers implemented the healthy nutrition and exercise component in three of the studies

(Brownell & Kaye, 1982; Gortmaker et al., 1999; Robinson, 1999). A multi-disciplinary team conducted the nutrition and activity sessions for two of the studies reviewed (Figueroa-Colon, 1996; Foster et al., 1985). Findings indicated there were significant reductions in BMI in eleven studies; however, three studies reported a significant reduction in the BMI of only the participating girls.

Research by nurses at Head Start has been conducted on a wide range of topics, including childhood obesity research. The reviewed studies evaluated interventions, and added critical evidence for obesity prevention in children (Horodynski & Strommel, 2005; Hudson et al., 2009; & McGarvey et al., 2006).

Secondary data analysis related to childhood obesity was supported by evidence from three dissertations, one of which evaluated Head Start childhood obesity prevention effects in later childhood (Coppen, 2008; Henry, 2006; & Zhai, 2008).

Research measurements used for data analysis in the reviewed publications included weight, height, BMI (11 studies), percentage of body fat (1), percentage overweight (2), skin-fold thickness (2), nutrient values amounts in school lunches (6), amount of nutrition education for parents & children (2), blood pressure (3), serum lipid level (1), fasting insulin level (1), waist circumference (1), cardio-fitness (1), eating behaviors (2), amount of MVA (5), and amount of TV time (2).

Intervention or program variables included: nutrition education for children (13 studies), teachers (4) or parents (10); education/activities to increase physical activity (13); a restrictive diet for children (2); education/activities to decrease TV/video game time (2), and lunchbox checks (1).

Types of statistical analysis for the research in the literature review included: ANOVA (2), ANCOVA (2), RANOVA (1), Odds Ratio (1), Chi-square (5), Wilcoxon rank (1), regression (5), mean ± SD (2), path analysis (1), t-tests (6), qualitative content analysis (2), percentages (3) and geographical mapping (1).

The limitations of many of the reviewed studies regarding the short duration of the intervention, and the limited improvement for nutrition knowledge and BMI percentiles in children might be effectively addressed in the Head Start *I am Moving, I am Learning* (IMIL) initiative. However, research studies are needed to determine the efficacy of this long-term obesity program. Therefore, this dissertation will investigate the efficacy of the IMIL initiative compared to the standard Head Start nutrition program.

CHAPTER 3

Methodology

Introduction

This chapter includes an overview of the study, design, research questions, operational definitions, study participants, data source, data analysis, ethical considerations, and limitations of the study.

Design

This secondary data analysis study employed a quasi-experimental, pre-and-post-test design, which was chosen to determine the statistically significant differences in variables measured on ratio, nominal and ordinal scales. These variables included BMI percentiles, demographic, and program characteristics for an experimental intervention group and a non-intervention group. Secondary analysis has been employed in previous Head Start and childhood obesity dissertations as a reliable method to obtain data on vulnerable populations (Coppen, 2008; Henry, 2006; Zhai, 2008).

This quantitative study assessed the efficacy of the Head Start childhood obesity prevention intervention, *I am Learning, I am Moving* (IMIL), as compared to the standard Head Start nutrition program. Two counties in Virginia were selected, one county implemented the IMIL obesity prevention program in its curriculum; the other used the standard Head Start nutrition program. Group I for this study (hereafter referred to as the

IMIL group) was the Head Start agency in the county that implemented the IMIL program. Group II (hereafter referred to as the non-IMIL group) was the agency in the county that uses a standard Head Start nutrition program.

Procedure

A research proposal and application were submitted and approved by the George Mason University Human Subjects Review Board prior to data collection. Confidentiality and anonymity were maintained for Head Start agencies and students by assigning a number to replace names throughout the study. In addition, approvals were obtained from the two school districts in the participating counties prior to accessing Head Start data.

Using a laptop, data were entered into a SPSS data file from the secondary data source by the researcher. The researcher's computerized data files were password protected; any data files written or typed on paper were locked in the researcher's office file cabinet. Data for each preschool child were assigned an identification number from 100-400. The researcher was the only person with access to these data.

Secondary data included the height and weight measurements obtained by the Head Start directors for approximately 350 four-year-old preschool children. In each of the two counties, one director and an assistant weighed and measured each child. The Head Start director from each of the two programs gathered the data in the fall and spring of the 2008-2009 school year using equivalent weight and height equipment for each child (Biomeasure Youth System, Glenview Health Systems, IL). The Head Start site for one of the counties graphed and calculated the height and weight measurements using the online BMI calculator at www.shapeup.com. The other Head Start site entered the data into the PROMIS software system, which calculated and graphed the BMI. Both site directors maintained a log for each child's twice yearly BMI, height, and weight measurements.

Forms used by the two Head Start county agencies (Appendix E and F for the IMIL group and Appendixes G-J for the non-IMIL group) differed in format; however, they contained the same basic physical and demographic assessment content. The forms were designed to gather more data than were needed or used in this study, such as, information for Head Start eligibility screening, goals health, education service plans, outcome tracking, and evaluation. Information that did not pertain to the study variables was not recorded or analyzed for this study.

Specific socio-demographic data (race and/or ethnicity, gender, age, and family income) that related to the study variables was collected from the two Head Start county databases. Height, and weight were recorded onto the data collection forms created for the study (Appendix K and L). Only the data listed on these forms was used for analysis. The researcher created a password-protected file in a SPSS software program for data storage.

Sample

The sample consisted of 354 four-year-old preschool children enrolled in Head Start in two counties located in Virginia. Non-random sample selection was chosen due to the nature of the setting, in which Head Start preschools were controlled and managed by the county in which they were located, and children were assigned to preschools based in the county in which they resided. Each of the counties had independent control and management of their associated Head Start program.

Inclusion criteria: children aged three to five years who were enrolled in Head Start preschool in two Virginia counties. Exclusion criteria: children who were missing height, weight, and demographic data in the secondary data file.

Demographic Description of Participating Counties

The two counties from which the study participants were selected had slightly different population statistics. The county from which the intervention group (IMIL) was selected had an estimated population of 364,734 people in 2007, compared to the county for the control group, which had a population of 289,995 people (U.S. Census Bureau, 2007). There were 9.1% children under five years of age in the county representing IMIL compared to 9.5% for the non-IMIL county. The percent of foreign-born persons in the IMIL county was 11.5% versus 11.3% for the non-IMIL county. Languages other than English were spoken in 16.3% of the IMIL county population, compared to 15.0% of the non-IMIL county. The home ownership rates for the IMIL and the non-IMIL counties were 71.7% and 79.4%, respectively. Percent of persons below the poverty level for the IMIL and the non-IMIL counties were 5.0% and 3.0% respectively. Percentage of persons who were high school graduates was 88.8% for the IMIL county and 92.5% for the non-IMIL county. The greatest difference between the two counties was income per household, which was $86.294 for the IMIL county, versus $107,200 for the non-IMIL county.

Racial and ethnic differences (Table 6) between the IMIL county and the non-IMIL county included a higher population of Black (19.9%) and Hispanic origin (19.2%) people in the IMIL county as compared to the non-IMIL county population (Black 8.3% and Hispanic origin (10.2%). Overall, there were moderate differences between the county populations for the two groups.

Table 6
Race and Ethnicity Statistics for Participating Counties

Race/Ethnicity	Group I- IMIL County	Group II Non-IMIL County
White	69.2%	76.4%
Black	20.1%	8.3%
American Indian & Alaska Native persons	0.5%	0.3%
Asian	7.2%	12.6%
Native Hawaiian & Pacific Islander	0.2%	0.1%
Persons reporting two or more races	2.8%	2.3%
Hispanic or Latino origin*	19.1%	10.4%
White, not Hispanic origin**	***52.1%	***67.4%

U.S. Census Bureau, 2007. * Origin can be viewed as the heritage, nationality group, lineage, or country of birth of the person or the person's parents or ancestors before their arrival in the U.S. **Not Hispanic White persons are those who responded "No, not Spanish/Hispanic/Latino" and who reported "White" as their only entry in the race question.

*** The concept of race is separate from the concept of Hispanic origin. Percentages for the various race categories add to 100 percent, and should not be combined with the percent Hispanic or not Hispanic origins.

Power analysis. The estimate of sample size for product moment *r* analysis was performed using a significance of $\alpha = 0.05$, a medium effect size of .30, and a desired power of .80, which determined a minimum sample size of 85 children in each group. This calculation can be compared to a sample size power analysis for a statistical t-test, using a level of significance of $\alpha = 0.05$, a power of .80, and a medium effect size of .50, which results in a sample size of 64 for each group.

A medium effect size is supported by meta-analysis and review of 13 childhood obesity intervention studies.The average effect size for these studies was $r = .22$ ($p < .001$), which corresponds to a low-medium effect size and also denotes clinical significance (Stice, Shaw, & Marti, 2006). In addition, a meta-analysis of preschool intervention program, participant, and study characteristics as moderators for cognitive, social, and parent-family outcomes found a mean effect size of 0.57 when duration of the intervention was greater than 300 sessions (approximately one school year) (Nelson, Westhues, & MacLeod, 2003). In this dissertation, a sample size of 96 in the control group and 258 in the experimental group exceeds requirements for a medium effect size.

Measurement

The literature review conducted for this dissertation indicated several program variables that were in common with the Head Start IMIL program (Table 7). These were measured and analyzed as the independent variables for this study. Measurements for these continuous variables, which included the number of minutes of MVPA and SCPA per school day and the number of minutes of nutrition education for children and teachers, are also based upon past research in the literature. In addition, the dependent variable, BMI percentile scores, was frequently employed in childhood obesity intervention studies.

Table 7
IMIL Program Variables

Description of Program Variables and Measurements (Continuous)
1- Average number of minutes per month for children's nutrition education.
2- Average number of minutes per month for teachers' nutrition education.
3- Average number of minutes per day of moderate to vigorous physical activity (MVPA) for preschool children per school day.
4- Average number of minutes per day of structured classroom physical activity (SCPA) for preschool children per school day.

The four program variables were compared to the dependent variable, change in BMI percentile (pre-to-post intervention BMI percentile change scores).

The data for these four variables were obtained from the proprietary databases at each of the two participating Head Start county offices. Nutrition education for teachers was tracked by the directors and entered into their proprietary databases. Directors received the data for the remaining three program variables from each preschool teacher's daily log, which includes amount of time (start time/stop time) and types of physical activity (sedentary, moderate activity, and vigorous activity) and types of nutrition education (meal nutrition conversation, and snack nutrition conversation). The physical activity measurements were calculated as minutes per day by the researcher for analysis; the nutrition education measurements were formatted as minutes per month.

Additional independent variables for different statistical analyses included: gender (dichotomous), ethnicity (categorical), age (continuous), mother and father's education level (categorical), income (continuous and categorical), WIC enrolled (dichotomous), Child speaks English (dichotomous), number of children in family (categorical), and number of parents in family (categorical). These were obtained from the Head Start directors' proprietary databases.

Change in BMI percentile scores and raw BMI percentile scores. BMI percentile for age was the primary outcome measure for this study. Change in BMI percentile for age scores was used to determine whether the intervention made a difference in the intervention group compared to the control group (independent t-test conducted on both groups together). Raw BMI percentile for age scores from pretest and posttest height, weight, and age measurements were used to determine whether the intervention had an effect within each of the two groups (separate paired or dependent t-tests conducted on the experimental and on the control group).

The raw BMI percentile scores variable was created after each student's height, weight and age in months were obtained from the two Head Start directors by the researcher. Height, weight, and age data was entered into the formula, BMI = [weight /

(height in inches^2)] x 703. Following data screening these raw BMI percentile scores were used in the dependent t-test in the data analysis.

Change in BMI percentile scores were calculated for each child using the raw baseline (pretest) BMI percentile score minus the raw posttest BMI percentile score (Vickers, 2004). Use of BMI percentile change scores rather than z-scores has support from recent research findings. When compared to BMI z-scores, studies have found that either raw BMI scores or change in BMI percentile scores were more stable and reliable measurements for addressing adiposity change in children at risk for obesity (Berkey & Colditz, 2007; Cole, Faith, Pietrobelli, & Heo, 2005; Ihmels, Welk, Eisenmann, Nusser, & Myers, 2009; Lemeshow, Fisher, Goodman, Kawachi, Berkey, & Colditz, 2008).

BMI percentile change scores: categorized. Chi-square analysis was used for research question four, in which categorical variables were analyzed. The demographic variables were formatted as nominal and ordinal measurements, therefore, it was necessary to transform the ratio measurement, Change in BMI, into a categorical variable. Using the CDC Body mass index-for-age percentiles for boys and girls (CDC, 2000) as a guideline, six categories for change in BMI percentiles from baseline were created, ranging from -59.99 to 60.00 (Table 8).

Table 8
**Change in BMI (Categorical Variable)*

Ranges for BMI Percentile-for-age-Change from Baseline Measurements
-59.99 to -40.00
-39.99 to -20.00
-19.99 to 0.00
0.01 to 20.00
20.01 to 40.00
40.01 to 60.00

**Transformed from a ratio to a categorical variable using the CDC (2000) BMI-for-age percentile growth charts (CDC, 2000).*

Data Analysis

The plan for data analysis in this study was based upon past childhood obesity research analysis methods evident in the literature review, in which parametric statistical tests, such as independent and dependent t-tests, were used to determine differences between the groups for the outcome variable, change in BMI percentiles from baseline. Also, it was evident from the literature that regression analysis was used for determining relationships between BMI percentile change scores and program characteristics. Chi-square analysis was also used in several studies to test the relationship between categorical demographic variables and BMI percentile change scores. Therefore, these types of analyses were implemented for this research.

Data analysis for each research question is presented in Table 9. The data from this study required analysis with both parametric and nonparametric statistical tests. Parametric tests, such as t-tests, were used to test the difference in Head Start children's overweight and obesity levels between the two groups. Differences between groups regarding pre-to-post intervention BMI percentile change scores were assessed with an independent-group t-test. A t-test for dependent groups was used to determine differences in pre-and post-intervention BMI percentile-for-age scores within each group. Multiple regression statistical analysis was used to test the relationship between program characteristics and BMI percentile change scores. Chi square analysis was used to test the relationship between demographic variables and BMI change scores. Descriptive statistical analysis (frequency distribution) was used to describe the demographic characteristics of the sample.

Table 9
Data Analysis

Research Question	Dependent Variable	Measurement Level	Independent Variable	Statistical Test
RQI	Change in BMI Percentile for age Scores	Continuous	Group I & II	T-test for Independent Groups
RQ2	Pretest & posttest BMI Percentile for age scores	Continuous	Group 1 & II	T-test for Dependent Groups (2 t-tests)
RQ3	Change in BMI Percentile for age Scores	Continuous	Program Characteristics	Multiple Regression
RQ4	Grouped Change in BMI Percentile for age Scores	Categorical	Demographic Variables	Chi Square

Intervention

Experimental intervention. The *I am Learning, I am Moving* (IMIL) program is an obesity initiative in which, multidisciplinary intervention teams within Head Start grantee facilities are trained and given the tools to effectively address childhood obesity in minority preschool children. The IMIL program enhances the standard Head Start classroom standards and protocols by increasing time spent in moderate to vigorous physical activity (MVPA) to meet national guidelines, improving the quality of structured classroom physical activity (SCPA) moving experiences, and improving healthy nutrition choices for children (Department of Health and Human Services, 2007). Unlike a stand-alone curriculum, IMIL is a framework that grantees can use to design enhancements that will work within their own program needs and which will incorporate obesity prevention into their daily routines and practices. In 2005, a proactive obesity prevention pilot project was initiated by Head Start in 17 agencies in Virginia and West Virginia, where the obesity rate for elementary school children is almost double the national average. Following the pilot program in 2005, 53 more teams from Head Start grantees were trained in the spring of 2006 in region III. (Region 3 includes Pennsylvania, Delaware, Maryland, the District of Columbia, Virginia, and West Virginia.) Since then, 105 grantee teams have received training in the IMIL program.

In the spring of 2006, region III team members from 53 grantee programs attended a two and a half day training program, and then received follow-up support from the Region III Head Start Technical Assistance System (Department of Health and Human Services, 2007). A training-of-trainers (TOT) model was used to teach the IMIL nutrition and physical activity program to the team members, who were also taught methods for identifying staff training needs, technical assistance, implementing program enhancements, and program evaluation. The training included five separate workshops:

1) "A Movement Vocabulary for Young Children," presented by Dr. Linda Carson, Director of the West Virginia Motor Development Center, West Virginia University.
2) "MVPA- It's Everywhere!" presented by Patty Kimbrell, Physical Activity Consultant, San Diego University.
3) "Nutrition Building Blocks," presented by Dr. Cindy Fitch, Associate Professor of Human Nutrition and Foods, West Virginia University.
4) "Moving with the Brain in Mind," presented by Joseph Smith, Jefferson Elementary Center.
5) "Resources for Family Meals – Setting the Table," presented by Amy Requa, Pediatric Nurse Practitioner and Region III Health Specialist.

The team members were encouraged to tailor the IMIL enhancement to their own programs. However, a one-year follow-up evaluation revealed that half of the grantees subsequently chose not to implement the IMIL program, while the other, either fully or partially initiated the intervention (Mathematica Policy Research, 2007).

In this study, the Head Start director for one of the participating counties arranged for teachers at each preschool in her jurisdiction to attend the IMIL training program in 2006. The director subsequently added the IMIL enhancement to the Head Start preschool program in that county.

Teachers had the primary responsibility for implementation of the IMIL intervention. In a daily report, teachers recorded amount of time per day (including start times and end times) and types of physical activity (including sedentary, moderate activity, and vigorous activity) and whether or not the teacher participated in the activity. The children were physically active for 15 minutes out of each hour in the preschool classroom, and had additional physical exercise outdoors for up to 60 minutes during the school day. The IMIL director gathered and submitted these data to the researcher.

The IMIL intervention teachers also recorded the amount of time for children's nutrition education, which was categorized as "meal nutrition conversation" and "snack nutrition conversation". Breakfast and a snack were offered to children in the four-hour programs at Head Start.

Standard intervention. The Head Start Federal Performance Standards (Appendix C) define the minimal requirements for nutrition, physical activity, and health care by Head Start grantees. The standards require that children's meals provide at least one-third of their daily nutrition needs in part-day programs and one-half to two-thirds in full-day programs. It also mandates that nutrient content and meal planning adheres to the U.S. Department of Agriculture's National School Lunch Program, and Child and Adult Care Food Program. However, the standard Head Start program does not have specific recommendations for amount of physical activity. The federal guidelines require that grantees provide adequate equipment and indoor and outdoor play spaces, and adult supervision to promote activities to support development of fine and gross motor skills (Department of Health and Human Services, 2005).

The standard program adhered to the Head Start Federal Performance Standards (Appendix C) standards for meal planning, exercise, and general education for children. However, the standards did not include any of the requirements for physical exercise that are emphasized by the IMIL program, such as not allowing the children to sit for longer than 45 minutes; having a teacher initiated physical activity in the classroom for 15 minutes each hour of school; and having teachers eat with the children and participate in physical exercise with the children. Children in the standard program had a recess each day for approximately 30-45 minutes, which teachers recorded as minutes of MVPA. Classroom structured physical activity did not occur each hour; however, teachers reported daily amounts of time in minutes for SCPA.

The directors for each participating county tracked the amount of nutrition education for teachers, including the additional IMIL training for the county that implemented the intervention.

The directors were responsible for obtaining the height and weight measurements for each child in their county preschools. These measurements were obtained in the fall and spring of the 2008-2009 school year. Each director maintained a proprietary database in which to store these data.

Summary

Results from this quantitative study were intended to contribute meaningful information to the nursing body of literature on preschool child obesity prevention. The study focus regarding the *I am Moving, I am Learning* (IMIL) obesity intervention for Head Start minority and disadvantaged children were intended to help to fill in the gaps in research regarding this program. In addition, the identified program characteristics that were associated with Head Start interventions may contribute needed evidence for the development of clinical protocols and future study initiatives for the prevention of obesity in young children.

CHAPTER 4

Data Analysis

Data were collected from Head Start agencies within two northern Virginia counties using a secondary data-collection approach. The data were analyzed with the SPSS statistical package, version 17.0. The variables selected were based on factors that have been identified in previous research to influence childhood obesity, as well as factors specific to the two Head Start programs (Bellows, 2007; Brownell & Kaye, 1982; Carrel et al., 2005; Figuere-Colon et al., 1996; Fitzgibbon et al., 2005; Fitzgibbon et al., 2006; Foster et al., 1985; Gable & Lutz, 2001; Gortmaker et al., 1999; Hafetz, 2007; Hollar et al., 2010; Horodynski & Strommel, 2005; Pate, et al. 2004; Zhai, 2008)

The researcher collected and recorded information from secondary data files during the spring of 2009. Data included descriptive variables of the two participating groups, pre-and-post-intervention BMI percentile measurements from each group, characteristics of the two Head Start programs, and sample demographic factors.

Descriptive Overview

The two counties in this study had a higher median household income compared to the general population of the United States. In addition, the percentage of people living in poverty was lower for the participating counties compared to the population of

Virginia as a whole, as well as for the United States in general. Racial and education differences between the participating counties as compared to the population of Virginia and the United States are depicted in Table 10.

Table 10
Selected Demographic Characteristics: Comparison Between County Residents, Population of Virginia, and the United States

Demographic	Intervention Group County	Control Group County	Virginia	United States
Median Household Income	$86,294	$107,200	$59,575	$50,233
Population 2008	364,734	289,995	7,769,089	304,059,724
Persons living below poverty level (%)	5%	3%	9.9%	13%
White (%)	69.2%	76.4%	73.0%	79.8%
Black (%)	20.1%	8.3%	19.9%	12.8%
American Indian & Alaska Native (%)	0.5%	0.3%	0.4%	1.0%
Asian (%)	7.2%	12.6%	4.9%	4.5%
Hispanic or Latino (%)	19.1%	10.4%	6.8%	15.4%
High school graduate (%)	88.8%	92.5%	81.5%	80.4%
Bachelor degree or greater (%)	31.5%	47.2%	29.5%	24.4%

Note: From [United States Census Bureau] "USA Quick Facts" by United States Census Bureau, 2000-2009. Retrieved from the world-wide-web on January 4, 2010 at http://quickfacts.census.gov/qfd/states/00000.html

There were 16 Head Start classrooms located in the county from which the intervention group (IMIL) was obtained and six classrooms in the county from which the control group was drawn. The classrooms in both groups averaged between 16 and 18 children, with a total of 262 children in the experimental group and 97 students in the control group. Twenty-nine percent of children in each group were WIC recipients.

The main program components of the IMIL Head Start program involved Moderate to Vigorous Physical Activity (MVPA), and Structured Classroom Physical Activity (SCPA). Both groups reported both types of activity. The experimental group reported a mean of 28.85 minutes per school day for MVPA and a mean of 58.69 minutes per day of SCPA. The control reported a mean of 39.06 minutes of MVPA and a mean of 20.94 of SCPA.

Nutrition education for children, parents, and teachers was also a major component of the IMIL program. The experimental group reported a mean of 209.40 minutes per month of nutrition education for children, a mean of 34.40 minutes for parents, and a mean of 15.00 minutes per month for teachers. The control group average minutes per month for nutrition education was 133.75 for children, 30.00 for parents, and 7.50 for teachers.

There were two teachers in each Head Start classroom: one primary teacher, and an assistant teacher. A difference was noted between the two groups for level of education for Head Start teachers. In the intervention group, 54% of primary teachers were college graduates and an additional 46% of primary teachers had a master degree (n = 15). In the control group, 67% primary teachers were college graduates and an additional 33% of primary teachers had a master degree (n = 6). In the intervention group, assistant teachers (n = 15) were mostly high school graduates (81%) with some college graduates (12%) and some master degree instructors (7%). Conversely, assistant teachers in the control group (n= 6) were mostly college graduates (67%), with a few high school graduates (33%).

Following data collection, it was evident that there were differences in race and ethnic frequency distributions for the two groups of children in this study. Differences were noted in the percentages of Hispanic students (58.3% for the experimental group versus 52.1% for the control group); and in the Asian student distribution (3.5% for the experimental group and 9.4% for the control group). In addition, the intervention group had 6.9% White students, while the control group had 11.5%. The largest difference between the two groups was the Black population, which was 26.3% for the intervention group and 13.5% for the control group.

The primary language spoken by children in both groups was Spanish (55.2% for the intervention group and 50.0% by the control group). English was the primary language for 38.6% of the intervention group and 27.1% of the control group.

The intervention group was 51.7% female, while the control group had 54.2% female students.

The intervention group had a larger percentage of parents who did not graduate from high school (42.1 mothers and 31.7% fathers) compared to the control group (29.2% mothers and 18.8% fathers). A similar trend was also found for parents who graduated from college for the intervention group (3.1% mothers and 2.7% fathers) compared to the control group (17.7% mothers and 15.6% fathers). However, the mean income for the intervention group ($15,768.58) was slightly higher compared to the control group (14,784.26).

Data Screening

The independent variable (grouping variable) meets the assumption of independence, which requires two mutually exclusive groups of subjects. Data were screened to identify computer entry errors, missing data, and outliers in order to determine the fulfillment of test assumptions. The variables examined for outliers within each group included: pretest and posttest BMI percentile for age; minutes per day of moderate-to-vigorous physical activity (MVPA); and minutes per day of structured classroom activity (SCPA). A potential exclusion value for outliers was determined using Mahalanobis distance, which calculates the distance of a particular score from the center cluster of remaining scores. The Mahalanobis distances score for each study participant is considered to be an outlier if it exceeds a "critical value." A reference table of critical values for chi square indicated that with four degrees of freedom the critical value for x^2 at $p < .001$ is 18.46. Any value above 18.46 was considered to be an extreme value that may affect the outcomes of statistical analysis. However, prior to deleting any extreme value, each value was investigated to confirm its status as an outlier. Mahalanobis distance was then calculated in a preliminary regression analysis. Explore analysis was subsequently conducted on the newly created Mahalanobis variable (mah1) to determine outliers, which led to the elimination of one case in the experimental group (Table 11).

Table 11
Extreme Values

	Experimental Group Case Number	Experimental Group Value	Control Group Case Number	Control Group Value
Mahalanobis Distance				
Highest				
1	129	23.67	262	15.84
2	237	17.21	267	13.42
3	251	16.34	306	11.90
4	232	15.96	346	10.20
5	231	15.52	307	9.79
Lowest				
1	44	1.29	332	3.09
2	16	1.46	326	3.17
3	46	1.58	333	3.21
4	22	1.65	327	3.34
5	47	1.67	324	3.40

Critical value of x^2 at p<. 001 and df= 4 is 18.46

Normality, Linearity, and Homoscedasticity

Frequency distributions for pretest BMI percentiles scores indicated that there was a larger proportion of students in the experimental group who were overweight prior to implementing the intervention (19.3%) or obese (29.7%) compared to the control group (8.3% overweight and 12.5% obese). As previously discussed, there were larger percentages of Hispanic and Black children in the intervention group compared to the control, which may have influenced the outcomes for the analyses in this study. Hispanic and Black children were found to have a higher rate of obesity compared to non-Hispanic Whites (Ogden, et al. 2008). These race/ethnicity percentages were not consistent with the available population statistics (Table 10), which were used to determine the selection of the study sample prior to data collection. It was also evident that 47.5% of the students in the experimental group were at a normal weight compared to 71.9% of the control group students (Table 12), which also may have influenced data analyses.

Chi-square analysis indicates that there is a relationship between intervention or control group membership and children's pretest BMI percentile weight group (X^2= 25.19, df = 3, p = .001).

Table 12
Weight Group Percentages for Pre-Intervention BMI Percentile for Age Scores

Group	Underweight for age	Normal weight for age	Overweight for age	Obese for age
Experimental N = 258	3.1%	47.9%	19.0%	31.0%
Control N = 96	7.3%	71.9%	8.3%	12.5%

The posttest BMI percentiles revealed a similar trend (Table 13). Both groups had a slight decrease in obese for age students. Both groups increased in percentage of overweight children, and decreased in percentage of normal weight children. Since the sample consisted of growing, four-year-old children, BMI percentile scores may have been influenced by linear growth, as well as weight increases. The IMIL group decreased in percentage of underweight children; however, the control group had a larger percentage increase in underweight children. This may have occurred due to the larger percentages of Asian and White children in the control group, which have been found to have a lower rate of obesity compared to Hispanic and Black children (Ogden et al., 2008).

Chi-square analysis revealed that there is a relationship between intervention or control group membership and children's posttest BMI percentile weight group (X^2 = 40.08, *df* = 3, *p* = .001).

Table 13
Weight Group Percentages for Post-Intervention BMI Percentiles for Age Scores

Group	Underweight for age	Normal weight for age	Overweight for age	Obese for age
Experimental N = 258	1.4%	45.9%	23.8%	28.9%
Control N = 96	13.5%	62.5%	14.6%	9.4%

Since the data included four main quantitative variables, both univariate and multivariate normality was assessed. Univariate normality was assessed with histograms, normal Q-Q plots and descriptive statistics for each variable for each group (experimental and control groups). Explore analysis revealed that the experimental group pre-and-posttest distributions for BMI percentile for age had moderate negative skewness (-.48 pretest BMI percentiles; -8.68 posttest BMI percentiles) with platykutosis (-2.15 pretest BMI percentiles; -2.47 posttest BMI percentiles). The distributions for the control group pre-and-posttest BMI percentiles were closer to normal (-0.04 pretest; -.86 posttest, with platykutosis -2.83 pretest; -2.13 posttest). The remaining four variables, minutes per day of moderate-to-vigorous physical activity (MVPA), and minutes per day of structured classroom activity (SCPA) showed minimal to moderate skewness and kurtosis. The variables were not transformed since the transformed scores would make interpretation impractical for this study, as explained by Tabachnick and Fidell (2001).

Research Question I

The first research question for this dissertation stated, “Are there differences in BMI Percentile change cores between the children enrolled in Head Start preschools that participate in the IMIL program (Group I) and the children enrolled in preschools that use a standard Head Start program (Group II)?” Secondary data included age, height and weight measurements for two time periods (pre-and-post intervention) during the 2008-2009 school year. BMI percentile change scores are used to compare the two groups to determine whether there is a difference from baseline BMI percentile scores (the effect of the intervention) between the two groups.

A two-tailed t-test for independent groups was conducted to test for differences in pre-and-post intervention BMI percentile change scores between the intervention and control groups. Levene’s test for equality of variances indicated that the variances were not equivalent between the two groups (p = .001) therefore; the unequal variances test results were reported for this analysis. The t-test indicated that the mean BMI change score for children in the experimental group (M= .99, SD= 9.91) (Table 14) was not significantly different from that of children in the control group (M= 1.56, 21.83), t(109.87) = -25, p = .81. The strength of the relationship between group membership (IMIL or control) and children’s BMI change score, as indicated by a point biserial correlation coefficient, was .13. Thus, group membership accounts for 1.7% of the variance in children’s BMI change scores.

The absence of a difference between the two groups may be due to several reasons. First, there may have been inconsistencies in the methods for implementation of the IMIL program, such as teachers may not have increased the amount of physical activity to the level described in the IMIL program. This might have prevented a greater change in BMI percentiles from baseline. Second, children spend only four hours a day at the Head Start preschools, and they are at home the majority of the day. Their nutrition intake may have been excessive at home, while their physical exercise may have been minimal. This might also have influenced change in BMI percentile from baseline.

Table 14
Independent Sample Statistics: ChangeInBMI

Group	Mean	N	SD	SEM	*t*	*p*
Control	1.56	96	21.83	2.23	-.25	.81
Experimental	.99	258	9.91	.62		

Research Question II

The second research question for this study stated, “Is there a difference between BMI percentile scores obtained pre-and-post intervention within each of the two groups?”

A two-tailed t-test for dependent groups was conducted to test for differences in pre-and-post intervention BMI percentile scores within the experimental and control groups. The baseline BMI percentile scores and the posttest BMI percentile scores were used for this analysis to determine a difference in scores within each group. The t-test indicated that the mean pretest BMI percentile score for children in the experimental group (*M*= 74.80, *SD*=27.64) was not significantly different from their posttest BMI percentile scores (*M*= 75.80, *SD*=26.35), *t* (257) = -1.61, *p* = .11 (Table 15). In the control group, the mean pretest BMI percentile score for children (*M*= 51.67, *SD*= 32.76) was not significantly different from their posttest BMI percentile scores (*M*= 53.23, *SD*=53.23), *t* (96) = -.70, *p* = .49 (Table 15).

The absence of a difference in BMI scores from baseline within the experimental group might have been due to the short duration of time in which the intervention was implemented, as well as the small sample size. There were also language barriers (approximately 50% Spanish-speaking children). In addition, teacher buy-in to program components, such as for their participation in physical exercise for 15 minutes each hour, may have influenced intervention effectiveness. In addition, the amount of time for types of physical activity (MVPA and SCPA) might not have been recorded correctly, thus, children might not have received enough exercise to make a difference in their BMI percentile scores at posttest.

Table 15
Paired Sample Statistics: Pre-and-Post Intervention

Group	Paired Sample	Mean	N	SD	SEM	*t*	*p*
Control	Pretest BMI percentile scores	51.67	96	32.76	3.34	-.70	.49
	Posttest BMI percentile scores	53.23	96	33.49	3.42		
Experimental	Pretest BMI percentile scores	74.80	258	27.64	1.72	-1.61	.11
	Posttest BMI percentile scores	75.80	258	26.35	1.64		

Research Question III

The third research question stated, "Which of the following variables are significant predictors of BMI percentile? Amount of nutrition education for children and teachers; amount of MVPA for children; and amount of SCPA for children."

Data were screened for missing data, outliers, and then examined for test assumptions. Mahalanobis distance using a preliminary regression analysis was used to identify outliers. Explore was then conducted on the newly generated Mah1 variable to determine if any cases exceeded the critical value of chi square. Using a chi square table, the critical value was determined to be 18.46 at $p < .001$, with $df = 4$. Results indicated that there were no cases that exceeded the critical value (Table 16).

Table 16
Extreme Values

	Case Number	Value
Mahalanobis Distance		
Highest		
1	232	16.59
2	235	15.59
3	231	14.17
4	89	13.62
5	77	13.49
Lowest		
1	40	1.69
2	47	1.70
3	37	1.70
4	51	1.71
5	41	1.72

Multivariate normality and homoscedasticity were examined with residuals (scatter) plots using a preliminary regression. The scatterplots were slightly scattered, though not extreme. Therefore, multivariate normality and homoscedasticity were assumed (Appendix B).

The enter method for multiple regression was used to determine which of the following independent variables were significant predictors for change in pre-and-post BMI percentile scores:

1. Minutes per month of nutrition education for children.
2. Minutes per month of nutrition education for teachers.
2. Number of minutes per school day of moderate-to-vigorous physical activity (MVA).
3. Number of minutes per school day of structured classroom activity (SCA)

Regression results indicated that the predictor variables as a group and individually were not significant predictors for the change in BMI percentile scores from baseline ($R^2 = .001$, $R^2_{adj.} = -.007$, $F(3, 350) = .17$, $p = .91$). The correlations between the variables are presented (Table 17). There were several significant correlations evident between both types of physical activity components for the IMIL program with both types of nutrition education (for children and teachers). SCPA was negatively associated with MVPA, which may indicate that when one type of exercise increases, the other decreases. Since MVPA occurs mostly outdoors, during inclement weather, SCPA (indoor exercise) increases, and this might reverse when weather outside is good. There was a negative association between the two types of nutrition education types with MVPA, and they had a positive association with SCPA. Nutrition education occurs indoors during meals; therefore, when there is more SCPA due to inclement weather, they may be more nutrition education during these days, as well. The reverse might be evident when the weather outside is good: there might be more time spent outside for MVPA, and less time indoors for nutrition education. The same logic may explain why there is a negative association between MVPA and SCPA: more time is spent outdoors during good weather, and more time is spent indoors during inclement weather, causing these two program variables to be practiced inversely.

Table 17
Correlation Between Program Variables (N = 354)

Program Variable	1	2	3	4	5
1. Change in BMI	1.000				
2. Nutrition Ed. Children	-.018	1.000			
3. Nutrition Ed. Teachers	-.018		1.000		
4. MVA	.036	-.449*	-.449*	1.000	
5. SCA	-.001	.749*	.729*	-.224*	1.000

a. Dependent Variable: Change in BMI Percentile
b. Tolerance < .01 for Variable: Nutrition Education for Teachers
c. * Sig. *p*= .001

Research Question IV

The final research question stated, “What are the relationships between BMI levels and the demographic factors for the children enrolled in Head Start?

Chi square analysis results using the dependent variable, Categorical BMI Percentile for age change scores (Table 8), and categorical demographic variables (gender, income, race/ethnicity, number children, number parents, mother education, father education) indicated that only race/ethnicity had a significant relationship with pre-and-posttest change in BMI scores ($X^2 = .011$) (see Appendix A for chi-square results on all demographic variables). Negative changes in BMI scores (0.00 to -19.99 BMI percentile category), which indicated that children lost or maintained weight pre-to-posttest, were evident within each race/ethnic group (33.3% of Asian children; 52.7% of Hispanic; 45.0% of Black; 34.5% of White; 26.9% of Biracial/multiracial). Positive changes, (0.01 to 20.00 BMI percentile category), which indicated that children maintained or gained weight pre-to-posttest were also evident within each group (44.4% of Asian; 34.3% of Hispanic; 45.0% of Black; 51.7% of White; and 61.5% of Biracial/Multiracial children). These were the two largest categories for BMI percentile changes pre-and-posttest.

The largest percentage of children who gained weight from baseline within each weight gain category was Hispanic (47.9% in the 0.01 to 20.00 BMI Change in BMI by Groups category; and 68.2% in the 20.01 to 40.00 category) (Table 18). Hispanic children also had the largest percent (64.2%) of within race/ethnicity Change in BMI by Groups for maintaining or losing weight (-19.99 thru 0.00 change in BMI percentage).

Table 18
Cross Tabulation for Change in BMI by Groups and Race/Ethnicity

Change in BMI by Groups	Counts	Asian	Hispanic	Black	White	Biracial/ Multiracial
-39.99 thru -20.00	O	2	7	3	3	0
	E	.8	8.5	3.4	1.2	1.1
	% Within Change in BMI by Groups	13.3%	46.7%	20.0%	20.0%	.0%
	% Within Race/Ethnicity	11.1%	3.5%	3.8%	10.3%	.0%
-19.99 thru 0.00	O	6	106	36	10	7
	E	8.4	93.7	37.3	13.5	12.1
	% Within Change in BMI by Groups	3.6%	64.2%	21.8%	6.1%	4.2%
	% Within Race/Ethnicity	33.3%	52.7%	45.0%	34.5%	26.9%
0.01thru 20.00	O	8	69	36	15	16
	E	7.3	81.8	32.5	11.8	10.6
	% Within Change in BMI by Groups	5.6%	47.9%	25.0%	10.4%	11.1%
	% Within Race/Ethnicity	44.4%	34.3%	45.0%	51.7%	61.5%
20.01 thru 40.0	O	0	15	5	1	1
	E	1.1	12.5	5.0	1.8	1.6
	% Within Change in BMI by Groups	.0%	68.2%	22.7%	4.5%	4.5%
	% Within Race/Ethnicity	.0%	7.5%	6.3%	3.4%	3.8%

CHAPTER 5

Summary of the Findings

This study sought to assess whether the Head Start childhood obesity prevention program, “I am Moving, I am Learning” made a difference in Head Start children’s BMI percentile scores. Results from this study indicated that there was no difference between and within the two participating groups regarding change BMI percentile scores post-intervention. In addition, there were no IMIL program components that were associated with lowering BMI percentile scores for Head Start preschool children. Only race/ethnicity had a relationship with change in BMI percentile scores out of all the demographic factors analyzed in this study.

Social Cognitive Theory

Bandura (1997) posits that humans can learn through observation, rather than through direct reinforcement. Bandura’s social cognitive theory (SCT) and preschool children are an ideal combination for teaching these children about nutrition and physical exercise. Children who observe adults performing a healthy behavior might adopt this same behavior for themselves (Bandura, 1997). Teacher modeling of the IMIL nutrition and physical activity components could ideally be a successful method to enhance the long-term health for Head Start children. This theoretical model was supported by several studies, which demonstrated that children were more likely to try new foods or be physically active if they observed an adult modeling the behavior (Davison et al., 2003; Hampson et al., 2007; Young et al., 2004). Davison et al. (2003) showed that children's activity levels were influenced by support from their parents and their parent's modeling of the exercise behavior. Hampson et al. (2007) showed that early social images of physical exercise from parents and other adults had a positive effect on a child's level of athleticism. Finally, Young et al. (2004) in another study at Head Start demonstrated that children's acceptance of new foods improved when teachers incorporated three 20-minute nutrition education activities each week, and acceptance on first exposure occurred as the weeks progressed. These research results lend support to Social Cognitive theory-based interventions for Head Start teachers, including the importance of adult modeling of nutrition and exercise behaviors for preschool children. Despite the lack of significant outcomes from this study, the modeling of health behaviors for the preschool children in Head Start should continue as a component of the IMIL program.

Comparison to Literature

Similar findings from other preschool-based studies in the literature (Bellows, 2007; Fitzgibbon et al., 2005; Fitzgibbon et al., 2006; Gable & Lutz, 2001; Hafetz, 2007; Horodynski & Strommel, 2005; and Zhai, 2008) supported the results in this study. Five other intervention studies conducted at Head Start preschools failed to find significant results from various nutrition and physical activity interventions (Bellows, 2007; Fitzgibbon et al., 2005; Fitzgibbon et al., 2006; Hafetz, 2007; Horodynski & Strommel, 2005). In addition, the participants in the Fitzgibbon et al. (2005) study were primarily

Black children, and the Fitzgibbon et al. (2006) investigation was conducted with primarily Hispanic children. However, there were no differences found in BMI percentile pre-and-posttest between the experimental and control groups in either study. The Hispanic children in the Fitzgibbon et al. study also had higher BMI scores at baseline than did the Black participants in the 2005 investigation, as was found in this dissertation.

Race/ethnicity was shown in this investigation to have a relationship with changes in BMI percentile scores. Hispanic children were at the highest BMI percentiles, followed by Black children, a finding that was supported by other studies (Fitzgibbon et al., 2006; Henry, 2006). Additionally, gender did not have a significant correlation with BMI percentile scores for the preschool children in this study, a result supported by several other studies (Brownell & Kaye, 1982; Figura-Colon et al., 1996; Foster et al., 1985; Robinson, 1999; Zhai, 2008).

Several elementary and middle school-based research in the literature reported outcomes in which an intervention was successful in reducing BMI percentile in their treatment groups (Brownell & Kaye, 1982; Carrel et al., 2005; Figuere-Colon et al., 1996; Foster et al., 1985; Gortmaker et al., 1999; Hollar et al., 2010). However, in four of the investigations (Brownell & Kaye, 1982; Carrel et al., 2005; Figuere-Colon et al., 1996; Foster et al., 1985) all of the participants were overweight, obese, or super-obese at baseline. In addition to baseline adiposity, the age of the participants in these elementary-to-middle school-based studies differed significantly from the preschool children in this dissertation. Additionally, two of these studies (Gortmaker et al., 1999; Hollar et al., 2010) were implemented over a two-year period, which has been found to be more effective than shorter duration programs (Gonzalez-Suarez, Worley, Grimmer-Somers, & Dones, 2009). Regardless, these studies were reviewed for this dissertation because they demonstrated successful outcomes using interventions that show promise for use with younger children. The lack of success with previous interventions used with preschool aged children reveals a serious gap in knowledge and ideas for obesity prevention tactics for this age group.

In this investigation, the main IMIL program components, Moderate to Vigorous Physical Activity (MVPA), which was primarily conducted outdoors, and Structured Classroom Activity (SCPA), which was mainly conducted in indoors, did not have a significant effect on BMI percentiles for children in the Head Start program. These results were in alignment with three of the preschool-based studies that had nutrition and physical activity components (Bellows, 2007; Fitzgibbon et al., 2005; Fitzgibbon et al., 2006). In addition, a study by Pate et al. (2004) found that the average amount of time a preschool child (in private, Head Start, or church-based preschools) spent in physical activities was about one hour per 8-hour day. This fails to meet recommended guidelines for at least 120 minutes per day for preschool children (National Center for Sport & Physical Education, 2002). Some of the ideas offered by researchers for the failure of many physical activity and nutrition interventions include: cultural differences; parental indifference; lack of parent, teacher, and child health knowledge; lack of physical activity in schools; and excess TV time (Bellows, 2007; Brownell & Kaye, 1982; Carrel et al., 2005; Figuere-Colon et al., 1996; Fitzgibbon et al., 2006; Foster et al., 1985; Gortmaker et al., 1999; Hollar et al., 2010; Pate et al., 2004).

The researchers for the Fitzgibbon et al. (2006) study speculated that parents of participants who were low-acculturated Latinos may have required a more intensive nutrition and physical activity component in order to circumvent their trajectory toward overweight. Contradictory findings in the Hafetz (2007) research suggested that cultural assimilation was not a moderator for parent knowledge and children's health behavior. However, research by Gable and Lutz (2001) clarifies the issue somewhat with the finding that inappropriate mealtime practices by parents (such as requiring a child to eat everything on their plate) were associated with higher BMI scores in children. In other words, it is crucial to help parents identify their own personal barriers and facilitators so that they may improve the nutritional environment at home, and then they might use their health and nutrition knowledge more effectively (McGarvey et al., 2006).

Several elementary and middle school-based investigations described physical activity interventions that were successful in lowering BMI for participants (Carrel et al., 2005; Gortmaker et al., 1999; Hollar et al., 2010). The Carrel et al. (2005) researchers refined school gym classes for overweight, middle-school children so that there was less time wasted on changing clothes, waiting in lines, and more time spent on individual and group physical activity. Competitive sports were minimized, while lifestyle-focused activities (walking, cycling, snowshoeing) were emphasized, which were concepts that could potentially be used for preschool children. The Hollar et al. (2010) two-year intervention, which incorporated a 10-15 minute desk-side physical activity program (such as, marching in place) while students learned spelling and math, might also be applicable to Head Start preschoolers. In addition, the Hollar et al. intervention included a structured physical activity component during recess, which is similar to the SCPA component in the Head Start IMIL program.

Limitations of Study

This study analyzed data from a secondary source. Thus, the researcher was not able to validate the accuracy of the original data collection procedures. Additionally, the sample was derived from two suburban counties in Virginia, which may limit the ability to generalize results. Health records from Head Start included some demographic and health information that relied on self-reported data from parents of the enrolled children, which may have had inaccuracies.

Although other factors may influence overweight and obesity in preschool children, this study only addressed those related to protocols for two Head Start nutrition programs. The programs did not control eating and exercise for enrolled children outside of school. In addition, the two groups of Head Start children from which the secondary data was obtained were found to have more sample variation than was initially evident. The experimental group had a greater percentage of overweight children at baseline compared to the control group. This may have occurred due to some racial and ethnic differences between the two groups, specifically, the experimental group had a greater percentage of Hispanic and Black children who were in the higher BMI percentile ranges.

Recommendations

At the time of this study, the IMIL program did not emphasize the monitoring of TV and video game usage by preschool children, particularly in the home environment; however, results from some studies have shown how these activities may increase obesity. The Gortmaker et al. (1999) two-year intervention, which reduced TV time and increased MVPA, could potentially be incorporated as a component in the parent education initiatives at Head Start preschools. The Gortmaker et al. researchers found that, among girls, each hour of reduction in TV viewing predicted a decrease in obesity prevalence. Robinson (1999) conducted a study that did not include any diet or exercise intervention, however, the researcher showed that significantly reducing TV time and video game usage resulted in decreased BMI in elementary school students. Robinson proposed that TV time and video game usage were associated with increased fat and energy intakes, while engaging in these activities. These elementary school-based obesity interventions have components that might potentially be used to circumvent the trend towards obesity for preschool children, as well.

Educational Implications

Focusing on educating parents may help increase successful outcomes for childhood obesity interventions (Fitzgibbon et al., 2006). Parents are in control of the home environment, and children spend more time in their homes than they do at school. The home environment might work to make or break an obesity intervention (Hafetz, 2007; McGarvey et al., 2006. Even the most well-designed obesity intervention may fail when the children's parents allow them to drink 10 juice box drinks, which contain about 100 calories each. Parents, especially those who are new to the United States, who may not speak English well, and are not familiar with the food here, need to be educated regarding nutrition and physical exercise. Parents who did not have knowledgeable parents, themselves, need nutrition and health education. Educating the parents is ground zero for childhood obesity. The home environment may be the saboteur for childhood obesity interventions.

However, schools might be the link and method to providing necessary nutrition and health education to parents. Programs for nutrition and physical activity are already in existence in most schools. Extending these programs to include parents may help to circumvent the obesity epidemic for children.

Conclusion

This study provided evidence that elements of the IMIL program may require refinement to improve results. The results from the assessment of the IMIL program appear to support the null hypotheses for all four of the research questions (Chapter 4, page 66) presented in this study.

There are lessons that can be learned from this study. Since the Head Start teachers appeared to bear most of the responsibility for implementing the IMIL program, improvements should be focused on providing them with more extensive training and supervision, particularly for tasks such as identifying and recording SCPA and MVPA activity and identifying and recording nutrition education for children and their parents.

Program consistency might be improved with classroom monitoring by Head Start directors, who could also identify and record SCPA and MVPA activity, for comparison with the teachers records. Directors should review these records monthly with teachers to improve compliance and subsequently, efficacy of the program. Annual program evaluations should be conducted to determine efficacy of IMIL, and to develop ideas for program improvements. Lastly, Head Start should conduct a mandatory IMIL initiation program for parents of enrolled children prior to the start of each preschool year. This might create more congruency between school and home regarding the nutrition and physical activity initiatives.

Because the results from this study were not significant regarding the research questions, more studies are needed to determine efficacy of the Head Start IMIL program. Instead of secondary data analysis, a team of researchers could obtain anthropometric measurements and other data themselves, as well as record classroom activities from direct observation. Ideally, future studies should be conducted over a two-year time period with a larger sample composed of several Head Start regions in the U.S.

An implication of this study for Head Start nurses might be to help improve the effectiveness of the IMIL program by focusing on teaching the teachers, who may require additional knowledge regarding nutrition and physical activity needs for their students, as well as for their own health. This could also help to improve teacher acceptance of the program and their performance regarding the implementation of the IMIL initiatives.

In addition, nurses employed at public health clinics, pediatrician offices, or family practices are poised to educate parents and children regarding the benefits of healthy nutrition and physical activity for the prevention of obesity and related diseases. To that end, nurses may be the key to alleviate the current childhood obesity epidemic.

Finally, in order to ensure that the current generation of children might have a healthy, as well as long lifespan, more research is needed that focuses on life-style factors (especially those in the home environment), and obesity-related genetic factors, to aid in the discovery of more effective childhood obesity interventions.

Appendix A

Chi Square Results of Relationship Between Dependent Variable, Categorical Change in BMI, with Demographic Variables

Characteristic	N	df	Pearson Chi-Square Sig. (2-sided)
Child's Gender & Change in BMI		7	$X^2 = .83$
Female	185 (52.3%)		
Male	169 (47.7%)		
	Total = 354		
Family Income & Change In BMI		14	$X^2 = .69$
<$20,000	N= 266 (75.8%)		
$20,000-39,999	N= 79 (22.5%)		
≥$40,000	N= 6 (1.7%)		
	Total = 351		
WIC Participation & Change in BMI		7	$X^{2\,=}$ .64
Yes	103 (29.4%)		
No	247 (70.6%)		
	Total = 350		
Race/Ethnicity & Change in BMI		28	$X^{2\,=}$ .01*
Asian	18 (5.1%)		
Hispanic	201 (56.8%)		
Black	80 (22.6%)		
White	29 (8.2%)		
Biracial/Multi-racial	26 (7.3%)		
	Total = 354		
Child Speaks English & Change in BMI		7	$X^{2\,=}$ .53
Yes	166 (46.9%)		
No	188 (53.1%)		

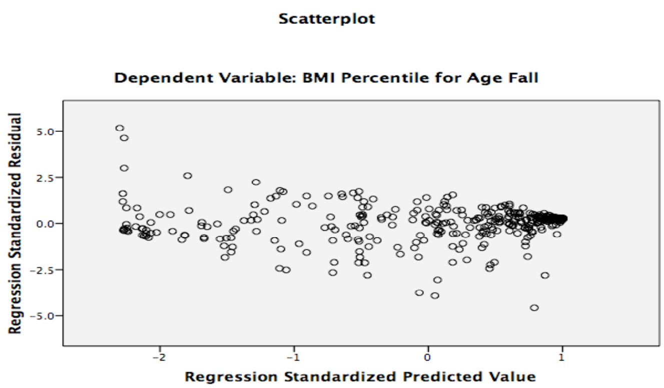
Number of Children in Household &	60 (17.2%)	35	$X^2 =$ .76
Change in BMI	115 (33%)		
	99 (28.4%)		
1	51 (14.6%)		
2	19 (5.4%)		
3	5 (1.4%)		
4			
5	Total = 349		
6			
Number of Parents in Household &		7	$X^2 =$ .22
Change in BMI			
	170 (48.2%)		
1	183 (51.8%)		
2			
	Total = 353		
Mother's Education & Change in BMI		35	$X^2 =$ .12
< High School Grad	136 (43.5%)		
HS Graduate	91 (29.1%)		
Some College	53 (16.9%)		
College Graduate	25 (8.0%)		
Master Degree	3 (1.0%)		
Unknown/Not Specified	5 (1.6%)		
	Total = 313		
Father's Education & Change in BMI		30	$X^2 =$ .93
< High School Grad	100 (59.9%)		
HS Graduate	28 (16.8%)		
Some College	12 (7.2%)		
College Graduate	2 (1.6%)		
Master Degree	0 (.0%)		
Unknown/Not Specified	0 (.0%)		
	Total = 167		
Pretest BMI Percentile Group &		21	$X^2 =$ .001*

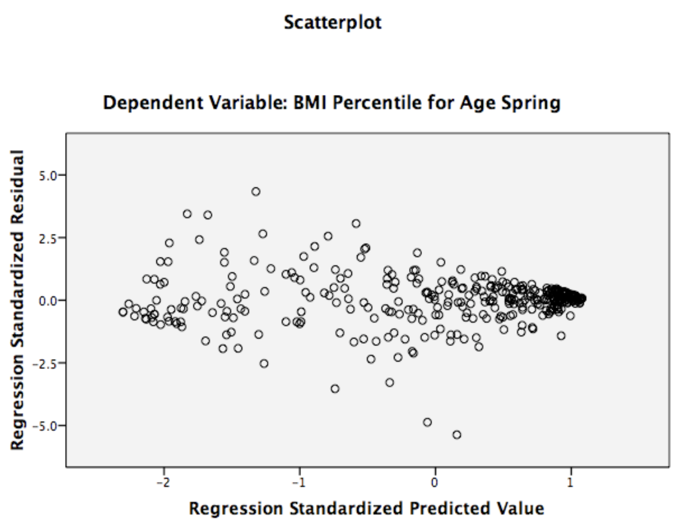
Change in BMI			
Underweight (< 5th Percentile)	15 (4.2%)		
Healthy Weight (5th to < 85th)	190 (53.7%)		
Overweight (85th to < 95th)	57 (16.1%)		
Obese (≥ 95th Percentile)	92 (26.0%)		
	Total = 354		
Posttest BMI Percentile Group & Change in BMI		21	$X^2 =$ .001*
Underweight (< 5th Percentile)	16 (4.5%)		
Healthy Weight (5th to < 85th)	182 (51.4%)		
Overweight (85th to < 95th)	75 (21.2%)		
Obese (≥ 95th Percentile)	81 (22.9%)		
	Total = 354		

* $p < .05$.

Appendix B

Pretest BMI Percentile Scores





Posttest BMI Percentile Scores

Appendix C

BMI Percentile Charts

Appendix D
Head Start Performance Standards

Appendix E
Child Health Record
(IMIL Group)

Appendix F
Eligible Child Demographic Form
(IMIL Group)

Appendix G
Family Profile
(Non-IMIL Group)

Appendix H
School Entrance Health Information Form
(Non-IMIL Group)

Appendix I
Nutrition Form
(Non-IMIL Group)

Appendix J

Family History Summary

(Non-IMIL Group)

Appendix K

Student Data Collection Form

1. Agency ID Number: ____________________
2. Student ID Number: ____________
3. County: _____________________
4. Height______________
5. Weight: ______________
6. BMI Percentile for age: _________________
7. Medium/mean number of minutes of TV time at home: ________
8. Race/Ethnicity: ______________________________
9. Gender: ______________________
10. Age in months: ____________

Appendix L

Head Start Agency Data Collection Form

1- County: ______________

2- Agency ID Number: ___________

3- Number of students enrolled: ______________

4- Average income of families enrolled: _________

5- Percentages of race/ethnicity groups:

   a. % Hispanic or Latino: ____

   b. % White: _____

   c. % African/American or Black: _____

   d. % Asian: _______

   e. % American Indian & Alaska Native: ________

   f. % Reporting 2 or more races: ______

6- Mean number of minutes of physical activity per week for students: ____

7- Mean number of hours of nutrition education for parents per school year:

   ____

8- Mean number of hours of nutrition education for teachers per school year:

   ____

9- Mean number of hours of nutrition education for students per school year:

____

10- Average caloric value of school lunches/snacks per day for students:

____

11- Average nutritional content of school lunches/snacks per day for students:

a. Carbohydrates: __________

b. Protein: ___________

c. Fat: __________

d. Calcium: _________

e. Iron: _________

f. Sodium: ___________

g. Potassium: __________

h. Folate: __________

i. Thiamine: _________

j. Vitamin C: ______

11. Average number of years of education for teachers: ___________

12. Average number of minutes of TV time in school: ____________

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