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Ecological Influences on Weight Status in Urban African-American Adolescent Females: A Structural Equation Analysis

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Ecological Influences on Weight Status in Urban African-American Adolescent Females:

A Structural Equation Analysis

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ABSTRACT

The present study employed a quantitative, non-experimental, multivariate correlational research design to test a hypothesized model examining associative paths of influence between ecological factors and weight status of urban, African-American adolescent females. Anthropometric and self-report survey data of 182 urban, African-American adolescent females were collected during after-school programs, health and physical education classes, and community events in an urban area in northeast Florida.

Descriptive analyses were conducted to characterize the study participants based upon their age, study setting, and weight status. A scale reliability analysis was conducted to assess the internal consistency reliability of the sample data using selected measures within the context of the study's specific population and subsequently guided the structural equation model (SEM) analyses. The SEM path analysis was used to develop two measurement models to control for observed error variance for variables demonstrating poor internal consistency reliability (diet behaviors and nutrition self-efficacy) and a final structural model to test the associative paths of influence between latent (diet behaviors and nutrition self-efficacy) and manifest variables (teacher social support and friend social support) on weight status.

The results of the path analysis indicated that both teacher social support and friend social support demonstrated a positive, indirect influence on child weight status through nutrition self-efficacy and diet behaviors following two different and specific paths of influence. Diet behaviors, in turn, demonstrated a positive, direct effect on child weight status. These findings provide clear implications for educational leaders that call for the integration of health behavior change theory into traditional education and

leadership practice and actively addressing the childhood obesity epidemic in the school environment by implementing health behavior change strategies at various ecological environmental levels.

ACKNOWLEDGEMENTS AND DEDICATION

I would like to take this opportunity to acknowledge individuals that assisted in the completion of this dissertation study and provided support throughout the process.

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CHAPTER 1: INTRODUCTION

Childhood overweight and obesity prevalence rates have reached epidemic proportion over the last 30 years, with prevalence disparities seen in the most vulnerable populations: racial and ethnic minorities (Doak, Visscher, Renders, & Seidell, 2006; Freedman, Khan, Serdula, Ogden, & Dietz, 2006; Maziak, Ward, & Stockton, 2008; Ogden, Carroll, Curtin, Lamb & Flegal, 2010; White, 2007). Disparities exist in the racial and ethnic minorities, with the highest rates of childhood overweight and obesity seen in non-Hispanic, African American females and Hispanic males. Of the racial and ethnic minority disparities, African American adolescent females surpass all other races and ethnicities in overweight and obesity prevalence and exponential rates of mean body mass index (BMI) increase over the past 20 years (Freedman et al., 2006; Ogden et al., 2010; USDHHS, 2007).

On February 9, 2010, President Obama signed an executive order to establish a childhood obesity task force led by First Lady Michelle Obama in an effort to address the epidemic in the United States. The task force plans to solve the public health crisis within a generation by forming partnerships between public and private organizations to address issues impacting the epidemic such as access to healthy and affordable foods in schools and communities, increasing physical activity, and providing parents and caregivers with tools and information for making healthier choices for their families.

The First Lady's decision to tackle childhood obesity came about after a pediatrician visit. During the visit, she learned that her daughters, both whom of are

African-American and adolescents, were at risk for becoming overweight, and she was cautioned to make lifestyle and dietary changes to prevent the onset. The visit served as a wakeup call for the First Lady and for the current administration that childhood overweight and obesity can affect anyone, and now is the time to act in an effort to improve the future health and quality of life of children.

While the Obamas' situation differs in many ways from most African-American families in the United States, they still face many of the environmental challenges that promote poor diet behaviors and set the stage for childhood overweight and obesity. Public acknowledgement of their risk for the epidemic confirms the notion that no one is immune to the problem and that specific influences may impact the likelihood of overweight and obesity among African-American female adolescents. Research studies continue to shed light on characteristics influencing the childhood overweight and obesity epidemic, with specific attention to ecological influences such as physical, social, and individual environmental influences (Cummins & Macintyre, 2005; Pearce, Witten, Hiscock, & Blakley, 2007; Pearson, Russell, Campbell, & Barker, 2005; Stafford, Cummins, Ellaway, Sacker, Wiggins, & Macintyre, 2007) .

The solution to arrest or reverse the childhood obesity epidemic may lie within the contextual framework in which the problem is viewed. Examining the childhood obesity epidemic from an ecological perspective helps to frame and describe diet behaviors as a dynamic process simultaneously influenced by various environmental influences (McNeil, Wyrwich, Brownson, Clark, & Krueter, 2006). The ecological perspective places emphasis on the interaction and interdependence of multiple levels of

influence which primarily include individual, social environment, and physical environment factors (McLeroy, Bibeau, Steckler, & Glanz, 1988).

Although overwhelming evidence exists regarding the significant increases in the prevalence of childhood overweight and obesity among African American females and adolescents, the search to identify specific multi-factorial relationships continues. Researchers recognize the possible relationships between ecological influences and weight, often postulating on how affecting these factors may lead to the arrest or reversal of the childhood overweight and obesity epidemic. More recently, researchers have examined a variety of factors influencing obesity in adults and children, however few have done so while specifically taking into account racial, ethnic, and age considerations.

Examining the influences of ecological factors on child weight may hold the answer to impede the exponential increases in childhood overweight and obesity prevalence rates, as both specify direct relationships between individual and interpersonal behavior and environments. The following discussion will explore the background and current state of the problem, clearly outline the purpose of the study, detail the study's conceptual framework and research questions, highlight the significance of the study, provide definitions of key terms related to the study, and disclose study assumptions and limitations.

Background of the Problem

Childhood overweight and obesity impose a synergistic chain reaction of adverse physical, psychological, and economic consequences, resulting in shortened life span, decreased overall quality of life, and increased health care cost. Overweight and obese children and adolescents tend to become obese adults, with research also confirming that

overweight or obese adults who were overweight or obese as children have an increased risk for morbidity and mortality (Center for Health and Health Care in Schools, 2005; Harper, 2006). Overweight and obesity are major risk factors for chronic disease such as asthma, type 2 diabetes, cardiovascular disease, and sleep apnea (Livingstone, McCaffrey, & Rennie, 2006). In addition, overweight and obese children and adolescents tend to suffer from mental distress associated with negative stereotypes, often reporting lower self-esteem and increased rates of loneliness, sadness, and nervousness (Center for Health and Health Care in Schools, 2005; Harper, 2006; Livingston, et. al 2006). Obesity related healthcare costs comprise 4% to 9% of direct health care costs in the United States, with an estimated annual direct and indirect cost of overweight and obesity from $69 to $117 billion annually (Harper, 2006).

Racial and ethnic disparities have emerged with the increases in childhood overweight and obesity prevalence rates over the last 30 years, with African American adolescent females demonstrating exponential rates of increase in mean BMI. Analysis of National Health and Nutrition Examination Survey (NHANES) data from 1971 to 2002 shows the development of prevalence disparities in African American adolescent females starting as early as 1976. The study examined changes in body mass index (BMI) among US adolescents (Freedman et al., 2006). A complete discussion and contextual definition of BMI may be found in Chapter 2 of this manuscript.

African American adolescent females BMI rate increases per examination period were more than double that of White (+.30 kg.m2) and Hispanic females (+0.25 kg/ m^2) at +0.71 kg/m^2 over the 30-year period (Freedman et al., 2006). Similar rates of increase were demonstrated in African American adolescents, ages 12 to 17 years old, over the

same 30-year period, with a mean body mass index (BMI) rate increase of +0.72 kg/ m^2 per examination period, nearly double that of Whites and Hispanic adolescents at +0.32 and +0.37 kg/m^2, respectively (Freedman et al., 2006).

The following figures illustrate racial and ethnic disparity trends in relationship to gender and age of mean BMI levels over a 30-year period. Figures 1 and 2 illustrate similar racial and ethnic disparities trends related specifically to adolescents. Figure 3 illustrates the racial and ethnic disparities trends in mean BMI levels. Figure 4 illustrates mean BMI increases per examination period, with both figures related specifically to females.

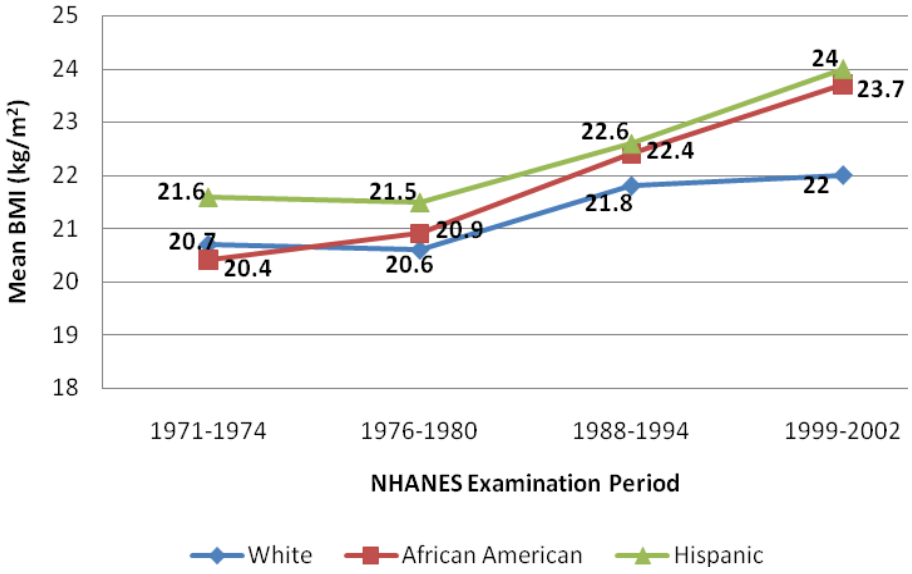

Figure 1. Mean BMI level trends of adolescents by race and ethnicity in the United States between 1971 and 2002 from National Health and Nutrition Examination Survey (NHANES) studies. Source: Freedman, Khan, Serdula, Ogden, & Dietz, 2006.

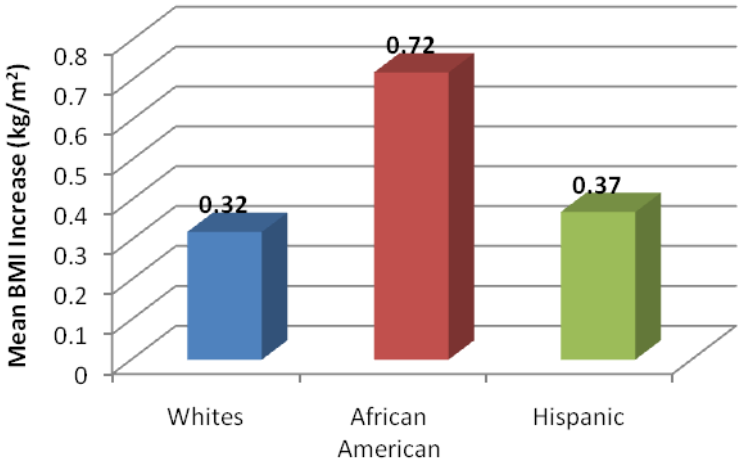

Figure 2. Increase per examiniation period in mean BMI levels of adolescents by race and ethnicity in the United States between 1971 and 2002 from National Health and Nutrition Examination Survey (NHANES) studies. Source: Freedman, Khan, Serdula, Ogden, & Dietz, 2006.

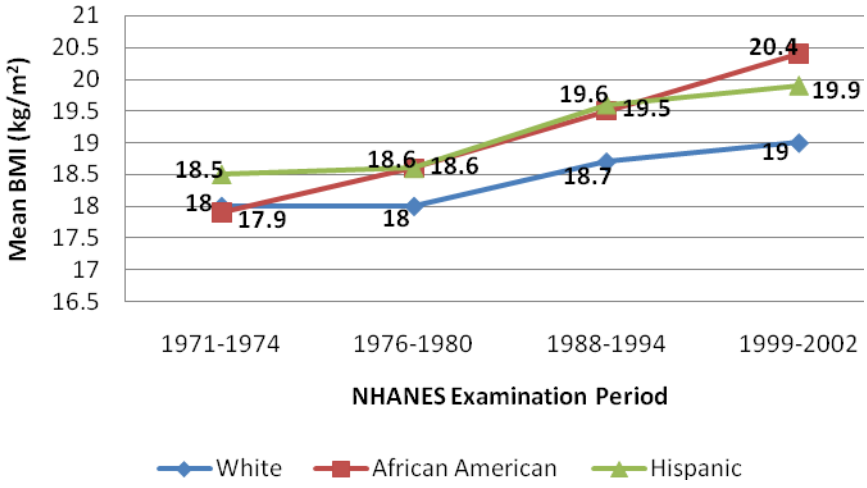

Figure 3. Mean BMI level trends of females by race and ethnicity in the United States between 1971 and 2002 from National Health and Nutrition Examination Survey (NHANES) studies. Source: Freedman, Khan, Serdula, Ogden, & Dietz, 2006.

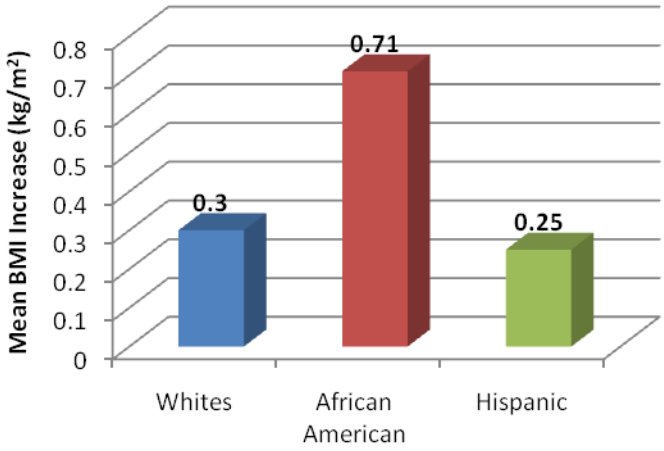

Figure 4. Increase per examiniation period in mean BMI levels of females by race and ethnicity in the United States between 1971 and 2002 from National Health and Nutrition Examination Survey (NHANES) studies. Source: Freedman, Khan, Serdula, Ogden, & Dietz, 2006.

In summary, the BMI of US children has increased drastically over the past 30 years, resulting in the current childhood overweight and obesity epidemic. Further investigation of the epidemic sheds light on disparities between African-American adolescent females and other races and ethnicities, with disproportionate increases noted as early as the 1970's. With BMI increases between study periods nearly double that of Whites and Hispanic children, African-American adolescent girls are emerging as the new majority for childhood overweight and obesity in the United States.

Current State of the Problem

Currently, childhood overweight and obesity prevalence rates continue to increase, with age, gender, racial and ethnic disparities emerging to further complicate the public health crisis. The most recent analysis of NHANES data during the 2007-2008 examination period reaffirms the existence of significant differences in age, race, and ethnic groups among US children and adolescents at three high BMI cut off points, at or above the 97th, at or above the 95th, and at or above the 85th percentiles (Ogden et al.,

2010). In this analysis, the authors examined BMI for age at or above the 97th percentile. BMI at the 97th percentile is not a widely recognized cut off point. The authors used the phrase "high BMI" to refer to all three BMI cut offs (Ogden et al., 2010).

The analysis revealed that non-Hispanic, African American females were significantly more likely to have high BMI at all three of the high BMI cut off points than all other racial and ethnic groups. Furthermore, African American females continue to exceed all other racial and ethnic groups in prevalence among all three high BMI cut off points, with the greatest disparities seen among adolescent girls (ages 12 – 19 years old). Figure 5 illustrates the high BMI prevalence disparities among African American female adolescents, aged 12-19 years old in 2007-2008.

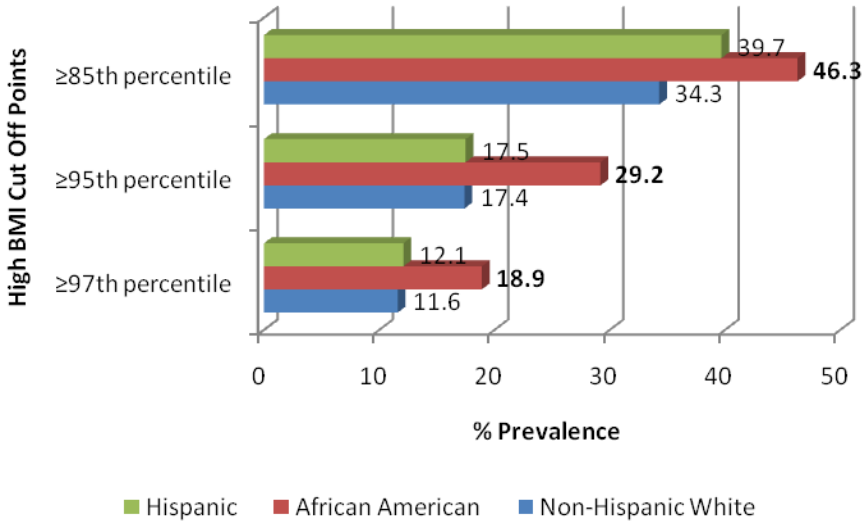

Figure 5. Prevalence of High BMI in female adolescents aged 12-19 years old by race and ethnicity in the United States between 2007-2008 from National Health and Nutrition Examination Survey (NHANES) studies. Source: Ogden, Carroll, Curtin, Lamb, & Flegal, 2010.

While the literature clearly demonstrates prevalence disparities of overweight and obesity between African American female adolescents and all other racial and ethnic

groups, it fails to definitively identify a causal factor or relationship for the phenomenon. This void has lead health researchers and clinicians to look beyond the traditional medical model to explore causal relationships and influences of various environmental factors. The paradigm shift brought forth a new body of literature exploring relationships between ecological influences, such as physical and social environments, and individual behaviors.

An extensive body of literature currently exists attempting to associate obesity and weight with social and individual-level environment characteristics (Moore, & Roux, 2006; Zenk, Schulz, Isreal, James, Bao, & Wilson, 2005). Social environmental factors, like social support, have been shown to influence health behaviors. McNeil, Wyrwich, Brownson, and Clark (2006) found that social support indirectly influenced individual-level factors, such as self-efficacy, which in turn influenced physical activity. Maddison et al. (2009) found in a similar study that individual social cognitive variables were better predictors of self-reported physical activity in comparison to physical and social environmental factors.

An earlier study on determinants of nutrition behaviors found self-efficacy had the strongest total effect on nutrition behavior, an effect mediated by outcome expectations (Anderson, Winett, & Wojcik, 2000). The study also examined socioeconomic status, age, and number of children, but did not examine race or ethnicity. With the multitude of potential ecological factors contributing to the childhood obesity epidemic in one way or another, identifying a solution that takes into account multi-level, multi-factorial considerations is imperative.

In urban communities, such as Jacksonville, Florida, the risk of childhood overweight and obesity are greatest among the city's racial and ethnic minorities residing in poverty-stricken, high-crime communities (Jacksonville Children's Commission, 2009). This fact is critical as low-income children and adolescents are more likely to experience adverse health conditions such as food insufficiency, malnutrition, and predisposition to deadly adult health conditions such as obesity (Jacksonville Children's Commission, 2009). The 2006 American Community Survey conducted by the U.S. Census showed that 26% of Jacksonville's total population is comprised of children and adolescents (18 years and younger), with almost half (43%) being African American or some other ethnic minority. Of the city's children, approximately 19% live in poverty, while 34% of those children are African American (Jacksonville Children's Commission, 2009).

Findings from the 2011 Youth Risk Behaviors Survey (YRBS) conducted in Duval County, Florida, confirmed racial and gender obesity risk disparities among adolescents. Many of the African-American, female middle and high school students self-reported sedentary and poor diet behaviors, with rates exceeding all other racial, ethnic, and gender groups. African-American, female high school students reported the highest rates of overweight, obesity, and body image self-description as slightly overweight. Furthermore, the group was more likely to drink soda daily, less likely to drink milk and eat fruit daily or eat vegetables or green salad during a seven-day period (Duval County Health Department, 2012a). Reports among African-American, female middle school students were similar, with rates of daily soda consumption and not

consuming five or more fruits and vegetables daily exceeding all other racial, ethnic, and genders groups (Duval County Health Department, 2012b).

As an extension of the social environments, the schools play a pivotal role in addressing the obesity epidemic in children and adolescents. In context of the amount of time and type of interactions school faculty and staff have with students during a day (Story, Nanney, & Schwartz, 2009), the school setting offers an opportunity to play a substantial role in the prevention and treatment of childhood obesity (Murphy & Polivka, 2007). Physical and health education courses are designed to serve as an opportunity to address childhood overweight and obesity through practical application. However, changes to state laws that reduce or eliminate mandatory physical and health education have worked against this notion, limiting opportunities to affect child weight status during the school day as evidenced by reduction in mandatory health and physical education requirements and funding.

The literature offers mixed perceptions among the parents and school staff regarding the extent of the role schools should have in childhood obesity prevention and treatment. Past studies suggested parents feel schools are not making substantial efforts to address childhood obesity (Price, Desmond, Rupport, & Selzer, 1992) and each should have on-site units designated to nutrition and weight control (Murphy & Polivka, 2007). However, many parents are also opposed to schools intervening by providing BMI screenings and information (Price et al., 1992).

The literature indicates mixed perceptions among school staff regarding the role of schools in childhood obesity prevention and treatment. School nurses believe that schools should take a more active role in childhood obesity prevention (Price, Desmond,

Rupport, & Stelzer, 1987; Moyers, Bugle, & Jackson, 2003) but often find it difficult to counsel parents and students on weight issues (Price et al., 1987). School social workers, teachers (Neumark-Sztainer, Story, & Coller, 1999), and principals (Price et al., 1987) feel schools are not equipped to play active roles in childhood obesity and prevention, yet believe that schools should play a more active role in addressing the epidemic. Teachers, especially health and physical education teachers, often are not provided continuing education and training to facilitate obesity prevention and treatment in the school setting. Neumark-Sztainer and colleagues (1999) found in their study of 114 school professionals that while nearly three quarters of participants (72%) expressed interest in learning obesity prevention techniques, none were currently involved in any type of training program.

More often than not, childhood obesity prevention and treatment ranks low in priority among education leaders and administrators faced with intense pressure to meet academic standards set forth by state education agencies. Education leaders and administrators often tend to address concerns related to meeting academic policy requirements, which are often tied to district resources. In addition, national academic policies, such as No Child Left Behind, often place taxing demands on schools not currently meeting minimal academic benchmarks. School administrators often chose to allocate available resources to help meet the expectations of such policies, for in many cases, their school's annual performance is directly linked to job security.

Some government agencies and states have taken steps to address the epidemic through policy development. The number of federal bills related to obesity prevention or treatment in children has steadily increased from the 106th Congress with 12, to 86 in the

109th Congress. The WIC reauthorization act of 2004 required local school districts to establish wellness policies by the beginning of the 2006-2007 school year, with schools facing the threat of losing reimbursement for school lunches for noncompliance. However, the strongest criticism relates to lack of accountability in implementing wellness activities.

The most recent nutrition bill, the Healthy, Hunger-Free Kids Act of 2010, makes more promising strides in addressing the multi-level influences on childhood obesity. Signed into law on December 13, 2010, the bill authorizes funding for federal school meal and child nutrition programs and increases access to healthy food for low-income children. Often referred to as the child nutrition reauthorization bill, it reauthorizes child nutrition programs for the next five years and includes $4.5 billion in new funding for these programs over 10 years (Office of the Press Secretary-White House, 2010). Unique requirements of the current bill include the establishment of nutritional standards for all foods sold during the school day, streamlining qualification standards to increase access to children with limited resources, and establishing accountability safeguards, which calls for compliance audits (Office of the Press Secretary-White House, 2010). Childhood obesity advocates are hopeful that the bill will impact the weight status of children at every level of influence.

The obesity epidemic continues to persist, especially among African-American adolescent females. Although multiple strategies exist to address the issues, many feel the school setting is the primary location in which prevention and treatment strategies should be implemented. Education leaders and administrators face an insurmountable challenge of balancing unrealistic academic and under-funded wellness mandates set forth by

government agencies. The challenge is further complicated with the spotlight of public opinion focused on the childhood obesity epidemic and inconsistent perceptions of parents and school staff concerning the roles and expectations of the schools in addressing childhood obesity. The answer to reverse this international epidemic may be found through continued research efforts that identify strategies clarifying the roles of schools and school staff in addressing this issue and increase the capacity and competencies for school faculty and staff to effectively address the childhood obesity epidemic in the school setting.

Purpose of the Study

The purpose of this study was to examine the direct and indirect ecological influences on child weight status in urban, African-American adolescent females. Overwhelming amounts of evidence exist confirming gender and racial disparities related to the childhood overweight and obesity epidemic, yet the impacts of relationships between obesiogenic factors remains an nearly untouched area of inquiry. The current literature provides insight and opportunity for further investigation to help definitively identify the manner in which these factors contribute to the public health crisis. The literature was thoroughly reviewed to specifically define overweight and obesity, the epidemic's prevalence, theories and conceptual frameworks used to understand the epidemic, and identify the instruments used to assess the impact of childhood overweight and obesity prevention interventions among youth. The results of the review confirmed the deficiency of scholarly work related to ecological influences on weight status among this population, further substantiating the need for this inquiry.

The current study tested a hypothesized model examining associative paths of influence between ecological factors and child weight status in urban, African-American adolescent females. The study's rationale is grounded in an adaptation of an ecological model developed by Story, Kaphingst, O'Brien, and Glanz (2008) which suggests that the food and eating environments have a greater influence on the increasing obesity epidemic than individual factors. The dynamic nature of this ecological model posits that behaviors affecting weight status have multiple levels of influence at the individual, social environment, and physical environment levels (Maddison et al., 2009; McNeill et al., 2006; Story et al., 2008). Physical environment factors are considered antecedents of social cognitive factors at the individual and social environment levels and may mediate relationships at different levels of influence to impact weight status (Maddison et al., 2009; Story et al., 2008). Figure 6 illustrates Story et al.'s multilevel approach and the corresponding influencing factors and characteristics.

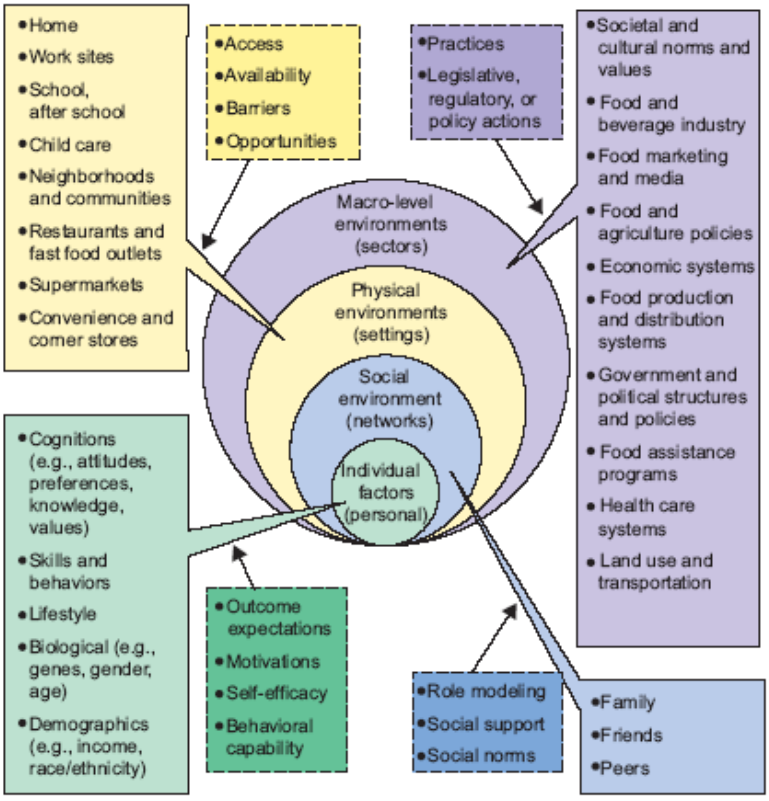

Figure 6. Ecological framework depicting the influences on what people eat. Figure from "Creating Healthy Food and Eating Environments: Policy and Environmental Approaches," by M. Story, K.M. Kaphngst, R. Robinson-O'Brian and K. Glanz, 2008, *Annual Review of Public Health*, 29, p. 272. Reprinted with permission of the publisher.

Significance of the Study

Although the literature acknowledges the association of ecological factors and overweight and obesity prevalence disparities between African American adolescent females and other racial and ethnic groups, more studies examining the specific associative paths of influence for this specific population are warranted. Further investigation of the ecological influences on child weight in this population may shed light on characteristics, that when strategically addressed, could arrest the exponential BMI increases noted in the literature.

The literature offers inconclusive findings on the efficacy of childhood overweight prevention interventions (Kelly & Melnyk, 2008) in adolescents, with even fewer studies specifically examining urban, African-American female adolescents (Thompson et al., 2008) and inclusive of all of the ecological factors included in the current study, such as diet behaviors, self-efficacy, and social support (Klein, Lytle, & Chen, 2008). No study to date has been designed to examine the associative paths of influence of youth diet behaviors, self-efficacy, and social support on child weight.

This inquiry dually served to inform intervention research, while clarifying the manner in which ecological influences affect weight status among the specific study population. Future research opportunities were identified by shedding light upon the direct and indirect ecological influences which impact child weight to aid educational leaders and administrators in maintaining the balance of their perceived and mandated roles in the obesity battle.

Conceptual Framework

The conceptual framework of the study uses an adaption of the ecological model developed by Story et al. (2008) which posits that the food and eating environments have a greater influence on the increasing obesity epidemic than individual factors. Story's et al.'s (2008) model finds its roots within McLeroy et al.'s (1988) ecological perspective, which delineated five levels of influence on health behavior and is discussed in further detail in Chapter 2 of this document. Emphasizing the individual's current knowledge and environmental surroundings, the Story et al. model integrates constructs of social cognitive theory to help describe influential factors at various levels of influence.

The adaptive model, which served as the current study's conceptual framework, specifically examined factors from the individual and social environment levels of the model to elucidate associative paths of influence. Individual level factors examined include diet behaviors and nutrition self-efficacy, while the social environment factors examined include teacher and friend social support. Diet behaviors provide information on energy intake while perceived self-efficacy refers to a self-report of the youth's internal level of confidence as it relates to eating healthy and overcoming barriers to eating healthy. Teacher and friend social support refers to a self-report of assistance received from either teachers or friends that aid the youth in engaging in healthy eating behaviors.

Selected study variables mirrored key components of an adaptation of Story et al's (2008) ecological model, which illustrates the influences of food and eating environments on weight status and served as the contextual framework for this study. Details on the full and adaptive models can be found in Chapter 2 of this document. Diet behavior and nutrition self-efficacy are found in the individual-level of the adaptive model, while teacher and friend social supports are found in the social environmental level. Diet behavior, nutrition self-efficacy, and teacher and friend social support were examined as independent variables using the Coordinates Approach to Child Health Evaluation Measures (CATCH'EM 2, 5, and 7) developed by the University of Texas-Houston School of Public Health (Hoelscher et. al., 2003; Penkilo et al., 2008; Thiagarajah et al., 2008). Child weight status served as the outcome variable and was measured using the CDC BMI-for-age growth charts for girls to obtain a percentile

ranking. Table 1 outlines the variables the current study examined at each ecological level of influence and associated measure.

Table 1

Study Variables by Ecological Level of Influence

Ecological Level	Variable	Measure
Individual	Diet Behaviors	CATCH'EM 2- Healthy Items Full Scale
Individual	Nutrition Self-Efficacy	CATCH'EM 5- Nutrition Self Efficacy Full Scale
Social Environment	Teacher Social Support	CATCH'EM 7- Perceived Social Support Teacher Sub-Scale
Social Environment	Friends Social Support	CATCH'EM 7- Perceived Social Friends Sub-Scale
Individual	Child Weight Status	2000 CDC Growth Charts for the United States

Figure 7 illustrates the conceptual framework for the current study.

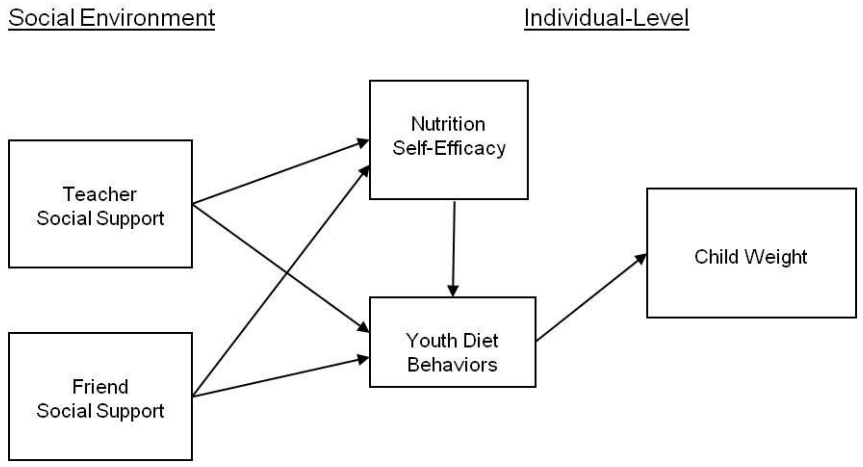

Figure 7. Conceptual framework examining ecological influences on child weight.

Research Questions

The study tested a structural model examining associative paths of influence between diet behaviors, self-efficacy, teacher social support, and friend social support on child weight in urban, African-American, adolescent females, specifically seeking to answer the following research questions:

1. Does teacher social support have a positive, indirect associative influence on child weight through nutrition self-efficacy and diet behaviors?
2. Does friend social support have a positive, indirect associative influence on child weight through nutrition self-efficacy and diet behaviors?
3. Does teacher social support have a positive, indirect associative influence on child weight through diet behaviors?
4. Does friend social support have a positive, indirect associative influence on child weight through diet behaviors?

The following listed hypotheses were developed based upon empirical evidence that demonstrates relationships between ecological factors and child weight (Anderson et al., 2000; Jeffery, Baxter, McGuire, & Linde, 2006; Moore, & Roux, 2006; Stafford et al., 2008; Zenk et al., 2005) to address the research questions driving the study.

1. Teacher social support has a positive, indirect associative influence on child weight through nutrition self-efficacy and diet behaviors.
2. Friend social support has a positive, indirect associative influence on child weight through nutrition self-efficacy and diet behaviors.
3. Teacher social support has a positive, indirect associative influence on child weight through diet behaviors.

4. Friend social support has a positive, indirect associative influence on child weight through diet behaviors.

Definition of Terms

The following key terms utilized throughout the study are defined in an effort to ensure no misinterpretation by the reader:

Body Mass Index (BMI): BMI values are ratios of anthropometric data (weight and height) in the form of a numerical formula. The formula utilizes a person's weight in kilograms divided by the square of their height in centimeters (Center for Health and Health Care in Schools, 2005). BMI has shown to be a reliable indicator of body fatness. While BMI is an accepted screening tool for the initial assessment of body fatness in children and adolescents, it is not a diagnostic measure because BMI is not a direct measure of body fatness (Centers for Disease Control and Prevention, 2009).

Child Weight Status: A child's weight status is determined based on an age- and sex-specific percentile for BMI (Centers for Disease Control and Prevention, 2007a) and include the following:

Underweight: Less than the 5th percentile

Healthy weight: 5th percentile to less than the 85th percentile

Overweight: 85th to less than the 95th percentile

Obese: Equal to or greater than the 95th percentile

Direct effect: The influence variables have on one another within a direct linkage in a structural model (Brown, n.d).

Endogenous Variable: A variable in which variability is predicted to be causally affected by other variables in the hypothesized model and have a straight, single-headed arrow pointing at it (Hatcher, 1994).

Exogenous Variable: A variable influenced only by variables that lie outside of the causal model (Hatcher, 1994).

Individual-Level: The most fundamental level of influence in the ecological approach focusing on behaviors existing or occurring in the individual self or mind. Targeted behavior characteristics at this level include knowledge, attitudes, skills, beliefs, motivation, self-concept, development history, past experience, and intention to comply with behavioral norms (McLeroy et al., 1988; USDHHS, 2005).

Just-Identified Model: A model in which there are exactly as many linerarly identified independent equations as unknowns (Hatcher, 1994, p. 159).

Latent Variables: Variables that that are not directly observable or measured and are inferred from a set of variables that may be quantified using scores from measures, tests, surveys, and other data sources (Schumacker & Lomax, 2004).

Manifest Variables: Variables that are directly measured or observed during the course of investigation (Hatcher, 1994).

Mediation: A multivariable model where there are multiple causal paths feeding into a single outcome variable: the direct effect from the independent variable to an intermediary (mediator) variable and the direct effect from the intermediary variable to the outcome variable. A variable must meet the following conditions to functions as a mediator variable: a) variations in levels of the independent variable significantly account for variations in the presumed mediator variable; b) variations in the mediator variable

significantly account for variations in the outcome variable; and c) when the paths between the independent and mediator variables and the path between the mediator and the outcome variables are controlled, a previously significant relationship between the independent and outcome variable becomes insignificant, with the strongest demonstration of mediation when the path between the between the independent and outcome variable is zero (Baron & Kenny, 1986, p.1176).

Overidentified Model: a model that includes more equations than unknowns (Hatcher, 1994, p. 159).

Path Analysis: A structural equation modeling technique used to test theoretical models specifying causal relationships between variables. Path analysis determines the degree which a theoretical model accounts for the actual relationships observed in the sample data (Hatcher, 1994).

Perceived Social Support: Defined as aid and assistance exchanged through social relationships and interpersonal interactions; represents a framework of concepts that describe structure, processes, and functions of social relationships (Heaney & Israel, 2002).

Perceived Self-Efficacy: Refers to the internal level of confidence the person feels concerning successfully completing an activity and overcoming barriers to complete the activity (Sallis & Owen, 2002).

Social Environment: Interpersonal relationships of the individual with people such as family, friends, and neighbors are believed to be the most important source of influence on the individual's health behavior. Social environments assume individuals exist within and are influenced by their social environments (USDHHS, 2005).

Specific indirect effects: The decomposition of the total indirect effect into specified indirect paths in a structural model (Brown, n.d.)

Total effect: The sum of the direct and total indirect effects in a structural model (Brown, n.d.).

Total indirect effect: Consist of all paths from one variable to another that are intervened or modified by at least one additional variable in a structural model (Brown, n.d.)

Limitations

Assumptions and limitations of the study are acknowledged. The most inherent challenge relates to the use of an adaptive model due to limitations of data availability. The study used an adaptation of Story et al.'s (2008) ecological framework examining only two of the four environmental levels of influence on diet because of time and financial constraints. The structural model, although based on substantive theory and prior research, does not take into consideration other factors of influence, such as physical and policy environmental factors. Furthermore, the study did not test all of the plausible models using the available study variables. Finally, the study did not analyze influence based upon the individual weight classifications due to data limitations. SEM requires large sample sizes for model development, and the study data fell short of the minimum data sample required to build a sufficient model for each of the weight status classifications.

Further study limitations include the use of food frequency questionnaires (FFQ) because of the inconsistent performance of this type of measure in validation studies and the tendency to introduce social desirability bias. Although cited in the literature as the most common tool used to assess diet behaviors (Johnson et., 2008; Taylor et al., 2009),

FFQ often yielded mixed findings in validation studies (Ambrosini et al., 2009; Hammond, 2000; Kristal et al., 2005; Langevin et al., 2007; Noia & Contento, 2009) and offers a greater potential for social desirability bias, which could significantly obscure the measurement of the variable of interest (Herbert, Clemow, Pbert, Ockene, & Ockene, 1995). However, the FFQ was used in the current study as it was a cost effective method of data collection and imposed minimal burden on the respondent.

Organization of the Remainder of this Document

The remainder of this document details the process undertaken to answer the research questions guiding the study. Chapter 2 provides a literature review of childhood overweight and obesity, defining the condition, its prevalence, and contributing factors. Additionally, the review expounds upon the current research, specifically focusing on defining childhood overweight and obesity, the epidemic's prevalence, theories and conceptual frameworks used to understand the epidemic, and the measures to assess the impact of childhood overweight and obesity prevention interventions among youth.

Chapter 3 follows the literature review with a description of the study's methodology. In this chapter, the research design is detailed, including the data collection protocol and data analysis techniques. In addition, ethical considerations are addressed. The study was designed as a quantitative, non-experimental, structural equation model (SEM) study to examine the influences of ecological factors on child weight in African American adolescent females.

Chapter 4 details the results of the data analyses and the manner in which the analyses answered each of the study's research questions. The study analyses consisted of a descriptive and structural equation analysis. Study data were gathered using the Youth Diet and Behaviors Questionnaire (YDBQ), a 39-item questionnaire that combined

previously validated diet behavior, nutrition self-efficacy, and nutrition social support scales. Chapter 5 summarizes the findings of the study in relationship to the research questions. In addition, the chapter includes a discussion on study findings, as well as implications for future research, study limitations, and lessons learned.

CHAPTER 2: REVIEW OF THE LITERATURE

The purpose of this chapter is to review relevant theories and literature pertinent to the study, which tested hypothesized models examining associative paths of influence between ecological factors and child weight in African-American adolescent females. The following review provides an overview of the childhood overweight and obesity epidemic in the United States, focusing on defining the measure of childhood overweight and obesity, factors contributing to its increased prevalence, theories and conceptual frameworks used to understand the epidemic, and the instruments used to assess the impact of childhood overweight and obesity prevention interventions among youth.

Childhood Overweight and Obesity: An Overview

The childhood obesity epidemic continues to persist globally. In the last two decades, childhood overweight and obesity rates have shown drastic increases in both developing and developed countries, with United States prevalence rates doubling and tripling. More recent reports allude to a slowing in prevalence rate increase in foreign countries (OECD, 2012). However, to date, no country has successfully reversed the trend.

On the surface, addressing the problem appears achievable by following a proper diet and engaging in regular physical activity. Health researchers remain optimistic by continuing to investigate possible solutions for a problem that has reached epidemic status. However, mixed findings suggest the solution extends beyond diet and physical

activity alone. The following discussion examines the childhood overweight and obesity epidemic, with a review of its formal definition, its prevalence, and key factors that contribute to the condition.

Defining the Measure of Childhood Overweight and Obesity

Childhood overweight and obesity are classifications describing ranges of weight that are greater than what is generally considered healthy for a given height. The terms also classify weight ranges associated with the increased likelihood of developing chronic diseases and other health problems (Centers for Disease Control and Prevention [CDC], 2007). The World Health Organization (WHO) defines obesity as a condition where fat has accumulated to such an extent that health is adversely affected (Neovious, Linné, Barkeling, & Rossner, 2004). The United States primarily uses the body mass index (BMI) value to classify weight status. BMI values are ratios of anthropometric data (weight and height) in the form of a numerical formula. The formula uses a person's weight in kilograms divided by the square of their height (Center for Health and Health Care in Schools, 2005). BMI has shown to be a reliable indicator of body fatness. Although BMI does not measure body fat directly, past research suggests that BMI correlates to direct measures of body fat, such as underwater weighing and dual energy x-ray absorptiometry (DXA; CDC, 2007). Currently, practitioners use the common definitions for obesity defined by the National Institute for Health outlined in Table 2.

Table 2

Adult Weight Classifications and BMI Values

Adult Weight Status Definition	BMI Value
Underweight	Below 18.5
Normal	18.5 – 24.9
Overweight	25-29.9
Obesity	30 or greater

Note. Source: *Overweight and obesity: Defining overweight and obesity,* Centers for Disease Control, 2007.

Although BMI measures persist as the most commonly used measure to evaluate overweight and obesity, researchers continue to debate over a universally appropriate measure for use among children and adolescents. Currently, a universally accepted system for classifying childhood overweight and obesity does not exist, but practitioners rely on specific BMI approaches of large research institutions (Neovious et al., 2004). However, in the United States, the CDC and the American Academy of Pediatrics (AAP) recommended BMI for identifying possible weight problems for children beginning at age two (CDC, 2009). For children and adolescents, BMI measures are age- and sex-specific and often referred to as BMI-for-age. The BMI value is plotted on the CDC BMI-for-age growth charts (for either girls or boys) to determine the percentile ranking. The percentile value indicates the relationship of the child's weight to other children of the same sex and age. The growth charts show the weight status classifications used with children and adolescents (underweight, healthy weight, overweight, and obese) and are outlined in Table 3 (CDC, 2009).

Table 3

Child Weight Status Classification by BMI-for-Age Percentiles

Child Weight Status Classification	BMI-for-age
Underweight	Less than the 5th percentile
Healthy Weight	5th percentile – less than 85th percentile
Overweight	85th – 95th percentile
Obese	95th Percentile or greater

Note. Source: *Healthy Weight: About BMI for Children and Teens,* Centers for Disease Control, 2009.

Nomenclature changes for specific levels of high BMI cut offs have established more concrete designations for child weight status. During the 1980s and 1990s, expert committees recommended establishing category labels for children and adolescents aged 2 through 19 years with BMI for age at specific cut offs. Children and adolescents with BMI for age at or above the 95th percentile were designated in the category labeled as "overweight," while those between the 85th and 95th percentile were categorized as "at risk for overweight" (Barlow & Dietz, 1998; Himes & Dietz, 1994). In 2005, the American Medical Association, in collaboration with the Health Resources and Service Administration and the Centers for Disease Control and Prevention (CDC), convened a new expert committee charged with providing revised childhood obesity recommendations. The committee recommended revising the category labels for the previous cut off as "obese" and "overweight," respectively (Barlow & the Expert Committee, 2007; Krebs, Himes, Jacobson, Niclas, Guilday, & Styne, 2007).

Researchers continue to debate over the appropriateness of BMI use to classify overweight and obesity among children due to the many problems associated with the technique. Among adults, BMI overweight and obesity values are established and

globally accepted. However, Neovious et al. (2004) argued that defining obesity, rather than overweight, by BMI among children and adolescents presents challenges as it directly contradicts the notion that criteria-based measures of fatness can classify individuals as obese. BMI values rely on weight-based measures that do not directly measure adiposity, thereby negating the appropriateness of its use in defining the condition of excess fatness and limiting its use solely to classifying individuals as overweight among this age group (Neovious et al., 2004, Troiano & Flegal, 1998). Common problems associated with use of BMI as an indicator or screening measure for adiposity among children and adolescents include factors such as global variations in age and sex, maturation and ethnicity, BMI component increases, validity of BMI as a proxy for body fatness, BMI and fatness over time, and insufficient evidence of risk.

Additional problems exist with using BMI as an indicator of weight using height, weight, and frame size rather than standards for percentages for body fat. Using the current BMI standards, it is possible for an individual to be classified as overweight while within a desirable range for percent of body fat and make no concessions for individuals with greater proportions of lean muscle and less body fat (Huddy, Nieman, & Johnson, 1993). In general, lean muscle weighs substantially more than fat and often provides an inaccurate assessment in individuals with more lean muscle than body fat, such as the case with athletes (Cottrell, 1992).

In an effort to address the need to establish an internationally acceptable definition of childhood overweight and obesity, Cole, Belizzi, Flega, and Dietz (2000) developed a weight classification system that with adult BMI values greater than international BMI values of 25 for overweight and 30 for obese for use among 2 and 18 year olds. The

study developed the measure using the data from six nationally representative surveys on growth from Brazil, Great Britain, Hong Kong, the Netherlands, Singapore, and the United States. Researchers used the survey data to develop centile curves that passed through the widely used adults BMI values. The resulting curves were averaged and used as age and sex specific cut off points among children and adolescents.

Many challenge the work of Cole et al. (2006), suggesting critical problems associated with the study methodology such as assuming a constant obesity prevalence during childhood and the use of a non-representative countries (Neovious et al., 2004). The notion of constant obesity during childhood disputes previous research findings that the prevalence of overweight and obesity increases with age, with excessive weight gain occurring during late adolescence and early adulthood (Mulligan, 2000; Power, Lake, & Cole, 1997). The notion would further exaggerate estimates in younger age groups.

Poor choices in the countries used for the study population also raised concerns among researchers. Five of the six countries used have gross domestic products (GDP) above the world average, as GDP is known to influence growth, pubertal timing, and obesity status (Kinra, 2000; World Health Organization [WHO] Technical Report Series, 2000). Further, the inclusion of Hong Kong as a representation of the Chinese population raised concerns due to differences in nutritional status in comparison to youth in mainland China (Hesketh & Ding, 2000).

Researchers concur that an ideal obesity classification system would be based on direct measures of body composition, which include such measures as percentage of body fat (%BF). Studies suggest that health complications are related more closely to the elevated disproportions of body fat rather than overall body weight (Neovious et al.,

2004). To date, an accurate, precise, accessible, low-cost, and well documented obesity classification system does not exist; therefore BMI measures are used as the primary measure of fatness among adults and children.

In summary, the terms overweight and obesity for children describe weight ranges in excess of associated heights for optimal health. In the United States medical professionals primarily use the BMI value to classify weight status for adults and children, although it does not measure fat directly. Researchers continue to debate over the appropriateness of its use for children and adolescents, citing numerous limitations that would compromise its effectiveness. Skeptical researchers have sought to develop alternate weight classification systems based on direct body composition measures which resulted in complex, expensive, impractical, and underutilized methodologies. To date, no one has devised a more practical alternative to BMI.

Factors Contributing to Childhood Overweight and Obesity

The recent increases in childhood overweight and obesity birthed a passion to determine the cause for the prevalence increase. Researchers have failed in their efforts to identify a single culprit responsible for the drastic increases in overweight and obesity in children, often attributing prevalence spikes to a combination of factors which including excessive energy intakes, decreased energy expenditures, environmental influences, and genetics (Maziak et al., 2008; Newby, 2007; Veugelers & Fitzgerald, 2005). The primary variables in the energy imbalance equation that contribute to childhood overweight and obesity include energy intakes and energy expenditures; genetics and environmental influence serve as secondary variables. The subsequent discussion further elaborates on the contributions that energy intakes, energy

expenditures, and environmental variables make to the childhood overweight and obesity epidemic.

Energy Intake. Energy intake, or total energy, refers to the total number of calories taken in daily by ingestion or parenteral means and is determined by energy density of and volume of consumed foods (Newby, 2007). Energy density is defined as the amount of available dietary energy per unit of weight (kcal/g or KJ/g) which can cause variability based upon nutrient composition. For example, water, fiber, and fat all contribute to food density. Water and fiber contribute to energy density by providing weight but little energy; therefore foods high in water and fiber are considered low-energy-dense foods. Fat provides the greatest amount of energy per gram among food density components, conversely making foods high in fat high-energy-dense foods (Newby, 2007).

Changes in supply, variety, price, taste, packaging, fast food availability, and aggressive marketing have increased the number of those consuming excessive amounts of high-energy-dense foods. Popular foods have shifted to more high-energy-dense foods such as fast foods, cereals, breads, potatoes, and soft drinks (Maziak et al., 2008). Despite counteractive campaigns by health organizations, convenient, cheap, and tasty foods emerge as the favored choices given the fast-paced lifestyles and economic state of many modern American families. The percentage of meals consumed outside of the home nearly doubled between 1970 and the mid-1990s, from 17% to 30% respectively (Maziak et al., 2008).

Eating behaviors, specifically the where and when of energy intake, have shown significant influence on energy intake. The literature establishes relationships between

obesity and meal location, specifically with meals consumed away from home and at fast food restaurants. Meals consumed away from home may contribute to childhood overweight and obesity as these foods are often higher in fat and lower in fiber (Bowman, Gortmaker, Ebbeling, Pereira & Ludwig, 2004; Gillis & Bar-Or, 2003; Paeratakul, Ferdinand, Champagne, Ryan, and Bray, 2003; Schmidt et al., 2005). Research reveals that children's diets were poorer in quality on days in which they consumed fast foods as meals. More specifically, their diets were significantly higher in total energy, saturated fat, and sugar-sweetened beverages and lower in fruits, vegetables, fiber, and milk (Bowman, et al., 2004; Paeratakul et al., 2003; Schmidt et al., 2005). Currently, limited research exists to adequately associate foods consumed away from home and obesity (Newby, 2007). Although a study observed that obese children consume more meals away from home than non-obese children (Gillis & Bar-Or, 2003), no significant associations were observed in a cross-sectional study between foods consumed away from home and the risk for obesity (Nicklas et al., 2004).

Eating behaviors, such as when meals are consumed, can have adverse health implications in relationship to overweight and obesity. Findings of recent research supports the fact that adolescents often skip breakfast as a weight management technique (Neumark-Sztainer, Hannan, Story, Croll, & Perry, 2003; Zullig, Ubbes, Pyle, & Valois, 2006) although the literature suggests that breakfast consumers are less likely to be overweight (Rampersaud, Pereira, Girard, Adams, & Metzel, 2005). Skipping breakfast has undesirable impacts on learning as the recent studies observed less healthful diets and interferences in cognition and learning, especially for those at nutritional risk, among children that skip breakfast (Rampersaud et al., 2005).

In summary, energy intake refers to the total numbers of calories consumed daily and is determined by the energy density and volume of food consumed. High energy dense foods, such as those high in fat, significantly contribute to the daily energy intake. Changes in food supply, variety, price, taste, marketing, and availability of fast food significantly impact the consumption of high energy dense foods. Eating behaviors also impact daily energy intake. Behaviors such as where and when food is consumed and types of food consumed all dictate individual daily energy intakes.

Energy Expenditure. Total energy expenditure (TEE) refers to the use of energy store to perform voluntary and involuntary functions of daily living. TEE comprises different metabolic functions that expend energy which include basal energy expenditure (BMR), thermogensis, energy expenditure from physical activity, and energy expenditure from growth (Maffeis, 2000; Maffeis & Castellani, 2006). BMR is defined as the rate at which heat is produced by an individual in a resting state and comprises 60% of the TEE. Thermogensis refers to energy expenditures induced by food, including digestion, absorption, and transport and storage of nutrients. Thermogensis accounts for 10% of TEE. Energy expenditure from growth comprises the smallest proportion of TEE, accounting for less than 2% of TEE.

Energy expenditure from physical activity is the only modifiable parameter of TEE and may account for 15-65% of TEE depending of the activity level of the individual. Energy expenditure for physical activity can be divided into two separate categories: energy requirements for programmed physical activities and non-exercise activities thermogenesis (NEAT). NEAT includes energy expended from spontaneous physical activities which are not sleeping, eating, or sports (Maffeis & Castellani, 2006).

In theory, spontaneous physical activity, such as working or engaging in recreational activities like sitting, standing, climbing stairs, dancing, or playing, should make up the largest component of energy expenditure from physical activity. However, the external variables such as environmental and biological factors significantly modify the energy expenditure for physical activity. More recently, childhood obesity researchers have begun examining the relationship between environmental factors and obesity.

Environments. Environments refer to the types of environments that affect behavior and may be either being objective (actual) or subjective (perceived). Overall, two main types of environments exist: physical and social. Physical environments may consist of weather or climate, community resources, the built environment, and the information environment. Social environments may include characteristics such as social support, norms, beliefs, and attitudes (Sallis & Owen, 2002). The environment can serve as a strong determinant for health behaviors directly formed through environmental constraints and supports (Bandura, 1986; Owen, Humpel, Leslie, Bauman & Sallis, 2004).

The built environment in the obesity epidemic has sparked increased interest among public health researchers. Broadly defined, the built environment encompasses neighborhoods, roads, buildings, food sources, and recreational facilities, the places in which people live, work, are educated, eat, and play (Sallis & Glanz, 2006). The built environment affects daily decisions such as transportation to work or school, access to fast-food restaurants, and recreational family time.

Built environmental factors that often impact children's ability to engage in spontaneous physical activity outside include urbanization and transportation automation, neighborhood safety, and parental perceptions (Maffeis & Castellani, 2006; Maziak et al., 2008). More often than not, urbanized settings limit recreation options for children due to traffic and limited availability of parks, playgrounds, and footpaths for walking. Furthermore, parents are often reluctant to allow children to play outside in urbanized areas where crime is a concern and often encourage sedentary alternatives in the home as a safety precaution (Maffeis & Castellani, 2006). Parental perception also plays a role in the activities that children engage in outside of the home. More active parents are more likely to have physically active children and encourage spontaneous physical activity (Davison & Birch, 2002; Maffeis & Castellani, 2006).

The combined effects of the environmental factor impact childhood overweight and obesity by promoting sedentary behaviors, which by definition involves engaging in low-intensity activities such as watching television and playing video and computer games (Martinez-Gomez, Tucker, Heelan, Welk, & Eisenmann, 2009; Treuth et al., 2009). However, recent research indicates computer and video game play have different metabolic and physiologic effects from television viewing and should therefore be considered independently (Wang & Perry, 2006).

Researchers have demonstrated relationships between sedentary behavior, overweight or obesity among children and adolescents, and risk factors for chronic disease (Caroli, Argentieri, Cardone, & Masi, 2004; Crespo et al., 2001; Fox & Hillsdon, 2007; Gortmaker et al.,1996; Hancox, Milne, & Poulton, 2004; Stettler, Singer, & Suter, 2004). Physical effects associated with sedentary behaviors, such as television watching,

include poor dietary habits, decreased physical activity, increased adiposity/obesity, and higher cholesterol (Vessey, Yim-Chiplis, & MacKenzie, 1998). Researchers have already established that watching 2 or more hours of television has been shown to be the global marker for identifying children at risk for hypercholesterolemia (Wong et al., 1992). Furthermore, children that watched at least 4 hours of television daily were more likely to be overweight than those that watched less television (Anderson, Crespo, Bartlett, Cheskin, & Pratt, 1998; Crespo et al., 2001; Vessey et al., 1998).

In summary, total energy expenditure (TEE) refers to the equation for use of energy stores and consists of four separate components, only one of which is voluntarily modifiable: energy expenditures from physical activity. Energy expenditures from physical activity lie at the heart of the childhood overweight and obesity epidemic, which are further exacerbated in conjunction with environmental factors that promote sedentariness. Research has demonstrated relationships between sedentary behavior and decreased physical activity, poor dietary habits, and increased adiposity among children and adolescents (Reilly et al., 2009).

The Ecological Perspective: A Multilevel Approach to Health Behavior Change

Public health practitioners, researchers, and educators rely on evidence-based theories as a means to help understand and address the issue of childhood overweight and obesity. The vast body of research available in the field serves as a road map on the journey to optimal health and favorable quality of life. The literature shows promising results in helping understand childhood overweight and obesity through the use of the ecological perspective as a conceptual framework.

The ecological perspective is a multi-level health behavior change approach that emphasizes the interaction between, and interdependence of, factors within and across all levels of a health problem (USDHHS, 2005). By definition, the approach outlines approaches to understanding health behavior focusing on the nature of people's interactions with their physical and social surroundings (Stokols, 1992, p.7). To clarify the definition, the term *ecological* refers to models, frameworks, and perspectives, rather than to specific constructs or variables, while *environment* simply implies the space outside of the person (Sallis & Owen, 2002).

The ecological approach hinges upon the two key points of multi-level influence and reciprocal causation to identify intervention points for promoting health. The approach outlines three levels of influence, their effect on health behavior, and the nature of their interaction. Reciprocal causation suggests that people dually influence and are influenced by their surroundings (USDHHS, 2005). The following discussion details background information on the development of the ecological approach, the guiding principles of the approach, the different levels of influence, relevant health behavior theories employed at each level of influence, and application of the approach in the prevention of childhood overweight and obesity.

Background

The ecological perspective finds its roots in public health, as the field has recognized the environmental influences of disease for centuries. The development of the ecological perspective began in the mid 1930's by Kurt Lewin. Lewin coined the term "ecological psychology" referring to the study of the environmental influence on behavior (Sallis & Owen, 2002). Others contributed to the body of knowledge through

the further development and exposition of the ecological approach. Rudolph Moos developed a social ecological model of health-related behavior in 1980 which identified four categories: physical settings, organizational, human aggregate, and social climate.

McLeroy et al., (1988) proposed an ecological model of health behaviors that is most commonly cited in reference to the ecological perspective. The multi-level model systematically addresses five different levels of influence as intrapersonal factors, interpersonal process and primary groups, institutional factors, community factors, and public policy. Sallis and Owen (2002) provided a working definition for the ecological model of health behavior as "models proposing that behaviors are influenced by intrapersonal, socio-cultural, policy, and physical-environmental factors" (p. 463) and further suggested that "these variables are likely to interact, and multiple levels of environmental variables are described that are relevant for understanding and changing health behaviors"(p. 463).

Daniel Stokols (1992) expounded on the work of McLeroy et at. (1988) to develop four assumptions to the approach, helping to further clarify the various components of the multi-level perspective. The first assumption suggests that health is influenced by multiple facets of physical and social environments. The second assumption suggests that the multidimensional nature of environments allows for characteristics to be described as social or physical, actual or perceived, and classified as discrete attributes. The third recognizes human-environment interactions can be described at varying levels of aggregation (individuals, families, work or cultural organizations, communities, or whole populations) while the fourth recognizes that

feedback takes place across the levels of environments and aggregates of persons (Stokols, 1992).

Guiding Principles of the Ecological Perspective.

In an effort to clarify the interrelatedness of the levels of the ecological perspective, Sallis and Owen (2002) outlined seven principles to help guide research and interventions. The first principle states multiple levels of factors influence behavior, which suggests that all of the levels can influence behavior simultaneously, to varying degrees. The second principle states that multiple types of environmental influences affect behavior. Each environmental influence has different characteristics that invoke different types of influence on health behavior (Sallis & Owen, 2002).

The third principle states that behavior-specific ecological models can be useful. Operationalizing the general principles of the ecological approach for specific behaviors increases the likelihood of producing desired outcomes. The fourth principle states that multilevel interventions may be most effective, and the fifth states that multilevel interventions are best implemented by multi-sector groups. The literature confirms that challenges exist in implementing multilevel strategies as the process is time-consuming and no one group has complete expertise at all levels of influence. However, involving stakeholders from diverse professional disciplines can help overcome the challenge (Sallis & Owen, 2002).

The sixth principle recommends evaluating ecological interventions, monitoring implementation activities, and making changes in mediators at multiple levels, both formatively and annually (Sallis & Owen, 2002). The seventh principle speaks to the manner in which political dynamics can limit ecological interventions, emphasizing the

importance of timing in relationship to community and public policy levels of influence. Stakeholders should remain prepared to act with changes in political climate or leadership (Sallis & Owen, 2002).

Levels of Influence of the Ecological Perspective. McLeroy et al. (1988) identified five levels of influence for the ecological approach as the intrapersonal, interpersonal, community, institutional, and public policy. Those levels are further condensed into three levels, with the community level taking into account institutional and public policy factors. Applying health behavior theory at each level of influence helps guide intervention planning and implementation by aligning theoretical constructs to the behavior change characteristics to produce desired and effective outcomes. The literature frequently demonstrates successful outcomes among childhood obesity prevention interventions based on social cognitive theory (SCT) that influence health behavior change at the interpersonal level. The following discussion examines each level of influence and applicable health behavior theories used at each level to effect obesity.

Intrapersonal Level. The intrapersonal, or individual, level is the most fundamental level of influence in the ecological approach with health behavior theories at this level focusing on behaviors existing or occurring in the individual self or mind. Targeted behavior characteristics at the intrapersonal level include knowledge, attitudes, skills, beliefs, motivation, self-concept, development history, past experience, and intention to comply with behavioral norms (McLeroy et al., 1988; USDHHS, 2005). Health behavior theories that promote change at the intrapersonal level find their foundation in psychological theory and incorporate change strategies to modify the nature

and extent of social influence (McLeroy et al., 1988). Interventions incorporate social influence as a means to change individual behavior rather than modifying social environment, assuming the proximal causes of behavior mechanisms for producing behavior change lie within the individual rather than the social environment.

Health behavior theories employed to change behavior at the intrapersonal level include the health belief model, transtheorectical model, theory of planned behavior (TPB), and the precaution adoption process model (PAPM). However, it should be noted that the literature reflects limited use of intrapersonal health behavior theories specifically addressing childhood overweight and obesity.

Interpersonal Level. Health behavior theories at the interpersonal level assume individuals exist within and are influenced by their social environments (USDHHS, 2005). Interpersonal relationships of the individual with people such as family, friends, and neighbors are believed to be the most important source of influence on the individual's health behavior. Interpersonal relationships are a key element of social identity as they provide social resources such as emotional support, information, access to new social contacts and social roles, as well as tangible help in meeting personal and social obligations and responsibilities (McLeroy et al., 1988). Members of these social environments provide the opinions, thoughts, behavior, advice, and support of health behaviors and, in turn, the individual has a reciprocal effect on those people (USDHHS, 2005).

Health behavior theories employed to change behavior at the interpersonal level include social cognitive theory (SCT), the social networks and support conceptual model, the transactional model of stress and coping, and the interdependence theory of social

influence and communication. SCT emerges as the theory most frequently cited in the literature for use in overweight and obesity interventions, in general, as well as childhood overweight and obesity prevention. In addition, the literature reflects fair use of social support conceptual models to help health behaviors related to childhood obesity. The following discussion outlines the characteristics of SCT and social support and explores their application in the literature.

SCT seeks to understand the relationship between behaviors, personal factors and cognitions, and environmental influences (O'Dea & Wilson, 2006). Recent literature reviews identify SCT as the most dominant health behavior theory used in developing health programs for adolescents, as demonstrated by the high rates of effectiveness when used in nutrition programs for children and adolescents (Hoelscher, Evans, Parcel, & Kelder, 2002). Researchers applying SCT with children should remain mindful that children are not completely in control of their environment and make appropriate modifications as needed.

Albert Bandura expanded upon the research of social learning theory to develop SCT based on the premise of observational learning and the additional construct of self-efficacy (Bandura, 1962; Baranowski, Perry & Parcel, 2002; USDHHS, 2005). SCT integrates concepts from multiple theory models including cognitive, behavioral, and emotional and asserts that the three main factors of self-efficacy, goals, and outcomes affect behavior change. Individuals with a greater sense of self-efficacy are more likely to change health behaviors despite existing obstacles. Individuals with less feelings of control over specific health behaviors are not motivated to act or persist beyond obstacles (USDHHS, 2005).

Continued research and theory modification of SCT resulted in the formulation of 11 constructs to help explain health behavior change, which include environment, situation, observational learning, behavioral capacity, reinforcements, outcome expectations, outcome expectancies, self-efficacy, emotional coping responses, self-control of performance, and reciprocal determination.

The construct of *environment* refers to physical, external, and objective factors affecting personal behavior. Some types of environments include physical, such as room size or location, and social, which include family members, friends, or co-workers (Baranowski et al., 2002; USDHHS, 2005). The *situation* construct refers to how the subjective environmental perception affects personal behavior. The representations may be real, distorted, or imagined factors while the perception of the environment refers to place, physical features, time, activity, participants, as well as their personal role in the situation (Baranowski et al., 2002; USDHHS, 2005).

The observational learning, or modeling, construct, also referred to as vicarious learning and occurs by watching the actions and reinforcements of another person (Baranowski et al., 2002; USDHHS, 2005). The behavioral capacity construct refers to knowledge and skill of the behavior as evidenced through performance. Learning is believed to occur as a presumptive outcome based upon performance (Bandura, 1972, 1986, 1997). The individual must have knowledge and skill in order to effectively perform the desired behavior (Baranowski et al., 2002; USDHHS, 2005).

The reinforcement construct, the primary construct of operant learning theory, can be classified as either positive or negative reinforcement. Positive reinforcement provides a reward to increase the desired behavior. Negative reinforcement withdraws a

negative stimulus to increase a desired behavior. The categories are further classified as external or internal reinforcement (Lepper & Cordova, 1992). External reinforcement refers to an event that is known to have predictable reinforcement value, while internal reinforcement refers to a person's subjective perception of the value of an event (Baranowski et al., 2002; USDHHS, 2005).

The outcome expectations construct refers to the anticipated outcomes of the behavior. The person learns and anticipates the occurrence of events in response to a particular behavior in a given situation (Bandura 1977a, 1986). Expectations are learned by previous experience or performance attainment, observation or vicarious experience, hearing about situation or social persuasion, or a physical response, also known as a physiological arousal. (Baranowski et al., 2002; USDHHS, 2005). The outcome expectancies construct differs from outcome expectations by assigning a quantitative value to a particular outcome (Bandura, 1977a, 1986). Expectancies influence behavior based upon the guiding principle that people will choose to perform an activity that maximizes the perceived positive and or minimizes the negative outcome (Baranowski et al., 2002; USDHHS, 2005).

The self-efficacy construct refers to the internal level of confidence the person feels concerning successfully completing an activity and overcoming barriers to complete the activity. Self-efficacy is often identified as the most important prerequisite of behavior change due to the fact that self-efficacy dictates effort exertion and level of performance (Bandura, 1977b, 1978, 1982, 1986, 1997; Baranowski et al., 2002; USDHHS, 2005).

The construct emotional coping responses deals with the fact that excessive emotional arousal can impair learning and performance (Bandura, 1977a). Certain stimuli can give way to fear, which elicits an emotional arousal that triggers a defensive behavior. Moos (1976) identified four categories of behavioral management for emotional physiological arousal. The first category includes psychological defenses for behaviors such as denial, repression, and sublimation. The second category involves cognitive techniques, which includes activities such as problem restructuring. The third category includes stress management techniques that treat the symptoms of the emotional distress and include progressive relaxation or exercise. The final category includes effective problem solving strategies and includes activities such as clarifying the problem and identifying, selecting, and implementing solutions to resolve the emotional arousal.

The construct self-control of performance relates closely to the self-efficacy in terms of selecting the extent of behavior for change and the practice for building confidence in self-regulation. Sub functions of the self-control construct include self-monitoring of one's own behaviors, its determinants, and effects; comparing behavior and its outcomes to a personal standard; and self-reward (Baranowski et al., 2002; USDHHS, 2005). The final construct, reciprocal determination, refers to the continuous interaction among the characteristics of a person, the behavior, and the environment in which the behavior is performed (Bandura, 1978, 1986; USHHS, 2005). Outcome behavior is dependent upon the constant interaction of all three components (Baranowski et al., 2002; USDHHS, 2005).

The literature most often cites use of the SCT as the theoretical basis for school-based childhood overweight and obesity prevention studies. Two independent literature

reviews identified SCT as the dominant theoretical perspective among school-based obesity prevention strategies. Budd and Volpe (2006) conducted a review of successful school-based obesity prevention studies utilizing randomized control trial method of research. Twelve studies met the criteria of the study, with four of the studies citing use of SCT as the theoretical framework, with varying approaches involving self-monitoring, goal setting, and cognitive restructuring (Budd & Volpe, 2006). Another literature review of school-based interventions designed to prevent childhood and adolescent obesity between 1999 and 2004 found that over half (6) of the 11 studies that met the criteria for the review utilized SCT (Sharma, 2006). Furthermore, all of the identified intervention studies demonstrated positive outcomes, including increased nutrition knowledge, lowered blood pressure, decreased BMI, decreased TV viewing, and increased fruit and vegetable intake (Budd & Volpe, 2006; Sharma, 2006).

Research further demonstrates the adequacy of using SCT as a predictor of childhood overweight and obesity. Sharma, Wagner, and Wilkerson (2006) found that SCT constructs of expectations, self-efficacy, and self-control predict childhood obesity prevention behaviors of drinking water, physical activity, fruit and vegetable consumption, and hours of screen time, respectively. In a different prediction study, O'Dea and Wilson (2006) concluded that dietary self-efficacy impacts the development of high BMI and risk for overweight and obesity in children and adolescents.

Separate from its overall use, many interventions studies focusing on the SCT construct self-efficacy have shown favorable health outcomes in childhood overweight and obesity interventions studies based on SCT. Rinderknecht and Smith (2004) found significant improvements in dietary self-efficacy among overweight children as a result

of participating in a nutrition intervention based on SCT. A similar intervention study using SCT demonstrated improvements in exercise barriers self-efficacy among children ages 9-10 years old and 11-12 year old girls after completing a 12-week physical activity protocol (Annesi, Westcott, Faigenbaum & Unrich, 2005).

The concept of social support distinguishes itself from other social relationships and should not be categorized as a theory. Social support represents a framework of concepts that describe structure, processes, and functions of social relationships (Heaney & Israel, 2002). Defined as aid and assistance exchanged through social relationships and interpersonal interactions, social support serves as the functional content of relationships (Heaney & Israel, 2002). The early work on social support originated from John Cassel's (1976) work in social epidemiology and suggested that social support serves a protective factor against the damaging effects of stress on health (Heaney & Israel, 2002). He further posited social support's non-specific role in disease etiology, suggesting its possible influence on the incidence and prevalence of a variety of health outcomes.

The concept of social support may be further differentiated by types, such as emotional, instrumental, informational, appraisal, perceived, and enacted support, as well as social integration (Barrera, 1986; Heaney & Israel, 2002; House, 1981; Lakey & Drew, 1997). House (1981) elaborated on four of the social support behaviors of emotional, instrumental, informational, and appraisal support. Emotional support involves the provisions and expression of characteristics such as empathy, love, trust, and caring. Instrumental support refers to tangible aid and services to provide direct assistance to one in need. Informational support refers to the provision of advice,

suggestions, and information used to address a specific problem. Appraisal support involves the provision of information to facilitate self-evaluation, such as constructive feedback, affirmation, and social comparison (Heaney & Israel, 2002; House, 1981).

Barrera (1986) outlined the remaining social support behaviors of perceived and enacted support, as well as social integration. Perceived support, also known as functional support, refers to an implied subjective judgment that family and friends will provide quality assistance during a crisis if needed. Enacted support refers to the same types of assistance provisions but emphasizes the specific actions carried out as a result of the crisis. Social integration encompasses the spectrum of social relationships, such as marital status, siblings, and organizational affiliation (Lakey, 2008).

Social support differs from other functions of social relationships in three distinct ways. Social support differs from negative interactions as it is always intended to be helpful when provided by the sender. In addition, social support is consciously provided by the sender, as opposed to observed behavior of social influence. Finally, the provision of social support can influence the thoughts and behaviors of the receiver (Heaney & Israel, 2002).

Community Level. Conceptual frameworks employed at the community level of influence explore the dynamics of social systems and methods of community mobilization for action. Factors included within the community level of influence include institutional, community, and public policy factors (USDHHS, 2005). Institutional, or organizational, factors consist of rules, regulations, policies, and informal structures, which may constrain or promote healthy behaviors. Community factors consist of existing social networks and norms, or standards, which exist as formal or informal

among individuals, groups and organizations, geographical and political terms (McLeroy, et al., 1988; USDHHS, 2005). Public policy consists of local, state, and federal policies and laws that regulate or support healthy actions or practices for disease prevention, early detection, control, and management (USDHHS, 2005).

Community level strategies offer the flexibility for use among different settings, such as health care institutions, schools, worksites, community groups, and government organizations. Successful interventions consider the unique characteristics of a population prior to implementation. Community level conceptual frameworks and theories designed to promote health behavior change include community organizations and other participatory models, diffusion of innovations theory, and communications theory.

In summary, the ecological perspective is a multilevel approach to changing health behavior that recognizes the interdependence of factors across the intrapersonal, interpersonal, and community levels. The intrapersonal level focuses on changing individual behaviors and targets behavior characteristics such as knowledge, attitudes, skills, beliefs, motivation, and self-concept. The interpersonal level focuses on the environmental influences and interpersonal relationships on the individual. The community level explores the influences of the social systems and methods of community mobilization to action.

A variety of health behavior theories may be employed at each level of influence in an effort to change health behavior. The literature reflects use of the social cognitive theory (SCT) at the interpersonal level most often in childhood overweight and obesity prevention studies. Numerous childhood overweight and obesity behavior prediction and

intervention studies focused on use of the SCT construct of self-efficacy. Studies and interventions using SCT demonstrated significant changes in health outcomes and obesity prevention behaviors among children and adolescents.

Application of the Ecological Perspective to the Prevention of Childhood Overweight and Obesity

Addressing the childhood overweight and obesity epidemic through an ecological approach may be useful because many of the factors of the phenomenon contextually align with the levels of influence in this approach. Researchers suggest that the ecological perspective may be the most comprehensive approach to addressing the myriad of factors at multiple levels of influence impacting childhood obesity (Davidson & Birch, 2001; Klein et al., 2008). Researchers continue to explore the potential impact of the ecological perspective on the childhood overweight and obesity epidemic by designing frameworks specific to the epidemic. The following discussion will elaborate on the practical application of the ecological perspective in frameworks specific to predicting childhood overweight, food choices, and the etiology of childhood obesity.

Davidson and Birch (2001) developed an ecological model specifically assessing the predictors of childhood overweight. The model is organized around the child's risk factors and the key influences such as family and community characteristics. Child risk factors refer to the child's behavior associated with the development of overweight. Characteristics of the child interact with the child's risk and contextual factors to influence the development of overweight.

The model accounts for the interactions between the child's weight status and his or her personal characteristics and risk factors, parenting styles and family characteristics, and community, demographic, and societal characteristics. The model utilizes the

multilevel approach to expand on community-related environmental influences such as accessibility to recreational facilities, accessibility of convenience foods and restaurants, and crime rates.

Story et al., (2008) proposed an ecological framework depicting the multiple influences on what people eat in an effort to make sense of the public health concern of obesity and chronic disease. In the framework, Story et al. conceptualized the many food environments and conditions influencing individual food choices. Emphasizing the individual's current knowledge and environmental surroundings, the framework integrates constructs of SCT to help describe important factors at various levels of influence. The authors posited that the food and eating environments have a greater influence on the increasing obesity epidemic than individual factors (Story et al., 2008).

The framework consists of four broad levels of individual and environmental influences which include the specific levels of individual, social environment, physical environment, and macrolevel environment. The individual level comprises the core of the framework and identifies factors related to food choices and behaviors such as cognition, behaviors, demography, and biology (Story et al., 2008). The individual factors further impact food choices through characteristics such as motivation, self-efficacy, outcome expectations, and behavioral capacity.

The three separate levels of environmental influence surrounding the individual level of influence include the social, physical, and macrolevel environments. The social environment includes the interactions among family, friends, and peers, and the model depicts how those relationships impact food choices through characteristics such as role modeling, social support, and social norms. The physical environment refers to the

locations in which people eat, prepare, or obtain food such as home, school, work, restaurants, and supermarkets. Physical settings further impact food choices by characteristics such as access, availability, barriers, and opportunities. Macrolevel environment refers to larger societal influences such as food marketing, social norms, food production and distribution systems, agriculture policies, and economic price structures (Story et al., 2008). Figure 6 illustrates the multilevel approach and the corresponding influencing factors and characteristics.

Lytle (2009) proposed an ecological framework to study the etiology of childhood obesity through longitudinal research in the Identifying Determinants of Eating and Activity (IDEA) study. The framework suggests that obesity-related risk factors in youth, such as BMI and body composition, are impacted by diet, biology, and activity. The framework consists of four levels of influence factors that impact obesity risk among children which include biological, behavioral, contextual, and immutable factors.

In the conceptual model explaining the etiology of childhood obesity, all of the levels of influence act to impact obesity risk. Factors of influence at the biological level include factors such as metabolism, pubertal status, and blood chemistry. The next level of influence, behavioral factors, includes a wide range of characteristics such as those related to activity, diet, and other non-specific areas like sleep, substance abuse, and weight control. Factors of influence at the contextual level include characteristics such a physical environment, socio-environmental, and individual and psychosocial factors which exist at multiple levels. Factors of the last level of influence, immutable factors, include demographics, socioeconomic factors, family history, and structure and influence the context in which child eating occurs (Lytle, 2009).

This conceptual model was designed to guide the research and study design for the IDEA study. The study followed youth and their parent or caregiver for 24-months tracking various measures identified through the conceptual model. Some of the individual measures of the children and parents included 24-hour recalls, diet history questionnaires, physical activity records, accelerometers, and blood samples; environmental measures included home, school, and neighborhood surveys (Lytle, 2009).

Unfortunately, study challenges limited the analysis to recruitment results, sample characteristics, and study protocol, hence offering no conclusion to the existence of relationships among the multilevel factors of influence. Some of the challenges encountered during the study included the lack of valid and reliable measures to quantify obesogenity of home and school environments, participant sampling issues in relationship to school location, and no data reduction protocol of neighborhood measures (Lytle, 2009).

In a different longitudinal study, an ecological framework approach was used to examine potential predictors of transitioning from a healthful weight to an overweight category during adolescence (Klein et al., 2008). The study found statistically significant predictors of a transition to overweight in the individual domain with a focus on belief about being overweight and trying to lose weight (Klein et al., 2008). However, the study did not analyze the role of the physical environment, which provides opportunities for future research.

In summary, many researchers continue to use the ecological perspective to address the childhood overweight and obesity epidemic due to its complex and multifaceted nature (Lytle, 2009). Attempts to address the epidemic resulted in the

development of several frameworks, which guided the research of studies to examine the relationships of obesiogenic behaviors and environments. The results of the research found inconclusive results and revealed the further opportunities for investigation due to unforeseen challenges and limited availability of tools to adequately quantify study variables.

Measuring the Impact of Childhood Overweight and Obesity Prevention Efforts

Researchers in the field of public health and health education continue to conduct studies and develop interventions in an attempt to end the epidemic of childhood overweight and obesity. Both efforts require the use of specific assessment instruments and measures to draw meaningful conclusions and determine the impact of research efforts. Ecological measures, such as individual diet behaviors, perceived self-efficacy, and perceived social support, are frequently cited in the literature as the most commonly used measures in understanding health behaviors in obesity prevention research among youth. Although a variety of measures exist for the previously outlined models, none is without challenges. The following discussion will further examine ecological measures, such as are individual diet behaviors, perceived self-efficacy, and perceived social support, in obesity prevention research among youth.

Diet Behaviors

Published research studies assessing the diets of children date back to a 1882 study by Hasse who examined the diets of Swiss and Russian girls ages 2-11 years old (Rockett & Colditz, 1997). The increasing prevalence of overweight and obesity has led to the development of more effective tools to assess food intake patterns among this population. All dietary assessments present benefits and challenges, as no single dietary

assessment is applicable to all research and intervention efforts. Often assessments are modified to address specific research needs and require additional validation to ensure feasibility. Currently, researchers continue to use 24-hour recalls, food records, and food frequency questionnaires (FFQ) in diet research and validation studies. The following discussion will examine the most commonly used diet assessment measure in child and adolescent diet-related research, the food frequency questionnaires (FFQ), highlight its associated benefits and challenges, and examine its use in the research literature.

The food frequency questionnaire (FFQ) is a retrospective assessment of dietary intake patterns over a period of time. The FFQ differs from other assessments due to its focus on frequency of the usage of food rather than specific nutrients. FFQ's objectivity originates in population-based food selection and grouping of foods with similar nutrient. Guidelines for food selection include choosing foods consumed by the majority of the population. The FFQ may be completed by self-report or administered by a trained interviewer and exists in two different formats: semi-quantitative and quantitative.

Semi-quantitative FFQs solicit only frequency responses with a usual serving size listed with each item. Nutrient intakes may be calculated using this method by multiplying the mid-point of the frequency interval by the nutrients in the specified portion of the food. The use of semi-quantitative FFQs is appropriate when respondents generally consume similar amounts of items and may become problematic with variation in portion sizes among respondents. A quantitative FFQ accounts for population variations in portion size by allowing respondents to select portion sizes according to usual eating habits. Use of standardized portions can lead to misleading and inconsistent results (Johnson, Yon, & Hankin, 2008).

The FFQ presents both benefits and challenges. Common benefits outlined in the literature include easy standardization, beneficial when considered with usual food intake patterns, and providing an overall picture of intake (Johnson et al., 2008; Taylor et al., 2009). Additional benefits of the FFQ include cost effectiveness and low respondent burden (Noia & Contento, 2009).

Diet research studies cite multiple challenges associated with the FFQ including questionable reliability of records, required literacy for use, inconsistent meal pattern data, and requisite knowledge of portion sizes (Hammond, 2000). In addition, researchers question the assessment's precision in relationship to vague wording of items. Furthermore, researchers struggle to demonstrate validity of the FFQ in comparison to other food records and 24-hour recalls (Kristal et al., 2005).

As with other diet assessments, FFQ use among child and adolescent diet research is common, yielding mixed outcomes which dually confirm the tool's utility and limitations. Some researchers assert the appropriateness of the FFQ's use among adolescents as it yields higher use compliance and has demonstrated significant reliability correlations as well as higher correlations to corresponding food record assessment (Papadopoulou et al., 2008; Taylor et al., 2009; Yang, Martin, & Boushey, 2010). Vadiveloo, Zhu, and Quatromoni (2009) used semi-qualitative youth FFQ to conclude that dietary intake patterns of school aged children fell below MyPyramid guidelines, with inadequate intakes of fiber, fruits, and vegetables.

While many studies confirmed the strengths of the FFQ's use among child and adolescents, others have demonstrated significant opportunities for further research. Several validation studies (Ambrosini et al., 2009; Langevin et al., 2007; Noia &

Contento, 2009) have confirmed the assertion by Kristal and colleagues (2005) suggesting validity inadequacy in reference to comparison diet assessments. Although diet assessment methods have been studied extensively, none of the current methods is perfect (Domel, 1997), thus creating opportunities for future dietary assessment calibration research.

Nutrition-Related Self Efficacy

Nutrition-related self-efficacy may be a significant piece of the childhood overweight and obesity puzzle. Dieting, weight control, and preventive nutrition can be managed by nutrition self-efficacy beliefs. Research studies have found nutrition self-efficacy to operate best in conjunction with general lifestyle changes, such as physical activity and the provision of social support (Schwarzer & Luszczynska, 2008). The following discussion describes the format of nutrition-related self-efficacy measurement items and examines previous research effort that used nutrition-related self-efficacy to measure effects of obesity interventions.

Nutrition-related self-efficacy measures attempt to predict diet behavior through temptation and self-control statements about excessive food consumption or unhealthy food selection (Schwarzer & Luszczynska, 2008). The most important element of any self-efficacy measure is the rigorous theory-based item wording, with most utilizing the following structure: "I am certain that I can do xx, even if yy (barrier)" (Luszczynska & Schwarzer, 2005). In nutrition-related self-efficacy measures, items can include particular foods or can refer to self-regulatory efforts. Some instruments target very specific components of nutrition, such as fat intake in specific populations. Measures typically include a Likert scale response ranging from 1-10, often with smaller ranges.

Research posits nutrition-related self-efficacy to be a significant predictor of physical, social, and self-evaluative outcome expectancies regarding healthy nutrition (Anderson et al., 2000). Previous studies demonstrated the effect of dietary fiber self-efficacy on fat, fiber, fruit, and vegetable intake was mediated by physical outcome expectations, while nutrition goal setting was linked to higher dietary fiber self-efficacy and actual fiber intake (Schnoll & Zimmerman, 2001). In a similar study, fruit and vegetable self-efficacy predicted a 24-hour recall of actual fruit and vegetable intake and outcome expectancies in terms of fruit and vegetable intake, demonstrating an inverse relationship between the fruit and vegetable specific predictors and an unhealthy diet (Resnicow et al., 2000).

Perceived Social Support

The current literature demonstrates the influence of social networks on the risk of obesity (Christakis & Fowler, 2007; Strong, Parks, Anderson, Winett, & Davy, 2008). Involvement of key support networks, such as caregivers, teachers, and friends, is imperative in the prevention and successful treatment of childhood overweight and obesity. Research studies demonstrate favorable short and long term outcomes in childhood overweight and obesity prevention and intervention programs incorporating the construct of social support (Beckman, Hawley, & Bishop, 2006). The following discussion examines the literature utilizing the social support measures in childhood obesity prevention and interventions programs.

Perceived social support measures attempt to measure the extent to which an individual believes that their needs for support, information, and feedback are fulfilled by others (Procidano & Heller, 1983). Perceived social support measure items specifically

differentiate between perceived social support received from family and friends, arguing that friend relationships are often shorter in time span than family relationships (Procidano & Heller, 1983). Many measures of perceived social support incorporate two dimensions, perceived availability and adequacy of supportive ties (Barerra, 1986). Measures typically include a Likert scale response ranging from 1-10, often with smaller ranges.

The literature further substantiates the significance of parental social support in the prevention and treatment of childhood overweight and obesity. Parents play a significant role in diet behavior as children model diet behaviors and habits of the parents and are not responsible for food purchased for the home. Recent studies found strong and consistent associations between family support and child weight status, with parents of overweight children showing less instrumental support to engage in physical activity and control or set limits on the child's diet (Elder et al., 2010; Sallis, Prochaska, Taylor, Hill, & Geraci,1999). Recent reviews of four family-based obesity treatment programs concluded that programs incorporating family and child involvement yielded better outcomes than those targeted at the child alone (Epstein, Valoski, Wing, & McCurley, 1994; Faith, Saelens, Wilfley, & Allison, 2001).

A mixed method study sheds light on the significance of parental and peer social support in the childhood overweight and obesity epidemic. Focus group and interview responses of parents and caregivers reported limited physical activity or exercise due to embarrassment, lack of facilities or resources, and conflicting work schedules. Variation in activity level ranged from moderate to vigorous among parents and caregivers that reported being physically active, with reported activities such as walking, aerobics,

household chores, and working at community events (Thompson et al., 2001). Survey data from fourth grade students on home and peer social support indicates limited adult engagement in physical activity with children, but support of their children being active (Thompson et al., 2001).

A study of older adolescents found an association between social support and intake of specific foods. Social support for fiber, fruits, and vegetables was correlated with fiber intake, whole grain servings, and micronutrients found in fruits and vegetables (Strong et al., 2008). Furthermore, the study also found that peer social support encouraged physical activity and influenced food choices. With socializing among peers considered a higher priority than exercising or eating healthy, a part of the solution to the childhood overweight and obesity may lie within social support networks.

In summary, a variety of measure exists to measure ecological factors such as diet and perceived behaviors among youth. Diet behaviors are most commonly measured using food frequency questionnaires due to the low cost and low burden of administration. Perceived behavior measures for both self-efficacy and social support exist in multiple formats, often differentiating by specific types, and use Likert scales. Although widely used within youth research, all present unique challenges, which should be noted and accounted for during the research process.

Conclusion

The public health crisis of childhood overweight and obesity spans far beyond the borders of the United States, affecting the lives of more than 155 million children and adolescents worldwide. Recent studies reveal that in the United States, Hispanic boys and African-American girls show the highest prevalence rate of overweight and obesity.

Overweight and obesity adversely affect poor children and adolescents, as the group shows high rates of increase, although not among the highest in overall prevalence.

Although no universal standard exists to categorize childhood overweight and obesity, practitioners compute BMI values and chart the values on BMI-for age growth charts developed by the CDC. Researchers challenge the use of BMI for classification of childhood overweight and obesity as it does not take into account global differences in body shape and cultural norms. However, in the quest for developing an optimal classification system to measure body fatness, BMI effectively addresses the primary needs of being easy, reproducible, and fairly valid.

On the surface, addressing the problem appears achievable by following a proper diet and engaging in regular physical activity. However, the reality of carrying out those acts remains as a challenge related to the complex behavioral, genetic, and environmental factors that influence individual health behavior. Researchers are working tirelessly in an effort to address the public health crisis of childhood overweight and obesity. Although past researchers have made significant contributions to the existing body of knowledge, the need for different approaches to address the public health crisis still exists. The current body of knowledge would benefit from additional research in the areas of policy development and implementation and obesity prevention program implementation.

Researchers praise the ecological model in the literature for its multilevel approach in taking into account all challenges that embody the childhood overweight and obesity epidemics. However, the literature offers limited support of effective obesity prevention programs based upon the model. Continued implementation research in the

area will provide researchers additional information to develop or revise effective strategies in addressing childhood overweight and obesity.

Ecological measures assist researchers in examining relationships in an effort to arrest the international epidemic. Despite the body of research and tools that exist, no measure is without error, with each presenting unique benefits and challenges. Arresting the raising prevalence of childhood overweight and obesity will occur when researchers begin to apply the current research knowledge to identify specific variables of influence and develop interventions to affect change among identified variables.

The next chapter, Chapter 3, details the methodology of the current study, describing the study settings, sampling methods, participants, measures and instruments, and the procedures for data collection and analysis. Chapter 4, details the results of the data analyses and the manner in which the results of the analysis address the research questions. The final chapter, Chapter 5, discusses implications of the study, lessons learned, and opportunities for future research.

CHAPTER 3: METHODOLOGY

The purpose of this chapter is to detail the methodology for the study which tested a hypothesized model to examine associative paths of influence between ecological factors and child weight status of urban, African-American adolescent females. Specifically, the following research questions were addressed:

1. Does teacher social support have a positive, indirect associative influence on child weight through nutrition self-efficacy and diet behaviors?
2. Does friend social support have a positive, indirect associative influence on child weight through nutrition self-efficacy and diet behaviors?
3. Does teacher social support have a positive, indirect associative influence on child weight through diet behaviors?
4. Does friend social support have a positive, indirect associative influence on child weight through diet behaviors?

The research questions aim to elucidate indirect paths of association, which is often referred to as mediation. However, as noted in the definition, specific criteria and supporting analyses must be met and performed to suggest mediation. Although mediation analysis may be performed using SEM, it was not the focus of the present study and is acknowledged as an opportunity for further research.

The chapter includes a description of the research design, detailing the study settings, sampling methods, participants, measures and instruments, and the procedures for data collection and analysis.

Research Design

A quantitative, non-experimental, multivariate correlational research design was used to examine the influences of ecological factors on child weight in African American adolescent females. Structural equation modeling was used to model the complex relationships among the variables of interest. Use of this statistical analysis afforded a systematic and scientific method to address the research questions within the context of the study's theoretical framework (Creswell, 2005). The availability of previously validated measures for select ecological factors provided an opportunity to quantify findings of the literature by using survey research and SEM techniques.

Both survey research and SEM techniques offered advantages related to the nature of the study. As the most frequently used method in nutrition research (Millen & Vernarelli, 2008), self-report diet and behavior surveys provided a cost effective mechanism to gather data, with minimal burden to the respondent (Noia & Contento, 2009). SEM techniques allowed for hypothesized theoretical models to be developed and tested based upon the literature to explain variable affects using data gathered from a sample (Kline, 1998; Schumacker & Lomax, 2004). As a powerful extension of multiple regression analysis, SEM is useful for studying complex variable relationships. To this end, path analysis estimates as many regression equations as are needed to include all the proposed theoretical relationships among the variables in the explanation at the same time (Lleras, 2005, p.26).

The employed research design elucidated association in the data while avoiding judgments regarding causation. Figure 8 illustrates the logistical model underlying the study. The following discussion details the study setting, sampling techniques,

participants, instruments and measures, data collection procedures, and data analytic methods employed.

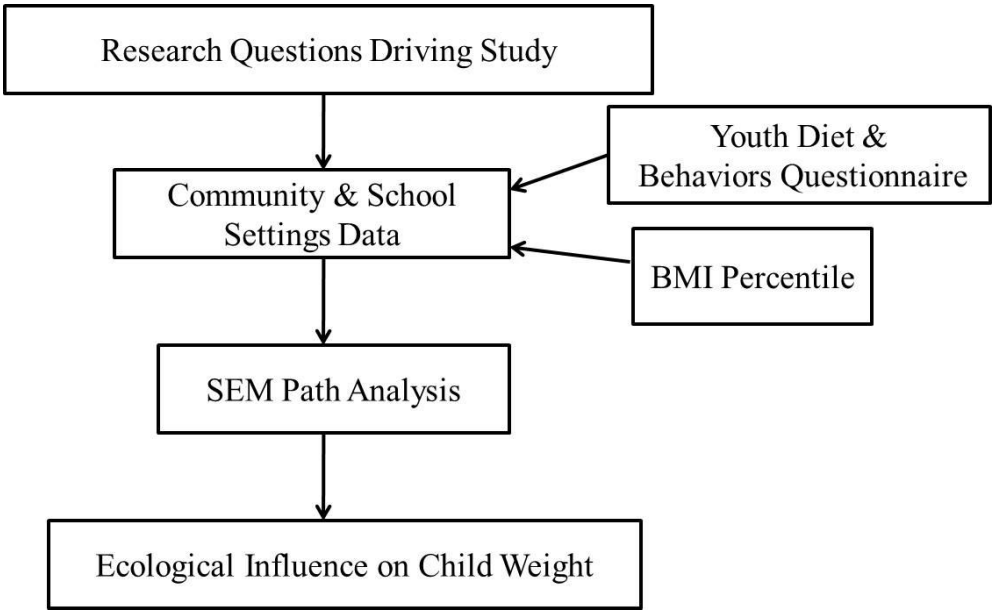

Figure 8 Logistical model.

Study Participants, Sample Size, Sampling Method and Study Settings

The participants, sampling, and study setting procedures varied slightly from the process outlined in the initial study proposal. Variations from the initial proposal included expansion of the recruitment population age range and study settings. Initially, the age range for study participants was 12-14 years old. The upper age range was increased to 17 years. In addition, the study setting was to take place in school-based after school programs located in a specific community with a history of health disparities among minority and poor populations. The study settings were expanded to include community events, summer school programs, and health and physical education classes during the regular school day located throughout the urban community. Variations were made in an effort to overcome recruitment challenges by increasing the pool of eligible

participants to achieve the minimum subject to variable ratio requirement for the statistical analysis. The following section outlines the details of the targeted study participants, minimum required sample size, sampling method, and study settings utilized for the dissertation study.

Study Participants.

Study participants included 214 females, aged 12-17 years old, who self-identified their race as African-American and ethnicity as non-Hispanic. This number included the total number of participants who returned signed parent informed consent and youth assent documents, giving permission to take part in the study. Of the 214 total participants who agreed to take part in the study, 31of the female students (in schools settings) were not available due to absence, and one student refused participation during the anthropometric data collection process. Thus, the final number of participants included in the data analysis for the study was 182.

Sample Size. Sample size generation for the present study was driven by the primary data analysis technique, structural equation modeling. Sample size generation for structural equation modeling (SEM) involves using a ratio of the number of subjects to the number of model parameters to be estimated (Hatcher, 1994; Kline, 1998). The total number of model parameters is the sum of the study model's path coefficients, variances, and covariance (Hatcher, 1994, p. 149). The literature suggests using ratios ranging from 5:1 to 20:1, with more realistic sample sizes originating from ratios of 10:1. The sample size for this study was based upon the study's initial model, which consisted of a total of 9 parameters and applied a 20:1 ratio, and called for a minimum number of

subjects needed as 180. The final study sample size (n = 182) slightly exceeded the required minimum sample size.

Sampling Method. Study participants were recruited using convenience sampling. Convenience sampling selects participants based on specified inclusion criteria of an intact and accessible group (Cotterell & McKenzie, 2005). This sampling method was the most feasible sampling procedure based upon the study settings and participant inclusion criteria. The study's participant inclusion criteria includes (a) race self-identification as African-American; (b) gender self-identification as female; and (c) age, at the time of consenting, within the range of 12-17 years. Both types of study settings, school and community-based, provided access to intact and accessible groups of potential participants and met all of the study's inclusion criteria.

Study Settings. The study took place in two different settings: school- and community-based locations. The following section describes each of the study settings and outlines the details of the recruitment tools and techniques used to encourage study participation.

School-Based (SB). Six schools in an urban north Florida city served as the study sites using one or more of the selection criteria of (a) a student racial composition of more than 50% African-American; (b) an active afterschool or summer school program; and/or (c) site-initiated participation interest. Of the selected SB settings, five schools were a part of the public system and one school was a private school. The following section details the selection process for SB study sites.

Two SB study sites were selected based upon student racial composition. All schools were sorted by type (elementary, middle, or high school) and African-American

student population percentage (at or above 50%). A total of 25 schools were identified as potential study sites. Schools excluded from the study included all elementary schools, middle and high schools with an African-American student population percentage of less than 50%, middle schools without afterschool programs, and alternative and special needs schools.

After receiving Institutional Review Board (IRB) approval from the University of North Florida (UNF) and the local public school district, principals at identified schools received a study recruitment packet, which included a cover letter (Appendix A) explaining the study and a blank On-Site Data Collection Approval Form (Appendix B). The cover letter provided instructions for principals to sign and return the form to the study investigator, which would grant permission for their school to participate in the study. Follow-up phone calls were made to principals if non-responsive after two weeks. A total of two schools agreed to serve as study settings for data collection using this inclusion criterion.

Three SB study sites were selected based upon active afterschool programs administered by a community based organization (CBO). Principals and program administrators of the schools with afterschool programs received a study recruitment packet with instructions to sign and return the form to the study investigator, which would grant permission for the programs and schools to take part in the study. Follow-up phone calls were made to principals and program administrators if non-responsive after two weeks to confirm participation interest.

One private school was selected as a SB study site after an administrator expressed interest in taking part in the study. The administrator received a recruitment

packet with instructions to sign and return the form to the study investigator, granting permission for the school to take part in the study.

SB study site participants were recruited using recruitment tools and techniques such as printed materials, presentations, daily announcements, and program incentives. Printed materials consisted of a script (Appendix C), brochures (Appendix D), and promotional flyers (Appendix E). Presentations were conducted with potential participants during health and physical education classes and during summer and after school programs. Daily announcements over the school's intercom system were made to remind potential participants to return consenting documents to designated school staff. Nutrition and fitness themed program incentives were offered to three of the six SB study sites in an effort to encourage study participation. The following sections detail each of the aforementioned recruitment tools and techniques and how they were used to recruit participants for the study.

Printed materials consisted of a script, brochures, and promotional flyers, and were used at all six SB study site. The script provided a brief summary of the study and was read aloud to potential participants during presentations. The script contained verbiage similar to the study consent and assent documents and provided an overview of the study, study duration, data analysis and use, any potential risks, information about the incentive program (for designated schools), and contact information should participants have questions or concerns regarding the study or their rights as a research participant.

The brochures were designed as a bulleted summary of the study's consent/assent documents. The brochure was written at a seventh grade reading level and summarized the study procedures, the incentive program (for designated school study sites), and

provided contact information should participants have questions or concerns regarding the study or their rights as a research participant. Caregivers received brochures along with consent/assent documents and the promotional flyer.

The promotional flyer was designed for both potential participants and their caregivers and summarized the study procedures and information on the data collection process and the incentive program (for designated schools). In addition, the flyer contained information about the date, time, and location of data collection or incentive program activities for their school. Potential participants received the flyer during presentations, along with a brochure and consent/assent documents to discuss with their caregivers. The verbiage for the flyer was also read during daily announcements to remind potential participants to return signed consent/assent documents to designated school, afterschool, or summer school staff members prior to data collection or the incentive program commencement.

Presentations were conducted with potential participants to provide details about the study and the opportunity to clarify study-related questions and concerns. During presentations, the script was read aloud to potential participants to initiate discussion and answer questions about the study. After the discussion, the potential participants received the consent/assent documents, a brochure, and promotional flyer to review and discuss with their caregiver. During the presentation, potential participants also received instructions about how to return signed consent/assent documents to designated school, afterschool, or summer school staff members prior to data collection or the incentive program commencement.

Daily announcements were also used to encourage study participation. The verbiage from the recruitment flyer was read aloud over the school's intercom with the morning and afternoon announcements. The announcements served as reminders to potential participants to return the consent documents before the scheduled data collection or incentive program (at designated schools).

A health and fitness-themed incentive program was offered to participants at Eugene Butler Middle School, Southside Middle School, and Raines High School to encourage study participation. The incentive program offered the opportunity to take part in a "5-2-1-0" Zumba Party held at the aforementioned SB study sites. During the "5-2-1-0" Zumba Party, participants learned about the "5-2-1-0" social marketing campaign, engaged in Zumba fitness, and received healthy snacks, food samples, and information to take home. "5-2-1-0" is a social marketing campaign developed by Nemours Hospital that encourages eating "5" or more servings of fruits and vegetables, engaging in no more than "2" hours of screen time, getting at least "1" hour of physical activity, and drinking "0" sodas and sugary drinks daily.

The "5-2-1-0" Zumba parties were conducted in partnership with local business and community organizations. A local radio station provided music, prizes, and entertainment for participants during each of the Zumba parties. It should be noted that prizes provided by the radio station were provided as a part of the organization's normal promotional procedures at community events and were not advertised during the recruitment process. A local fitness company provided a 45-minute Zumba fitness session during each party. A community feeding program provided healthy food samples, snacks, and information on preparing healthy meals for families to participants to take

home to caregivers. In addition, the feeding program honored a caregiver of one of the study participants for that caregiver's efforts to improve the health of the family and community. The parent honoree was selected based upon recommendations of the study school's principal and/or afterschool program administrator. The local hospital provided bottled water and a back pack for participants.

Community-Based (CB). Two community events served as community-based (CB) study sites using the selection criteria of (a) historically high attendance of study target population (African-American adolescent females); and (b) simplified parental consenting opportunity. The following section details the selection process for CB study sites.

Both CB study sites were selected based upon their historically high attendance of study target population (African-American adolescent females) and simplified parental consenting opportunity. One of the events was an over-night mother-daughter workshop conducted annually for the last four years, with no less than 100 participants, and over 95% of the participants self-identifying as Black or African-American. Caregivers are present during the event and could be asked to provide on-site consent.

The next event was a weekly bible study class for a fairly large church with a predominately African-American (approximately 98%) congregation. The church conducts weekly bible study classes at its church facilities for both adult and young members. In addition to the ideal racial composition, the setting is optimal for obtaining on-site consent as caregivers must sign youth in weekly to participate in bible study classes.

Organizational administrators of the selected CB study sites received a study recruitment packet with instructions to sign and return the form to the study investigator. Follow-up phone calls were made to non-responsive administrators after two weeks to confirm participation interest.

CB study site participants were recruited using presentations and printed materials. Brief presentations were made to potential participants and their caregivers at the time of event registration or program check. The study's details were summarized for each potential participant and their caregiver. During the presentation, both received a study brochure, consent/assent documents to sign, and a copy of the study flyer. Potential participants and their caregivers were instructed to review the information and to complete, sign, and immediately return the consent documents to the study investigator, if they did not have questions. The study investigator was available to answer the questions and address concerns of potential participants and caregivers.

The printed materials used to promote recruitment for CB study sites included brochures and promotional flyers. The program incentive was not offered to CB study site participants.

Study Variables and Measures

Diet behavior, nutrition self-efficacy, social support, and child weight status were the variables examined in an effort to elucidate associative paths of influence for the study. Diet behavior, nutrition self-efficacy, and teacher and friend social support were examined as independent variables, and child weight status as the dependent variable. Selected study variables mirrored key components of an adaptation of an ecological model developed by Story et al. (2008), which illustrates the influences of food and

eating environments on weight status. The adapted model served as the framework for this study. Details on the full and adaptive models were discussed in Chapter 2. Diet behavior and nutrition self-efficacy were modeled in the individual-level of the adaptive model, while social support was modeled in the social environmental level. Child weight status served as the outcome variable in the model.

Independent Variables. The following sections details each of the independent variables and the measures used to gather study data.

***Diet Behaviors*.** Youth diet behaviors were measured using the Coordinates Approach to Child Health Evaluation Measure healthy items nutrition behavior scale (CATCH'EM 2) developed and subjected to psychometric analysis by the University of Texas-Houston School of Public Health (Hoelscher et al., 2003; Penkilo et al., 2008; Thiagarajah et al., 2008). The nine-item scale asks participants about the type and number of times specific foods were eaten the previous day. Participants are asked to select the answer that best describes how many times they ate a specified food on the previous day, with responses ranging from none to three or more times. Internal consistency reliability of data gathered previously using this scale indicated reliability to be at a reasonable level ($\alpha = 0.63$) for a brief scale (Hoelscher, 2010).

***Self-Efficacy*.** Self-efficacy was measured using the Coordinates Approach to Child Health Evaluation Measure nutrition self-efficacy scale (CATCH'EM 5) developed and subjected to psychometric analysis by the University of Texas-Houston School of Public Health (Hoelscher et al., 2003; Penkilo et al., 2008; Thiagarajah et al., 2008). The 15-item scale asks participants questions on their ability to select and eat different types of food, using a 3-point Likert scale from 1 (*not sure*) to 3 (*very sure*). Internal

consistency reliability of data gathered previously using this scale indicated reliability to be at a reasonable level ($\alpha = 0.82$) for a brief scale (Hoelscher, 2010).

Social Supports. Social support was measured using the Coordinates Approach to Child Health Evaluation Measure teacher and friend sub-scales of perceived nutrition social support scale (CATCH'EM 7) developed and subjected to psychometric analysis by the University of Texas-Houston School of Public Health (Hoelscher et al., 2003; Penkilo et al., 2008; Thiagarajah et al., 2008). The full social support scale included 15 items that were further designated into 3 sub-scales for parent, teacher, and friend social support. Each sub-scale contained five-item scales that ask participants what they believe caregivers, teachers and friends wanted them to eat, using a 3-point Likert scale from 1 (*never or almost never*) to 3 (*always or almost always*) on each respective sub-scale. The internal consistency reliability coefficients of data previously gathered using the sub-scales were acceptable, with Cronbach α values at 0.85 for teacher social support and 0.84 for friend social support (Hoelscher, 2010). Although the Cronbach α values for the parent social support scales were acceptable at 0.71(Hoelscher, 2010), the measure was not included in the present study due to its poor α values for the data from the present study's participants.

Dependent Variables-Child Weight Status. Child weight status was measured using the CDC BMI-for-age growth charts for girls to obtain a percentile ranking. BMI-for-age percentiles were calculated using height, weight, and age data to identify child weight classification. First, BMI was calculated using anthropometric data (height and weight) using the following formula: weight (lb) / [height (in)]^2 x 703 (CDC, 2009).

BMI values were plotted on gender-specific CDC growth charts to determine BMI-for-age percentile and child weight status classification.

Study data were gathered using the Youth Diet and Behaviors Questionnaire (YDBQ). The YDBQ (Appendix F) is a 39-item questionnaire that combines diet behavior, nutrition self-efficacy, and nutrition social support scales previously found to be valid and reliable (Hoelscher et al., 2003; Penkilo et al., 2008; Thiagarajah et al., 2008). Reliability and validity refer to the consistent and truthful measure of study variables (Creswell, 2005; Hatcher, 1994). Scales were selected based upon their favorable internal consistency reliability coefficients, which should be at least 0.70 (Cronbach, 1990). The answer sheet for the questionnaire included a section to collect anthropometric data necessary to calculate the BMI-for-age percentiles, such as height, weight, and age. Table 4 overviews the variables examined in the present study.

Table 4

Study Variables Overview: Variables by Type, Measure, Scoring, and Reliability Coefficients

Variable	Variable Type	Measure	Scoring & Reliability
Diet Behaviors	Independent	CATCH'EM 2-Healthy Items Full Scale	9-item scale on food intake behavior. Scale ranges from 0-3; Internal consistency reliability ($\alpha = 0.63$).
Nutrition Self-Efficacy	Independent	CATCH'EM 5-Nutrition Self Efficacy Full Scale	15-item scale on perceived nutrition self efficacy. 3-point Likert scale; Internal consistency reliability ($\alpha = 0.82$).
Teacher Social Support	Independent	CATCH'EM 7-Perceived Social Support Teacher Sub-Scale	5-item scale on perceived teacher social support. 3-point Likert scale; Internal consistency reliability ($\alpha = 0.74$).
Friends Social Support	Independent	CATCH'EM 7-Perceived Social Friends Sub-Scale	15-item scale on perceived friend social support. 3-point Likert scale; Internal consistency reliability ($\alpha = 0.85$)
Child Weight Status	Dependent	2000 CDC Growth Charts for the United States	BMI plotted using the CDC BMI-for-age growth charts to determine a percentile ranking in one of four weight status categories (underweight, healthy weight, overweight, and obese).

Data Collection

Data collection took place between March 2011 and February 2012, in both SB and CB study settings, and involved administering the survey questionnaire, collecting

anthropometrics data, and distributing the toolkit for students to take home to caregivers. Undergraduate dietetics student interns from the Brooks College of Health at University of North Florida (UNF) served as data collection assistants and were required to complete the online Collaborative Institutional Training Initiative (CITI) course and a one-hour training session on questionnaire administration and anthropometric data collection prior to collecting data.

Site visits were conducted with designated school or organizational staff to determine feasibility and logistics of data collection in the SB or CB setting. The study designated school or organizational staff member was contacted one to two days before scheduled data collection to confirm the previously scheduled data collection appointment, logistics, and determine the number of returned informed consents. Receipt of signed consent documents was required prior to participation in incentive programs. Data collection occurred after the incentive program in participating sites. Signed consent documents remained in the possession of designated school or organizational staff until data collection.

On scheduled data collection dates, a designated organization or school staff member gathered study participants who had returned signed parent consent and student assent documents into a private area. A data collection assistant read the recruitment script aloud to study participants and offered the opportunity for participants to withdraw from the study. The YDBQ booklet, answer sheet, and pencil were distributed, and oral instructions on completing the questionnaire were provided to each study participant. Each study participant returned the questionnaire booklet and completed answer sheet to the data collection assistant.

After completing the questionnaire, study participants were lead to another private area (away from the main group) to facilitate anthropometric data collection. Once in the private area, the participant gave the data collection assistant the completed answer sheet to fill in the height and weight data. The data collection assistant instructed the participant to remove sock and shoes before assessing height and weight. Height was assessed and recorded in centimeters (cm) using a medical grade portable stadiometer; weight was assessed and recorded using a medical grade scale with remote display screen and in kilograms (kg). The data collection assistant recorded the height and weight information on their individual answer sheet.

Using the height and weight information recorded on the answer sheet, BMI and BMI percentile were calculated and recorded in the obesity awareness toolkit using the iPad application STAT GrowthCharts Lite. The application calculates height, weight, BMI and BMI percentile using the 2000 CDC Growth Charts data (by sex) in either US or metric units. The obesity awareness toolkit included information on the study, the participant's risk for overweight or obesity, and helpful information on ways to improve their diets and increase physical activity. Sealed toolkits were given to participants, and each was advised to take the toolkits home to caregivers .

Data Analysis

Data were analyzed using statistical software programs SPSS 17® (SPSS, 2007) and Mplus5.2® (Muthén & Muthén, 2007). SPSS 17® was used to generate descriptive statistics, frequencies, and scale reliability coefficients. Structural equation analyses were conducted using Mplus5.2® to generate measurement and structural models for path

analysis. The following discussion will detail the processes used to conduct the descriptive and structural equation analyses of the study data.

Descriptive Analyses. Descriptive analyses were conducted on study data using SPSS 17® to characterize the study participants based upon their age, study setting, and weight status. Specifically, frequencies, central tendency measures (i.e., means, medians, and mode), standard deviations, and distribution shape statistics were examined. A scale reliability analysis was conducted to assess the internal consistency reliability of the sample data when used with the identified measures. The alpha reliability analysis serves as primary estimate for internal consistency reliability (Carmines & Zeller, 1979), with acceptable values at and above 0.70 (Cronbach, 1990). Cronbach α values for each of the study's measures (diet behaviors, nutrition self-efficacy, and the social supports sub-scales) were examined.

Structural Equation Analyses. Structure equation modeling (SEM) techniques were performed using Mplus5.2® to examine associative paths of influence between diet behaviors, nutrition self-efficacy, and teacher and friend social supports on child weight status. The scale reliability analysis guided the structural equation analyses by ensuring adequate psychometric properties of the study's sample data. Scores generated by selected study scales that yielded *poor* internal consistency reliability coefficients required the development of a measurement model to form a latent variable, while those scores generated by selected study scales that yielded *acceptable* internal consistency reliability coefficients were incorporated in the structural model as manifest variables. The analyses proceeded through two phases. First, measurement models were developed to control for the observed error variance in the diet behaviors and nutrition self-efficacy

variables. Path analyses was used to form measurement models for diet behaviors and nutrition self-efficacy using their respective scale items, and were subsequently used in the structural model as latent variables. The final phase of the analyses involved developing a structural model testing the latent (diet behaviors and nutrition self-efficacy) and manifest (teacher and friend social support) variables' associative paths of influence on child weight status. Both phases of the analyses involved the development of structural equation models and followed a sequential process that included model specification, identification, estimation, testing, and modification (Schumacker & Lomax, 2004). The following discussion will outline the steps for model development and analysis for each phase of the structural equation analyses.

Phase1: Measurement Model Development. Measurement models were developed to form latent variables for use in the structural model to control for measurement error associated with the study's scales and sub-scales (Meyers, Gamst, & Gaurino, 2006). Using measurement models to form latent variables overcomes the challenge of measurement error by excluding the unwanted error of the indicator manifest variables from the definition of the latent variable and modeling the unwanted residual error separately from the latent variable (Hatcher, 1994). As a result, the scores on latent variables are perfectly reliable.

Measurement models were developed for diet behaviors and nutrition self-efficacy study scales due to their demonstrated poor internal consistency reliability and poor structural model fit. Scores on the diet behavior scale and parent social support sub-scale yielded unacceptable Cronbach α values ($\alpha = 0.505$ and 0.520, respectively) during the descriptive analysis for this study. A measurement model was also developed for the

parent social support sub-scale but later excluded as its exclusion improved the fit of the structural model. Although scores on the nutrition self-efficacy scale had an acceptable Cronbach α value, this variable decreased the fit of the structural model as a manifest variable.

The measurement models were specified using the 9 items of the diet behavior scale and 15 items from the nutrition self-efficacy scale (Hoelscher et. al., 2003). Model specification dually involved the development of a theoretical model based upon recommendations from the research literature while determining all of the model's relevant relationships and parameters (Kline, 1998; Schumacker & Lomax, 2004).

Parameter estimates were identified for both measurement models (Hatcher, 1994; Schumacker & Lomax, 2004). Parameters relevant to the diet behaviors measurement model included a latent variable, nine manifest variables, and nine error variances. The nine items from the diet behaviors measure served as manifest indicator variables to form the latent variable of diet. Each manifest variable had an associated error variance. Parameters relevant to the nutrition self-efficacy measurement model included a latent variable, 15 manifest variables, and 15 error variances. The 15 items from the nutrition self-efficacy measure served as the manifest indicator variables to form the latent variable nutrition self-efficacy.

Order conditioning was used to overidentify measurement models and ensure models included more equations than unknowns. Schumacker and Lomax (2004) suggested using the order condition to establish model identification, which implies that the number of model parameters to be estimated must be *less than or equal* to the model's number of distinct values, or data points (p.64). The number of model

parameters to be estimated is equal to the sum of the path coefficients, variances, and covariances to be estimated (Hatcher, 1994). Distinct values are calculated using the following equation:

$$\text{Distinct Value} = (p\,(p+1))/2$$

where p is equal to the number of manifest variables (either exogenous or endogenous) in a model. The distinct value of both measurement models exceeded the model parameters, thus meeting the order condition for model identification. The diet behaviors measurement model yielded a distinct value of 45 with 13 parameters, while the nutrition self-efficacy measurement model yielded a distinct value of 120 with 17 parameters.

Figure 9 illustrates the general measurement models developed to form the latent variable for diet behaviors while Figure 10 illustrates the general measurement model to form the latent variable for nutrition self-efficacy. Note that the latent variables for the measurement models are represented by ovals: the diet behaviors latent variable with "diet" and nutrition self-efficacy with "NSE." Manifest indicator variables for each of nine items from the diet behavior and 15 nutrition self-efficacy scales are represented by squares with causal arrows pointing away from their associated latent variable, with each item represented by the letter "Q" and corresponding with the item number on the study instrument. Associated error variance for each manifest variable was represented by a circle, with the letter "E" and number corresponding to the manifest indicator variable, and a straight, single-headed arrow pointing to the manifest indicator variable (Hatcher, 1994; Schumacker & Lomax, 2004).

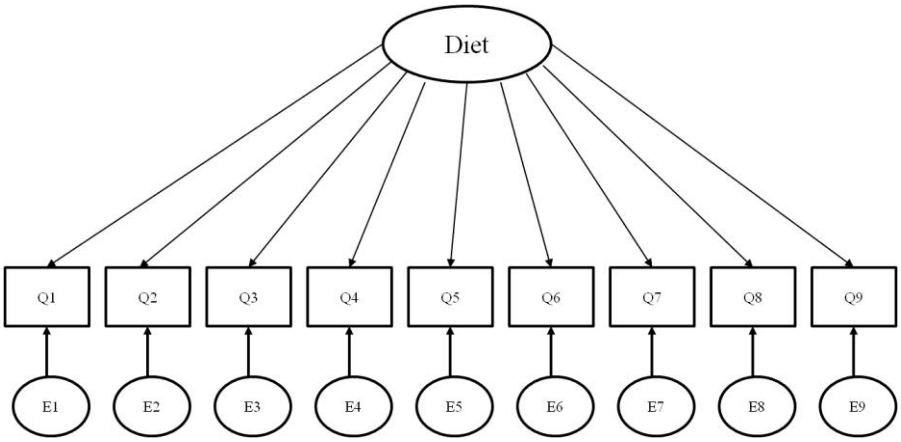

Figure 9. General measurement model developed to form the diet behaviors latent variable.

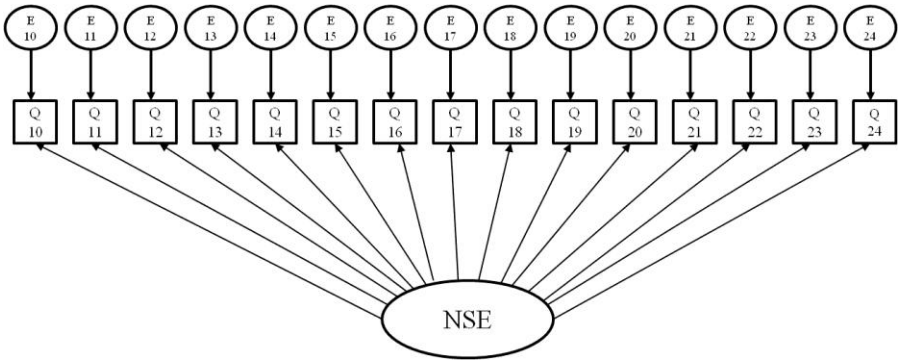

Figure 10. General measurement model developed to form the nutrition self-efficacy latent variable.

The maximum likelihood (ML) estimation method was used to estimate model parameters as close as possible to the study data for both measurement models (Schumacker & Lomax, 2004). A perfect model fit to the data is demonstrated when the elements of the parameter values matrix for the study data model minus the elements of the parameter values matrix for the estimated model equal zero (Schumacker & Lomax, 2004). The ML produces a variety of fit indices while simultaneously calculating all model parameters (Kline, 1998). Furthermore, use of the method is well suited for more complex models, such as nonrecursive, measurement, or hybrid models (Kline, 1998).

Five goodness-of-fit indices were examined to assess the fit between the measurement models and the study data: the chi-square statistic, comparative fit index (CFI), Tucker-Lewis fit index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMSR). The chi-square statistic provides a statistical test of the null hypothesis that the model fits the data (Hatcher, 1994). Small chi-square values with a statistically non-significant *p* value relative to degrees of freedom indicate a good model fit (Hu & Bentler, 1995). Both the CFI and TLI describe the improvement in fit of the tested model compared with that of a null model assuming zero covariance among the variables while providing an accurate fit assessment regardless of sample size (Kline, 1998). Values for the two indices range between 0 and 1, with values at or above 0.9 indicating a good fit (Hatcher, 1994). The RMSEA is a parsimony-adjusted index that measures the discrepancy between the actual and hypothesized models per degree of freedom (Hu & Bentler, 1995). RMSEA values less than 0.05 indicate a good fit, values 0.05 and 0.08 indicate a reasonable fit, while values at or greater than 0.10 indicate a poor fit (Kline, 1998) The SRMR is a standardized summary of the average covariance residuals, with values of 0.10 or less indicating a favorable fit (Kline, 1998).

Modifications were made to the measurement models to improve the fit. The model modification index (M.I.) and expected parameter change index (E.P.C) were used to improve model fit. The M.I. value is provided for each parameter that is fixed or held equal to another parameter and estimates the expected decrease in the chi-square statistic if the parameter in question is freely estimated (Muthén & Muthén, 1998). The E.P.C. value provides the expected parameter change index for each parameter that is fixed or

held equal to another parameter and provides the expected value of the parameter in question if freely estimated (Muthén & Muthén, 1998). Four additional covariance paths were added to the diet behaviors measurement model based upon the M.I. and E.P.C. values: three additional paths were added to correlate errors with Q6 (Q2, Q1, and Q4) and one path to correlate errors with Q7 (Q5). Two additional covariance paths were added to nutrition self-efficacy measurement model based upon the M.I. and E.P.C. values for Q24 errors (with Q17) and Q13 errors (with Q23).

Phase2: Structural Model Development. The next phase of the analyses involved the development and analysis of a hypothesized structural model that included latent (diet behaviors and nutrition self-efficacy) and manifest variables (teacher and friend social support) to estimate associative paths of influence to child weight status. The hypothesized structural model was specified based on an adaptation of an ecological model developed by Story et al. (2008), which illustrates the influences of food and eating environments on weight status and served as the contextual framework for the present study. The model specifications included the latent variables created for diet behaviors and nutrition self-efficacy and the manifest variables teacher and friend social support. Four paths of influence were hypothesized and tested to answer the study's research questions and associated hypotheses, which were derived from empirical evidence and suggest direct and indirect relationships among diet behavior, nutrition self-efficacy, teacher social support, friend social support, and child weight status (Anderson et al., 2000; Jeffery et al., 2006; Moore & Roux, 2006; Stafford et al., 2008; Zenk et al., 2005). The first hypothesis posited that teacher social support has a positive, indirect influence on child weight through nutrition self-efficacy, and in turn through diet

behaviors, whereas the second hypothesis affirms the same but for friend social support. The third hypothesis posited that teacher social support has a positive, indirect associative influence on child weight through diet behaviors, while the fourth affirms the same but for friend social support.

Direct path effects were estimated using the maximum likelihood (ML) estimation method, whereas total indirect effects were calculated as the sum of the path coefficients between specific independent variables and intermediate variables and the intermediate variables and the outcome variable (Sobel, 1987). Model fit was assessed using the chi-square statistic, CFI, TLI, RMSEA, and SRMR. Modifications were made to the structural model based upon M.I. and E.P.C. values. The manifest variable of parent social support was excluded from the structural model due to its poor Cronbach alpha values. In addition, a general measurement model was created to form a latent variable for nutrition self-efficacy to increase the fit of the hypothesized structural model. Figure 11 illustrates the resulting final structural model.

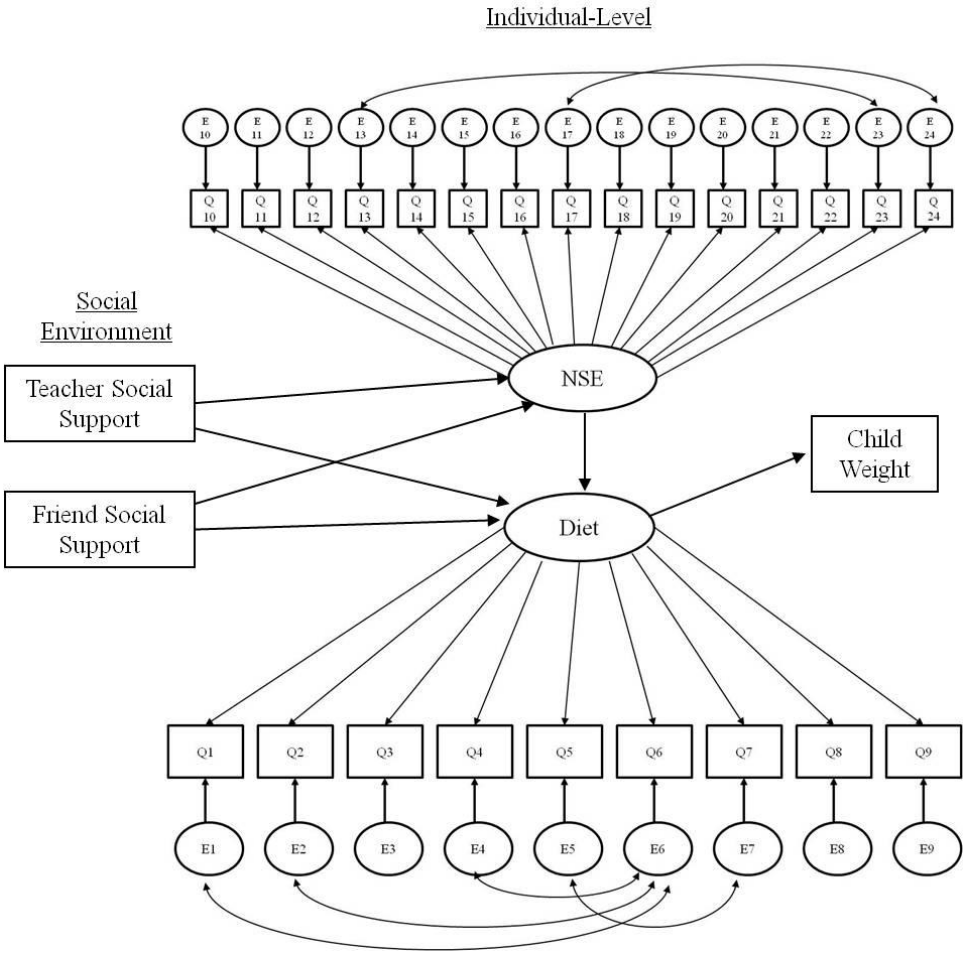

Figure 11. Hypothsized structural model including a latent and manifest variables.

Ethical Considerations

Ethical considerations for the participants were addressed by protocol approval by multiple human subject institutional review boards, required parental and participant consent, anonymous data collection, and continuous data monitoring and security. The study received approval from the University of North Florida's Institutional Review Board (IRB) (Appendix I) on March 10, 2011, and the Duval County Public School's (DCPS) Office of Research, Assessment, and Evaluation (Appendix J) on March 11, 2011, to conduct research during the 2010-2011 academic year. Subsequent amendments to the UNF IRB were approved to add and/or remove data collection assistants and study

sites on April 15, 2011, June 1, 2011, June 23, 2011, and August 26, 2011. A research approval extension was granted by the DCPS Office of Research, Assessment, and Evaluation on July 21, 2011, to conduct research during the 2011-2012 academic year.

Parent consent and youth assent forms (Appendix G and H) were required for participation in the study. Both consent and assent forms provided an overview of the study, with information on the perceived risk, benefits, compensation, and contact information for clarification on the study or rights as a research participant.

Data were collected and maintained anonymously and contained no identifiers to link answers provided back to any individual participant. Height and weight data were measured in a private area and recorded in centimeters and kilograms, respectively, to ensure privacy. Completed answer sheets were kept in a locked storage box that was only accessible by the research team, until data analysis. After data analysis, hard copy questionnaire answer sheets were scanned and stored on an encrypted, password protected server as pdf files and the answer sheets were destroyed after scanning. Electronic copies were properly disposed of after data analyses.

Conclusion

In summary, the present study sought to shed light on the childhood overweight and obesity epidemic by employing a quantitative, non-experimental, multivariate correlational research design to examine ecological influences on child weight in urban African-American adolescent females. Measurement models were used to form latent variables for diet behaviors and nutrition self-efficacy to control for measurement error of the scales. A structural model was developed that included the latent and the manifest variables. A path analysis was conducted to estimate model parameters and examine

associative paths of influence among ecological factors on child weight status. Chapter 4 details the results of the data analyses and the manner in which the results of the analysis address the research questions. The final chapter, Chapter 5, discusses implications of the study, lessons learned, and opportunities for future research.

CHAPTER 4: RESULTS

This chapter details the results of the data analyses for the study. The study tested a hypothesized structural model examining associative paths of influence between ecological factors on child weight in African-American adolescent females in Jacksonville, Florida. The following discussion details the results of the descriptive and structural equation analyses. In addition, the structural analyses section outlines the manner in which each of the study's research questions and associated hypotheses were addressed.

Descriptive Analyses

SPSS 17® (SPSS, 2007) was used to compute descriptive statistics, frequencies and scale reliability estimates. Descriptive statistics and frequencies were generated on the study setting, age, and child weight status to describe the study population. A scale reliability analysis was conducted to ensure adequate internal consistency reliability of the study data when used with selected measures. The following sections detail the findings for each of the previously mentioned analyses.

Study Setting

Data collection for the study took place in three different types of settings: school-based program, school-based programs with an incentive program, and community-based programs. Nearly two-thirds (64%) of participants took part in the study at school-based

study sites offering an incentive program, while the balance took part in community- or school-based programs not offering an incentive program (12% and 23%, respectively).

Table 5

Age, Study Setting, and Weight Status Characteristics of Study Participants (N = 182)

Characteristic	*n*	%
Age		
12	55	30.2
13	31	17.0
14	32	17.6
15	19	10.4
16	17	9.3
17	28	15.4
Study Setting		
Community-based	42	23.1
School-based	23	12.6
School-based with Incentive Program	117	64.3
Weight Status		
Underweight	0	0
Healthy Weight	77	42.3
Overweight	45	24.7
Obese	60	33.0

Note. Underweight = less than the 5th percentile; Healthy Weight = 5th percentile – less than 85th percentile; Overweight = 85th – 95th percentile; Obese = 95th Percentile or greater

Age

The study sample consisted of 182 African-American female adolescents, with ages ranging from 12 to 17 years old. More than half (65%) of the participants were in middle or early high school (9th grade), with a median age of 14. The highest participation was among 12 year olds, comprising slightly under one-third (30.8%) of the of participant population. Figure 12 illustrates the age frequency distribution among participants, which is negatively skewed towards participants lower in age. However,

participation among 17 year-olds was slightly higher than other high school aged participants at 15%. Table 5 outlines the age characteristics of study participants while Table 6 details the descriptive statistics for age of study participants.

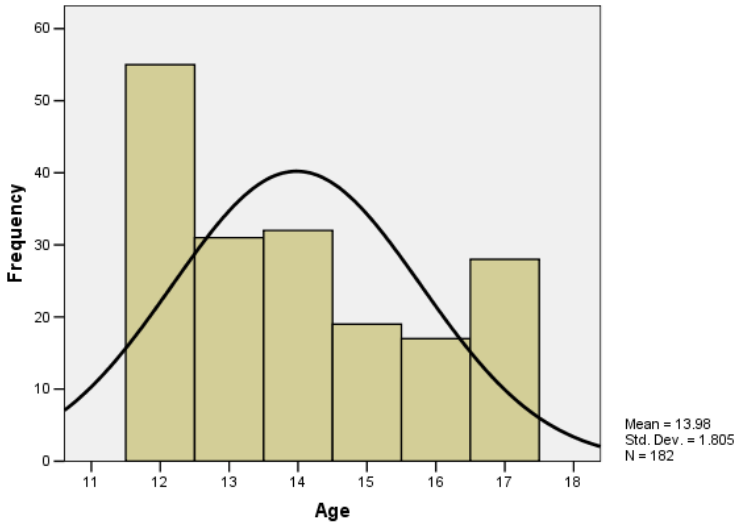

Figure 12. Age of study participant frequency distribution.

Table 6

Descriptive Age and Weight Status Characteristics of Study Participants

	Characteristic	
	Age	Weight Status
M	13.98	82.04
SD	1.81	18.98
Median	14.00	89.35
Mode	12.00	98.90
Var	3.26	360.41
Min	12.00	11.70
Max	17.00	99.60
Range	5.00	87.90
Skewness	0.46	-1.48
Kurtosis	-1.16	2.00

Note. Weight status measured in BMI percentile with weight classification as follows: Underweight = less than the 5th percentile; Healthy Weigh t=5th percentile – less than 85th percentile; Overweight = 85th – 95th percentile; Obese=95th Percentile or greater

Child Weight Status

Overall, most of the participants had an unhealthy weight status based upon BMI-for-age frequency distributions and central tendency measures. More than half of the study participants (57.7%) were classified as either overweight or obese, with more than a third (33%) classified as obese. Figure 13 illustrates the BMI-for-age percentiles frequency distribution, which ranged from 11.7 to 99.6 and reflects a negatively skewed distribution of percentile frequencies towards the higher weight classification, such as overweight and obese weight (kurtosis = 2.002, Skewness = -1.481). High prevalence of overweight and obesity among participants was further confirmed by a median weight status exceeding overweight designation at 89.4 and a mode of 98.9, designations at the upper limits of obesity. Table 5 outlines child weight status characteristics.

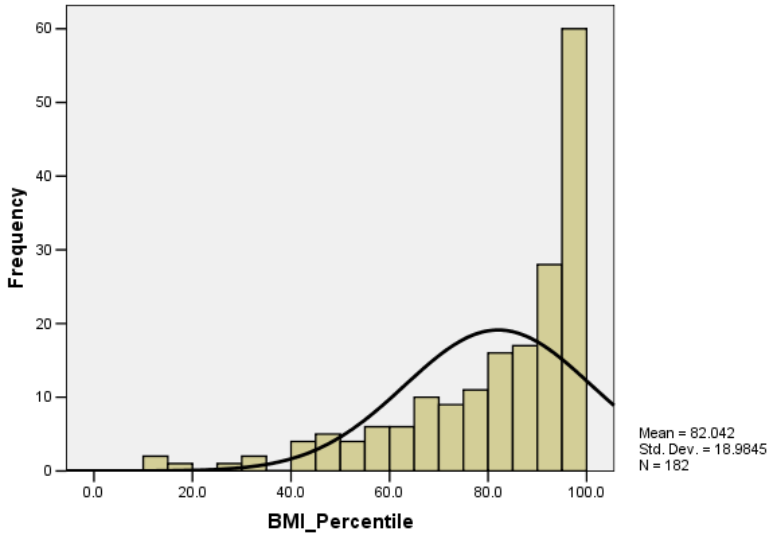

Figure 13. Participant weight status frequency distribution.

Missing Data. Acknowledgement and treatment of missing data are addressed. Missing data were identified and assumed to occur as a random over-sight by participants. Of the 182 completed questionnaires, 19 questionnaires contained missing data, with a total of 26 items not answered. Missing data was treated with item mean

imputation due to the limited number of missing data points. It should be noted that use of this treatment method is not recommended for greater quantities of missing data as it can cause estimation bias (Allison, 2009). Table 7 details missing data by questionnaire item number.

Table 7

Missing Data Analysis

Questionnaire Item	*n*	missing
Q2	181	1
Q6	181	1
Q7	181	1
Q10	181	1
Q13	180	2
Q15	181	1
Q17	181	1
Q20	181	1
Q22	181	1
Q24	181	1
Q25	180	2
Q27	181	1
Q28	181	1
Q29	181	1
Q31	180	2
Q32	180	2
Q34	181	1
Q38	181	1

Scale Reliability Analysis

Cronbach α values were estimated for study data scores generated using the diet behavior and nutrition self-efficacy scales and the social support sub-scales to ensure acceptable internal consistency reliability estimates for the specific sample. The analysis found acceptable α values for scores when using the nutrition self-efficacy measure (0.768), the teacher social support (0.737), and the friend social support (0.806) subscale measures; Cronbach α value for the diet behaviors measure and the parent social support sub-scale measure fell below the minimum acceptable value at 0.505 and 0.520, respectively. The parent social support sub-scale measure was excluded from the study as

measurement error could not be eliminated by using a measurement model. Table 8 lists the Cronbach α values for the study data.

Table 8

Internal Consistency Reliability of Study Data Using Select Measures

Measures	α
Diet Behaviors	0.505
Nutrition Self-Efficacy	0.768
Parent Social Support	0.520
Teacher Social Support	0.737
Friend Social Support	0.806

Structural Equation Analyses

The structural equation analyses for the study were conducted using Mplus5.2® (Muthén & Muthén, 2007) to examine associative paths of influence of diet behaviors, nutrition self-efficacy, and teacher and friend social supports on child weight status. Analyses involved the development of measurement models to test a hypothesized structural model examining associative paths of influence on child weight status. To test the research questions and associated hypotheses, simultaneous regression equations were employed. A comparison of the path coefficients examined the impact of the associative paths of influence on child weight. The following sections detail the results of each model development and how the analyses addressed each of the research questions and associated hypotheses.

Measurement Model

The measurement model was developed to control for measurement error in the diet behavior and nutrition self-efficacy scores, evidenced by the poor internal consistency reliability values and structural model fit. Latent variables were created for diet behaviors and nutrition self-efficacy using each of the measures' associated items as

indicator manifest variables. The maximum likelihood (ML) estimation method was used to estimate model parameters. The chi-square statistic, comparative fit index (CFI), Tucker-Lewis fit index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMSR) were used to evaluate model fit while path coefficients were assessed for statistical significance at $p < .05$. Modifications were made based on the model modification index (M.I.) and expected parameter change index (E.P.C). The following section details the findings for the diet behaviors and nutrition self-efficacy of the measurement models.

Diet Behaviors. The results of the simple diet behaviors measurement model yielded less than desirable fit indices (CFI = 0.549, TLI = 0.399, RMSEA = 0.086, SRMR = 0.071). Modifications allowing the correlations of Q6 errors with Q1, Q2, and Q4 errors and correlations of Q7 errors with the Q5 errors were made to improve the fit of the final measurement model, resulting in a model improvement evidenced by a non-significant chi-square statistic ($\chi^2 = 28.511$, $p < 0.197$). An adequate fit for the final diet behaviors measurement model was further confirmed by acceptable fit indices, including the CFI (.932), TLI (.894), RMSEA (.036), and SRMR (.047) values. Fit statistics' for the final measurement and structural models are listed in Table 9.

Table 9

Fit Indices for Final Measurement and Structural Models

Model	χ^2	*df*	CFI	TLI	RMSEA	SRMR
Measurement						
Diet Behaviors	28.511	23	.932	.894	.036	.047
Nutrition Self-Efficacy	137.494	88	.867	.841	.056	.061
Structural	406.936	312	.831	.810	.041	.067

Note. χ^2 = chi-square statistics; *df* = degrees of freedom; CFI = comparative fit index; TLI = Tucker-Lewis fit index; RMSEA = root mean square error of approximation; SRMSR = standardized root mean square residual.

Table 10 details the correlation matrix of the final diet behaviors measurement models. Diet behavior scale items (Q1-Q9) demonstrated low correlations ranging from -0.007 to 0.307. The highest correlations were seen between Q2 (dairy and milk) and Q6 (cereal and grains; $r = .307$, $p < .0001$), followed by Q5 (bread and grains) and Q7 (vegetables; $r = .253$, $p < .01$), and Q8 (fruit) and Q9 (fruit juice and fruit; $r = .246$, $p < .01$).

Table 10

Correlation Matrix for Diet Behaviors Measurement Models

		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
Diet Behaviors										
	Q1	---								
	Q2	.150**	---							
	Q3	.138	.052	---						
	Q4	-.094	.060	.109	---					
	Q5	.170**	-.038	.027	.083	---				
	Q6	-.139*	.307**	.063	.225	.039	---			
	Q7	.225**	.065	.086	.100	.253	.074	---		
	Q8	.110	.153**	.129	.039	.050	-.006	.124	---	
	Q9	-.007	.126**	.151	.094	.041	.138	.245	.246	---
Nutrition Self-Efficacy										
	Q10	.003	.230*	.015	.014	.079	.094	.087	.092	.002
	Q11	.020	.004	-.069	.038	.038	.049	.193	.103	.032
	Q12	.092	.144*	-.015	-.048	-.005	-.034	.069	.082	-.102
	Q13	.071	.056	.089	.040	-.038	.030	.042	.184**	.042
	Q14	.103	.021	-.085	-.074	.099	.085	.181	.149**	-.033
	Q15	.141*	.066	.049	.040	-.109	-.034	.187	.002	.032
	Q16	.046	.086	.117	.030	.122*	-.012	.235	.170**	.030
	Q17	.082	.105	.018	.012	.137	-.010	.108	.141**	.006
	Q18	.167**	.153**	.000	-.135*	-.027	-.171**	.020	.063	-.024
	Q19	.087	.319**	.044	-.016	.000	.084	.119	.026	.255**
	Q20	.115	.121*	-.069	-.028	.098	.080	.127	.125*	.145*
	Q21	.158**	.074	.013	-.052	.047	.112	.120	.047	.088
	Q22	-.044	-.058	-.101	-.025	.100	-.040	.161**	-.022	-.027
	Q23	.037	.087	-.020	.048	.082	-.130*	.108	.011	-.122*
	Q24	.087	.050	.069	.104	.022	-.141*	.049	.024	.051

Note. *$p < .10$; **$p < .05$.

Figure 14 illustrates the path coefficients (β) and fit statistics for the final diet behaviors measurement model. With the exception of Q4 (pasta and grains), Q5 (breads and grains), and Q6 (cereal and grains), all path coefficients were statistically significant at $p < .05$. The model suggests that scale item Q9 (fruit juice and fruit) was the strongest measure of diet behaviors ($\beta = .499$, $p < .05$), followed by item Q7 (vegetables; $\beta = .440$,

$p < .05$) and Q8 (fruit; β =. 406, $p < .05$). Although the path coefficients for of Q4, Q5, and Q6 were not statistically significant (β =0.165, 0.147, and 0.176 respectively), they were included in the model in an effort to maintain the integrity of the scale, as the model provided an adequate fit with their inclusion and a noted decrease in fit indices in their absence.

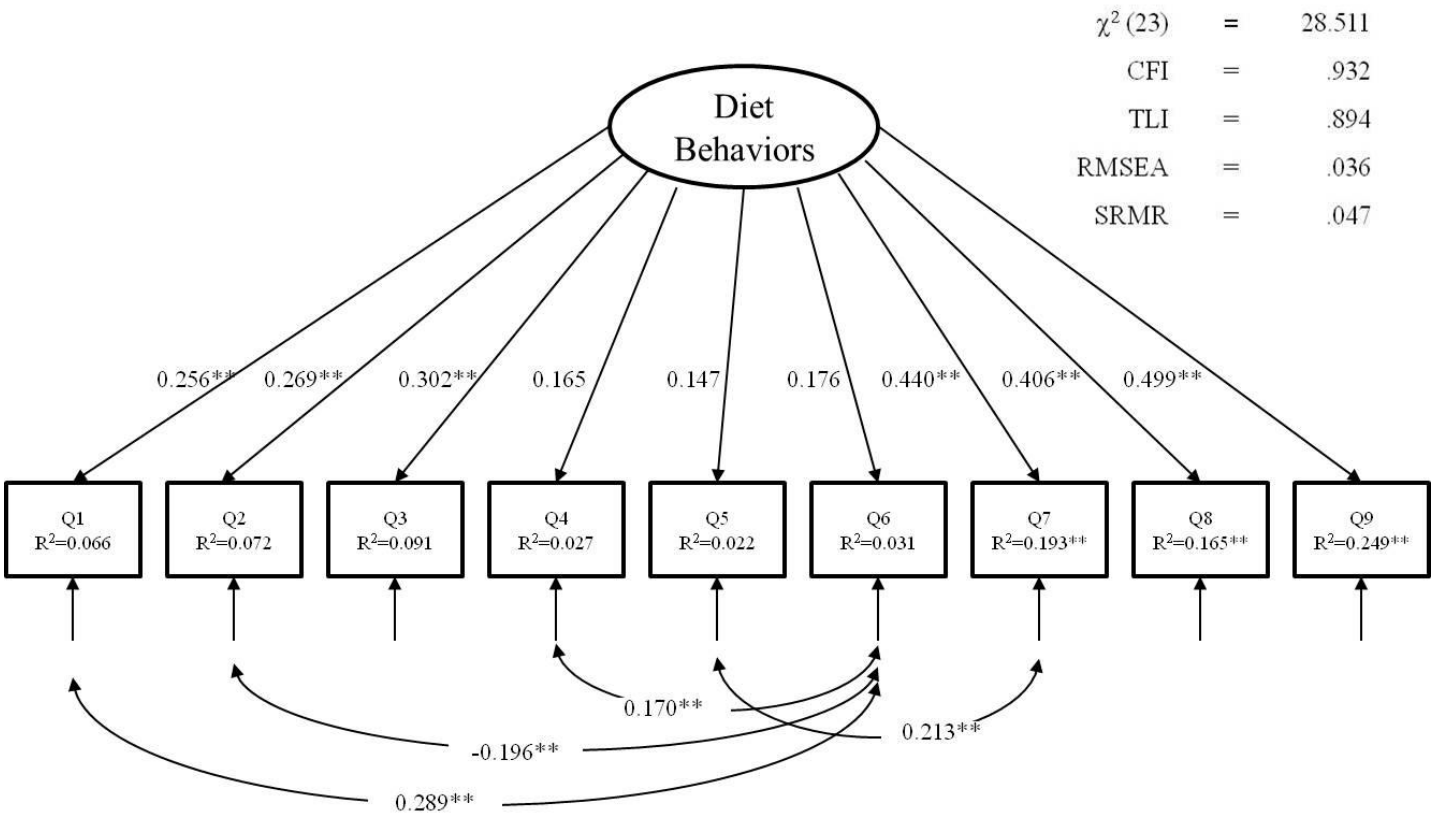

Figure 14. Standardized path coefficients for the final diet behaviors measurement model. Latent variable shown in ellipses and error variance (R^2) of indicator variables shown in squares. χ^2 =chi-square statistics; CFI= comparative fit index; TLI= Tucker-Lewis fit index; RMSEA= root mean square error of approximation; SRMSR= standardized root mean square residual. *$p < .10$; **$p < .05$.

Nutrition Self-Efficacy. The results of the simple nutrition self-efficacy measurement model yielded a statistically significant chi-square statistic (χ^2=182.995; $p < 0.0000$) and less than desirable fit indices (CFI = 0.750, TLI = 0.708, RMSEA = 0.075, SRMR = 0.071). Modifications were made by allowing Q13 errors to correlate with Q23 and Q17 errors to correlate with Q24 to in an attempt to improve the fit of the final measurement model. Although the modifications did not yield a non-significant chi-square (χ^2=137.494; $p < 0.0006$) or an acceptable CFI = 0.867 and TLI = 0.841, however acceptable RMSEA = 0.056 and SRMR = 0.061 were achieved after the modifications were made. The modified model was maintained as the final measurement model as it provided the best fit possible with the data based upon the M.I. and E.P.C. values. Fit indices for the final nutrition self-efficacy model are listed in Table 9.

Table 11 details the correlation matrix for the final nutrition self-efficacy measurement model. Nutrition self-efficacy scale items (Q10-Q24) demonstrated low to moderate correlations, ranging from .012 to .486. Most of the correlations were statistically significant at $p < .05$, with nearly all of the scale's items reaching minimal statistical significance at $p < .10$. The highest correlations were seen between Q17 (whole grain bread vs. white bread) and Q24 (ask caregiver for whole grain bread; $r = .486$, $p < .0001$), followed by Q15 (fresh fruit vs. candy) and Q20 (1 scoop of ice cream vs. 3 scoops of ice cream; $r = .350$, $p < .0001$), and Q11 (fruit as a snack) and Q14 (grilled chicken sandwich vs. hamburger; $r = .344$, $p <. 0001$).

Table 11

Correlation Matrix for the Final Nutrition Self-Efficacy Measurement Model

	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24
Nutrition Self-Efficacy															
Q10	---														
Q11	.275**	---													
Q12	.304**	.190**	---												
Q13	.148**	.149**	.276**	---											
Q14	.147**	.344**	.253*	.179**	---										
Q15	.037	.184**	.157**	.121*	.258**	---									
Q16	.054	.210**	.286**	.221**	.241**	.250**	---								
Q17	.209**	.012	.049	.314**	.136*	.068	.196**	---							
Q18	.195**	.095	.184**	.176**	.119*	.260**	.171**	.117	---						
Q19	.297**	.118	.088	.236**	.132*	.176**	.138	.209**	.273**	---					
Q20	.073	.192**	.154**	.188**	.292**	.350**	.149**	.170**	.241**	.231**	---				
Q21	.095	.191**	.023	.051	.219**	.179**	.114	.068	.151**	.131*	.183**	---			
Q22	.310**	.319**	.191**	.155**	.338**	.149**	.241**	.246**	.224**	.180**	.153**	166**	---		
Q23	.047	.142*	.224**	-.084	.268*	.291**	.234**	.087	.095	.056	.188**	.084	.262**	---	
Q24	.121	.172**	.104	.279**	.174**	.143**	.246**	.486**	.129*	.243**	.086	.061	.332**	.155**	---

Note. *$p < .10$; **$p < .05$

Figure 15 illustrates the path coefficients (β) and fit statistics for the final nutrition self-efficacy measurement model. All path coefficients for the scale items were statistically significant (p <.05). The strongest measure of nutrition self-efficacy were scale items Q22 (vegetables at dinner; $\beta = .547$, $p < .05$) and Q14 (grilled chicken sandwich vs. hamburger; $\beta = .545$, $p < .05$).

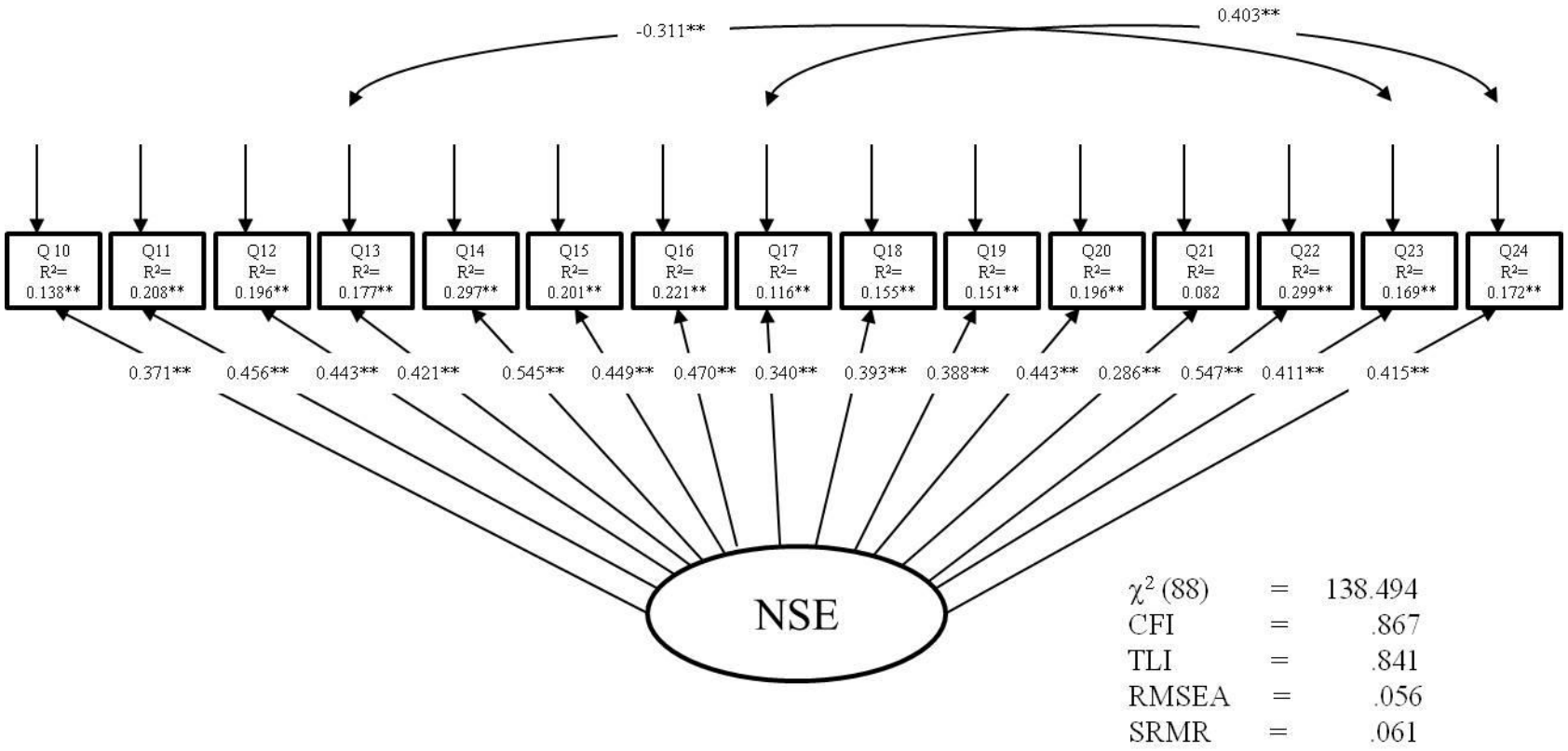

Figure 15. Standardized path coefficients for the nutrition self-efficacy (NSE) measurement model. Latent variable shown in ellipses and error variance (R^2) of indicator variables shown in squares. χ^2 =chi-square statistics; CFI= comparative fit index; TLI= Tucker-Lewis fit index; RMSEA= root mean square error of approximation; SRMSR= standardized root mean square residual. *$p < .10$; **$p < .05$.

Structural Model

The structural model was developed to examine associative paths of influence between latent variables (diet behaviors and nutrition self-efficacy) and manifest variables (teacher and friends social supports) on child weight status. Fit indices indicated a marginal fit of the data. All of the fit statistics were less than desirable, evidenced by a statistically significant chi-square (χ^2=406.494; $p < 0.0002$) and poor fit indices of CFI=0.831 and TLI=0.810, despite appropriately marginal evidence of error variance (RMSEA = 0.041 and SRMR = 0.067). Although the fit of the structural model was not ideal, it was maintained as the structural model for the analysis as the model provided the best fit possible with the data. Fit indices for the final structural model are listed in Table 9.

Low, yet statistically significant, correlations between manifest indicator variables of latent variables and model manifest variables were observed. Table 12 presents the correlation matrix for the latent and manifest variables for the structural model. Correlations ranged from -.005 to .510. Many of the correlations were statistically significant at $p < .05$. BMI marginally correlated with several of the diet behaviors items, with the highest correlations demonstrated with Q2 ($r = .214$, $p < .01$), Q6 ($r = .156$, $p < .01$), Q8 ($r = .212$, $p < .01$), and Q9 ($r = .203$, $p < .01$) and teacher social support ($r = .162$, $p < .05$). BMI did not correlate well with nutrition self efficacy or friend social support.

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Table 12

Correlations Matrix for the Latent and Manifest Variables of the Structural Model

	BMI	TSS	FSS
Diet Behaviors			
Q1	.026	.126*	.052
Q2	.214**	.166**	.150**
Q3	.084	.188*	.132*
Q4	.040	.138*	.171**
Q5	-.072	.192**	.082
Q6	.156**	.145**	.137*
Q7	.021	.119*	.164**
Q8	.212**	.216**	.032
Q9	.203**	.272**	.203**
Nutrition Self-Efficacy			
Q10	.096	.151**	.096
Q11	-.037	-.026	.012
Q12	.050	.134*	.028
Q13	.028	.095	.081
Q14	.013	.030	.048
Q15	-.023	.062	.138*
Q16	.033	-.033	.111*
Q17	.089	.181**	.103
Q18	.035	.012	.052
Q19	.070	.193**	.204**
Q20	.006	.198**	.203**
Q21	-.051	.141*	.243**
Q22	-.074	-.025	.144
Q23	-.003	.005	.151**
Q24	-.025	.002	.080
BMI	---	.162*	.042
TSS	.162*	---	.510**
FSS	.042	.510**	---

Note. BMI = Body Mass Index; TSS = Teacher Socail Support; FSS = Friend Social Support. *$p < .10$; **$p < .05$.

Teacher social support marginally correlated at a statistically significant level with all diet behaviors items (Q1 at $r = .126$, $p < .10$; Q2 at $r = .165$, $p < .05$; Q3 at $r = .118$, $p < .10$; Q4 at $r = .138$, $p < .10$; Q5 at $r = .191$, $p < .01$; Q6 at $r = .144$, $p < .05$; Q7 at $r = .119$, $p < .10$; Q8 at $r = .216$, $p < .01$; and Q9 at $r = .273$, $p < .001$). Low, yet statistically significant, correlations were observed between teacher social and several nutrition self-efficacy items (Q10 at $r = .151$, $p < .05$; Q 12 at $r = .134$, $p < .10$; Q 17 at $r = .181$, $p < .01$; Q 19 at $r = .193$, $p < .01$; Q 20 at $r = .198$, $p < .01$; and Q 21 at $r = .141$, $p < .10$). The strongest correlation was between teacher social support and friend social support ($r = .510$, $p < .05$).

Friend social support marginally correlated at a statistically significant level with nearly all of the diet behavior items (Q2 at $r = .150$, $p < .05$; Q3 at $r = .132$, $p < .10$; Q4 at $r = .171$, $p < .05$; Q6 at $r = .136$, $p < .10$; Q7 at $r = .164$, $p < .05$; and Q9 at $r = .203$, $p < .01$) and five nutrition self-efficacy items (Q15 at $r = .138$, $p < .10$; Q19 at $r = .204$, $p < .05$; Q20 at $r = .203$, $p < .05$; Q21 $r = .243$, $p < .05$; and Q23 at $r = .151$, $p < .05$).

The observed correlations suggest that BMI and teacher and friend social supports are associated with diet behaviors related to dairy, grain, vegetable and fruit consumption. BMI is also associated with teacher social support, but not friend social support or nutrition self-efficacy. Furthermore, teacher social support is associated with general diet behaviors, friend social support, and nutrition self-efficacy related to cereal, starchy vegetables, grains, healthy beverage selection, breakfast, and ice cream portions. Friend social support is also associated with nutrition self-efficacy related to healthy snacks and beverage selection, ice cream portions, salad and breakfast consumption.

Figure 16 illustrates the direct and indirect effects of the final structural model. Teacher social support had the greatest effect on diet behaviors, demonstrating a direct, positive influence on diet behaviors ($\beta = .421$, $p < .05$), however its direct effect on nutrition self-efficacy was not statistically significant. Friend social support demonstrated a positive, direct effect on nutrition self-efficacy ($\beta = .227$, $p < .05$), but its direct effect on diet behaviors was not statistically significant. Nutrition self-efficacy demonstrated a direct, positive effect on diet behaviors ($\beta = .221$, $p < .05$), with 6% of its variance explained by friend social support. Diet behaviors demonstrated a positive, direct effect on child weight ($\beta = .338$, $p < .05$), with 28% of its variance explained by nutrition self-efficacy and teacher social support, while accounting for 11% of the variance in child weight status.

The results of the path analysis indicate that both teacher social support and friend social support demonstrate positive, indirect influence on child weight status through nutrition self-efficacy and diet behaviors following two different and specific paths of influence. Diet behaviors, in turn, demonstrate a positive, direct effect on child weight status. Friend social support demonstrated a positive, total indirect effect ($\beta = .016$; $p < .05$) on child weight through nutrition self-efficacy ($\beta = .227$; $p < .05$) and diet behaviors ($\beta = .221$; $p < .05$.). Teacher social support also demonstrated a positive, indirect effect on child weight status, but through diet behaviors only ($\beta = .142$; $p < .05$) . Diet behaviors demonstrated a positive, direct effect on child weight status ($\beta = .338$; $p < .05$). The following sections will detail how the findings of the structural model analysis addressed the study's research questions and associated hypothesis.

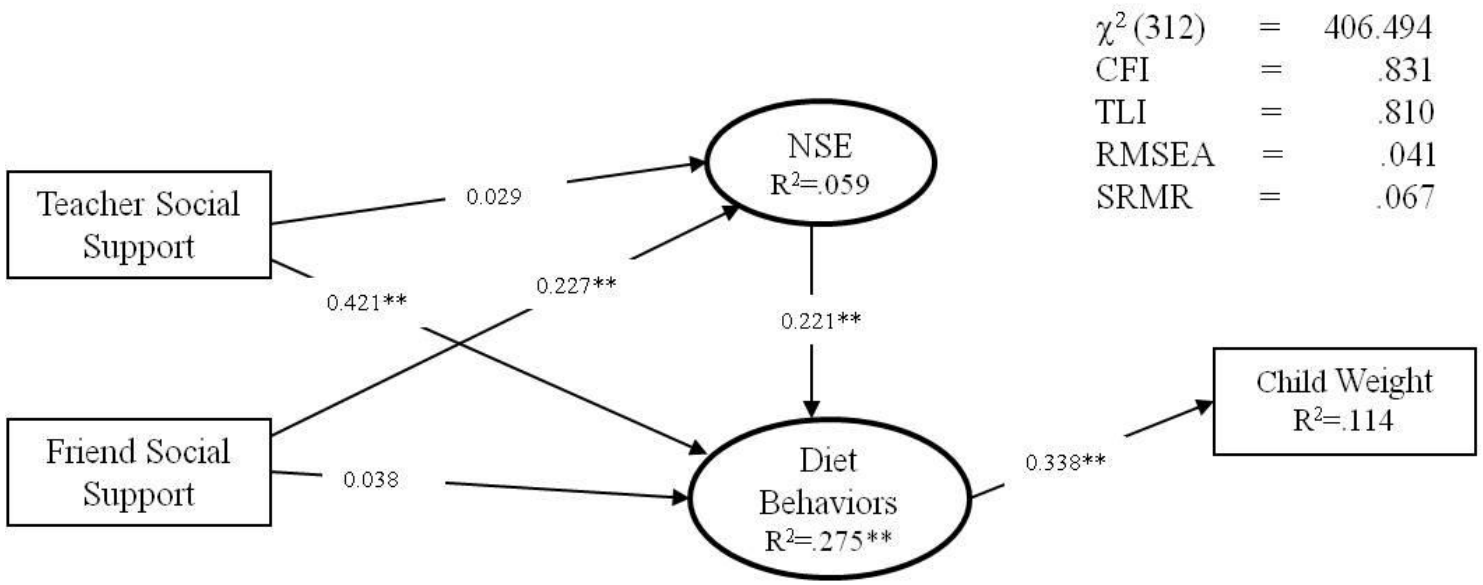


Figure 16. Standardized path coefficients for the final structural model to test associative paths of influence of ecological factors on child weight status. Latent variable shown in ellipses, and manifest variables are shown in squares with associated error variance (R^2). χ^2 =chi-square statistics; CFI= comparative fit index; TLI= Tucker-Lewis fit index; RMSEA= root mean square error of approximation; SRMSR= standardized root mean square residual. $^{**}p < .05$.

Research Question #1: Does teacher social support have a positive, indirect associative influence on child weight through nutrition self-efficacy and diet behaviors? The hypothesis (H_1) associated with research question #1 posited that teacher social support has a positive, indirect associative influence on child weight through nutrition self-efficacy, and in turn through diet behaviors. Alternatively, the null hypothesis (H_0) posited that teacher social support does not have a positive, indirect associative influence on child weight through nutrition self-efficacy and diet behaviors. The structural model failed to demonstrate a statistically significant direct effect between teacher social support and nutrition self-efficacy, suggesting that the social support of teachers did not indirectly influence diet behaviors and weight status through nutrition self-efficacy. Therefore, the findings from the path analysis support failure to reject the null hypothesis, affirming that teacher social support does not have a positive, indirect associative influence between child weight through nutrition self-efficacy and diet behaviors.

Research Question #2: Does friend social support have a positive, indirect associative influence on child weight through nutrition self-efficacy and diet behaviors? The hypothesis (H_2) associated with research question #2 posited that friend social support has a positive, indirect associative influence between child weight through nutrition self-efficacy and diet behaviors. Alternatively, the null hypothesis (H_0) posited that friend social support does not have a positive, indirect associative influence on child weight through nutrition self-efficacy and diet behaviors. The structural model demonstrated a positive, direct effect between friend social support and nutrition self-efficacy. Subsequently, nutrition self-efficacy demonstrated a positive, direct effect on

diet behaviors and diet behaviors, in turn, demonstrated a positive, direct effect on child weight. Therefore, the findings from the path analysis support rejection of the null hypothesis, affirming that friend social support has a direct, positive associative influence on child weight through nutrition self-efficacy and diet behaviors.

Research Question #3: Does teacher social support have a positive, indirect associative influence on child weight through diet behaviors? The hypothesis (H_3) associated with research question #3 posited that teacher social support has a positive, indirect associative influence on child weight through diet behaviors. Alternatively, the null hypothesis (H_0) posited that teacher social support does not have a positive, indirect associative influence child weight through diet behaviors. The structural model demonstrated a positive, direct effect between teacher social support and diet behaviors, which subsequently directly effects child weight. Therefore, the findings from the path analysis support rejection of the null hypothesis, affirming that teacher social support has a positive, indirect associative influence on child weight through diet behaviors.

Research Question #4: Does friend social support have a positive, indirect associative influence on child weight through diet behaviors? The hypothesis (H_4) associated with research question #4 posited friend social support has a positive, indirect associative influence on child weight through diet behaviors. Alternatively, the null hypothesis (H_0) posited friend social support does not have a positive, indirect associative influence on child weight through diet behaviors. The structural model failed to demonstrate a statistically significant direct effect between friend social support and diet behaviors. Therefore, findings from the path analysis support failure to reject the null

hypothesis, affirming that friend social support does not have a positive, indirect associative influence on child weight through diet behaviors.

Conclusion

The descriptive analyses indicated that more than half of data collection occurred in school-based-settings offering an incentive program, with the median age of participants being 14-year old, and more than 57% at an unhealthy weight status (overweight or obese). Further, an internal consistency reliability analysis yielded poor Cronbach α values for study data using select measures (parent social support and diet behaviors).

The structural equation analyses developed two measurement models (diet behaviors and nutrition self-efficacy) to account for measurement error in scores generated using select measures for use in the final structural model. All of the path coefficients for the nutrition self-efficacy measurement model were statistically significant at $p < .05$; all but three of the path coefficients for the diet behaviors measurement model were statistically significant. Although the nutrition self-efficacy measurement model did not provide an ideal fit, it was utilized in the final structural model as it provided the best fit to the data.

Although the final structural model did not provide an ideal fit, it was maintained as it provided the best fit to the data. The correlation matrix suggested associations between BMI, teacher social support, and friend social support and diet behaviors, while teacher and friend social supports was also associated with nutrition self-efficacy. The results of the path analysis for the final structural model revealed that both teacher social support and friend social support demonstrate positive, indirect influence on child weight

status through nutrition self-efficacy and diet behaviors following two different and specific paths of influence. Diet behaviors, in turn, demonstrate a positive, direct effect on child weight status. Teacher social support demonstrates a positive, indirect influence on child weight among African-American adolescent females through diet behaviors only, whereas friend social support acts in the same manner through nutrition self-efficacy and diet behaviors.

The final chapter, Chapter 5, provides a summary and discussion on the study's findings, acknowledges study limitations, and explores recommendations for educational leaders and opportunities for future research.

CHAPTER 5: DISCUSSION

The recent trend of increasing prevalence rates of childhood overweight and obesity continues to occur in both developing and developed countries, with United States prevalence rates doubling and tripling. More recent reports allude to a slowing in prevalence rate increase in foreign countries (OECD, 2012). However, to date, no country has successfully reversed the trend. Health education practitioners and researchers remain optimistic in in eliminating the epidemic by continuing to investigate possible solutions for a problem that has reached epidemic status.

The current literature implies that the solution to arrest or reverse the childhood obesity epidemic may lie within an alternative contextual examination of the problem, specifically through an ecological perspective. This study followed that school of thought with a conceptual framework based upon an adaptation of an ecological model developed by Story et al. (2008) fashioned in a quantitative, non-experimental, multivariate correlational research design specifically to address the overreaching question as to how ecological factors influence child weight status in African-American adolescent females. The following discussion summarizes the results of the study in relationship to the study's research questions, acknowledges limitations, and outlines implications for educational leaders and opportunities for future research.

Summary and Discussion

The study employed a quantitative, non-experimental, structure equation model (SEM) to examine ecological influences on child weight in African-American adolescent females. It was found that social environmental level factors indirectly influence the weight status of African-American adolescent females through individual-level factors, with individual-level factors directly influencing weight status. The following section will summarize the study findings in relationship to the research questions and provide a brief discussion of the study's major conclusions.

Research Questions

Research Question #1: Does teacher social support have a positive, indirect associative influence on child weight through nutrition self-efficacy and diet behaviors? Teacher social support significantly correlated with all of the diet behavior items and many of the nutrition self-efficacy items. Furthermore, teacher social support marginally correlated with BMI, and moderately with friend social support. Although the significant correlations were observed between teacher social support and several nutrition self-efficacy items, the final structural model failed to demonstrate a statistically significant direct effect between teacher social support and nutrition self-efficacy. These findings suggest that the social support of teachers *does not* indirectly influence diet behaviors and weight status through nutrition self-efficacy and, in turn, confirms a negative answer to research question #1.

Research Question #2: **Does friend social support have a positive, indirect associative influence on child weight through nutrition self-efficacy and diet behaviors?** Friend social support marginally correlated with statistical significance with

nearly all of the diet behavior and five of the nutrition self-efficacy items. The final structural model demonstrated a positive, direct effect between friend social support and nutrition self-efficacy. Subsequently, nutrition self-efficacy demonstrates a positive, direct effect on diet behaviors and diet behaviors, in turn, demonstrates a positive, direct effect on child weight. These findings suggest that the social support of friends *does* indirectly influence diet behaviors and weight status through nutrition self-efficacy and, in turn, confirms a positive answer to research question #2.

Research Question #3: Does teacher social support have a positive, indirect associative influence on child weight through diet behaviors? As previously noted, teacher social support significantly correlates with all the diet behavior items and several nutrition self-efficacy items. Furthermore, teacher social support demonstrated a positive, direct effect on diet behaviors, which subsequently directly affects child weight status. These findings suggest that the social support of teachers *does* indirectly influence weight status through diet behaviors and, in turn, confirms a positive answer to research question #3.

Research Question #4: Does friend social support have a positive, indirect associative influence on child weight through diet behaviors? As previously stated, friend social support significantly correlated with several of the diet behavior and nutrition self-efficacy items. In addition, friend social support failed to demonstrate a statistically significant direct effect between friend social support and diet behaviors in the final structural model. Therefore, these findings suggest that the social support of friends does not indirectly influence weight status through diet behaviors alone and, in turn, confirms a negative answer to research question #4.

Major Conclusions

Overall, the findings suggest that social environmental ecological factors indirectly influenced child weight status through individual-level ecological factors. The social support of teachers directly influences the diet behaviors of African-American adolescent females, which directly influences their weight status. This finding supports research question #3, which suggests an indirect associative influence between teacher social support and child weight status through diet behaviors. As children spend a significant portion of the day in school, teachers are afforded a unique opportunity to help influence diet behaviors in a variety of methods, including modeling, policy implementation, and formal curriculum. Unfortunately, current laws and policy don't provide opportunities to effect child weight status during the school day as evidenced by reduction in mandatory health and physical education requirements and funding. Further research is needed in this area to determine how specific types of teacher social support can indirectly influence diet behaviors and child weight with hopes to influence state health and physical education standards and associated funding.

In addition, the social support of friends' indirectly influences weight status through nutrition self-efficacy and diet behaviors. Friend social support directly influences the nutrition self-efficacy of African-American adolescent females, which, in turn, directly influences diet behaviors, and diet behaviors directly influences weight status. This finding supports research question #2, which suggest indirect associative influences between friend social support and child weight status through nutrition self-efficacy and diet behaviors, respectively. The direct influence of friend social support on nutrition self-efficacy may result from adolescence peer influence. Adolescent peers tend to spend extensive amounts of time together engaged in recreation and socialization

activities that often involve eating (Story, Neumark-Sztainer, & French, 2002). These findings provide future research opportunities into strategies to increase nutrition self-efficacy among adolescents in an effort to improve diet behaviors and impact weight status.

The findings are of particular interest as the present study draws attention to the clear distinction among specific social relationships within the social-environmental level. The findings indicate specific indirect paths of influences on child weight status by friend and teacher social support, which was an unexpected outcome. Initially, the study sought to examine social support generally using a measure that collectively looked at parent, teacher, and social support. Although the combined scale provided acceptable internal consistency reliability, it did not perform well in the final structural model. The author of the measure indicated use of the measure in subscales; however, the parent social support subscale provided poor internal consistency reliability values among the study population and was subsequently excluded from the analysis. The findings suggest that a solution to the increasing childhood obesity epidemic may be found through further delineation of social relationships within the context of social support. These highly specified social support systems may very well extend beyond common relationships, thus resulting in an overlooked area of inquiry.

The literature offers inconclusive support of the study's findings, with previous studies reporting direct associative relationships with different types of social support, nutrition self-efficacy and diet behaviors. Granner and colleagues (2004) found self-efficacy to be the highest correlate with diet behaviors and further suggested that diet behaviors among African-American adolescents is predicted more by social influences

than availability. These findings partially support the findings of the current study, in regards to a relationship between adolescent self-efficacy and their diet behaviors. Findings of previous studies related to diet behaviors and social influence contradict the current study's findings. This difference may be attributed to gender differences, as the current study specifically examined African-American adolescent females and findings from Granner and associates found this to be true in African-American adolescents, making no distinction among gender.

Stanton, Green, and Fires (2007) found race-specific associations between diet behaviors and social support subscales, with African-American adolescents reporting higher perceived friend social support related to diet behaviors. Similar findings were also found by Cutler and associates (2011) confirming a positive association between peer social support and fruit, vegetable, and starchy food diet behaviors. These findings contradict the findings of the current study. However, these findings make no mention of examination of gender differences, as the current study specifically examined African-American adolescent females.

Limitations

Assumptions and limitations of the study are acknowledged. The most inherent challenge relates to the use of an adaptive model due to limitations of data availability. The study used an adaptation of Story et al.'s (2008) ecological framework examining only two of the four environmental levels of influence on diet because of time and financial constraints. The structural model, although based on substantive theory and prior research, does not take into consideration other factors of influence, such as physical and policy environmental factors. Furthermore, the study did not test all of the

plausible models using the available study variables. Finally, the study did not analyze influence based upon the individual weight classifications due to data limitations. SEM requires large sample sizes for model development, and the study data fell short of the minimum data sample required to build a sufficient model for each of the weight status classifications.

Use of food frequency questionnaires as a data collection tool is acknowledged as a study limitation due to its inconsistent performance in psychometric analysis studies and tendency to introduce social desirability bias. Although cited in the literature as the most common tool used to assess diet behaviors (Herbert, Ma, Ebbeling, Matthews, & Ockene, 2001; Johnson et al., 2008; Taylor et al., 2009), food frequency questionnaires often yield mixed findings in validation studies (Ambrosini et al., 2009; Hammond, 2000; Kristal et al., 2005; Langevin et al., 2007; Noia & Contento, 2009) and offer a greater potential for social desirability bias, which could significantly obscure the measurement of the variable of interest (Herbert, Clemow, Pbert, Ockene, & Ockene, 1995).

Another limitation of the present study involves the data collection in a field setting using the study population. The study focused on urban, African-American adolescents. Further, the study occurred in multiple settings, with each setting following varied logistical and administrative procedures. In addition, as minors, the study population required additional consent from caregivers before participation, which came in the form of completing and returning consent forms to the designated study location. Obtaining consent from caregivers was often a challenge, as they are often inundated with papers and forms to sign. Furthermore, as the study was voluntary and offered no direct benefit for participation, caregivers often elected not to sign and return the form.

The final study limitation acknowledged is related to measures used in the study and their poor internal consistency reliability among the study population. According to Schene et al., (2000), "Unreliability masks the true relation- ship between constructs under study. If the error components of the observed scores are uncorrelated, the maximal theoretical possible correlation between two unreliable measures is the square root of the product of their respective reliabilities: $r_{X_1X_2} \leq \sqrt{(r_{X1X2}r_{X2X2})}$" (p. s16).

Although the study's selected measures were previously found to be valid and reliable using data gathered from a general population, the measures did not provide adequate internal consistency reliability values when used with the study's specific racial and gender population. This finding clearly speaks to the measures' lack of cultural competency, which may also serve as an area for additional inquiry.

Data with poor internal reliability values required additional statistical manipulation to account for observed measurement error or complete elimination from the final analyses. In the case of the data measured with the parent social support subscale, additional statistical manipulation did not reduce the observed measurement error in the measure, and the data were excluded from the final structural model analysis. The measure's inadequate model fit in both the measurement and structural model may be attributed to the limited response format of a three-point Likert scale. Although the use of single items as indicator variables is often discouraged (Hatcher, 1994), it is often advised that larger response categories be used, including seven to nine items.

Implications for Educational Leaders

In spite of the limitations, the findings from the current study present preliminary evidence that perceived friend and teacher social support of urban, African-American

adolescent females indirectly influences their weight status through nutrition self-efficacy and diet behaviors. Although the literature provides inconsistent perceptions of school faculty and staff on the role of schools in addressing obesity, the implied expectation suggests increased accountability among local school systems and educational leaders. Apprehension among school faculty and staff in taking action is evident as they remain mindful of competing administrative and academic priorities and resource capacity.

The public outcry for increased school system accountability in addressing the obesity epidemic imposes significant implications for educational leadership practice, calling for the integration of health behavior theory, based upon the ecological perspective, into the current education and leadership practice. Integrating health behavior change theory into traditional education and leadership practice provides educational leaders a theoretically sound and evidence-based strategy to seamlessly transition their school environment into one that actively affects obesiogenic behavior change. By doing so, educational leaders will not only ensure the successful implementation of change strategies but also realize the positive effects of these efforts.

In addition, teachers should feel empowered to provide social support related to diet behaviors through the support of their educational leaders demonstrating traditional leadership techniques such as transformational and path-goal leadership characteristics. The following section will provide change strategy recommendations in the context of the health belief model at the individual and social cognitive theory at the social-environmental ecological level in an effort to affect overweight and obesity in the school environment.

Implementing change strategies based on the health belief model (HBM) at the individual ecological level can influence positive health behavior change in students and staff, as it addresses the individual's perception of the threat posed by obesity, the benefits of avoiding the threat, and factors influencing the decision to act (Janz, Champion, & Strecher, 2002). Furthermore, the HBM complements addressing problem behaviors that evoke health concerns as its central focus is motivation, thus making the constructs of the HBM serve as a useful framework for developing long-and short-term behavior change strategies. Constructs applicable to affecting overweight and obesity in the school environment include perceived susceptibility, barriers and benefits, cues to action, and self-efficacy. Janz, Champion, and Strecher (2002) recommend teachers, especially health and physical education teachers, and educational leaders implement the following listed change strategies based upon construct of the HBM in the school environment to affect obesiogenic behaviors:

- Perceived Susceptibility: Defining populations at risk for becoming overweight through school-based BMI risk awareness and monitoring programs and tailoring risk awareness messages to the fit the characteristics and behaviors of those at risk;
- Perceived Benefits: Explaining the specifics and potential positive results of eating healthy and exercise in ways that are easy to understand;
- Perceived Barriers to Change: Offering reassurance, incentives, and assistance and correcting misinformation to promote positive changes in diet behavior and active living;

- Cues to Action: Promoting awareness about healthy behaviors around the school through self-maintenance tools like pedometers and a reminder system with daily health tips included in the morning announcements; and
- Self-Efficacy: Providing direct nutrition education by incorporating diet and fitness themes across the curriculum whenever possible and performance guidance through cooking demonstration and behavior change simulation activities.

Social-environmental level change strategies, based on the social cognitive theory (SCT), may influence positive health behavior change in school staff and students through the reciprocal interactions between the individual and their environments and psychosocial determinants of health behavior. Albert Bandura began developing the concept, formally called social learning theory, in 1962, based on the premise of observational learning (Bandura, 1963; Baranowski, Perry & Parcel, 2002), and the theory has since evolved into the most dominant health behavior theory used in developing adolescent health and nutrition programs (Hoelscher, Evans, Parcel, & Kelder, 2002). Constructs of the SCT applicable to affecting overweight and obesity in the school environment include behavioral capacity, expectations, self-efficacy, observational learning, and reinforcements. Educational leaders applying SCT with adolescent should remain mindful of environmental control limitations and make appropriate modifications as needed. The following list details suggested change strategies based upon constructs of SCT theory that teachers, especially health and physical education teachers, and educational leaders can implement in the school environment to affect obesiogenic behaviors:

- Behavioral Capacity: Promoting skill mastery through training parents and caregivers, teachers, and school staff on the importance of nutrition, a healthy diet, and active living;
- Expectations and Observational Learning: Modeling positive outcomes of the proposed health behavior by school administration and staff in the school environment, which includes offering less low nutrient density, high fat, and or sugar ala carte menu items on school lunch menus, promoting healthy celebrations and meetings, offering healthy fund-raising alternatives, eating healthy foods, making healthy food choices, and engaging in regular physical;
- Self-Efficacy: Approaching behavior change in small steps to ensure success, which includes providing opportunities to taste new and different foods; and
- Reinforcements: Promoting the offering of non-food rewards and incentives to students.

Classroom teachers serve as the frontline change agents in implementing the recommended change strategies in the school environment at the individual and social-environmental ecological levels. Successful implementation will require the support of educational leaders employing a combination of transformational and path-goal leadership styles. Transformational leadership involves the process in which an individual engages with others to create connections that dually elevate the moral and motivational levels of both the leader and follower (Northouse, 2002). Path-goal leadership refers to how leaders motivate followers to accomplish designated goals

(Northouse, 2002). Educational leaders can ensure the success of their classroom teachers by creating a supportive and resources school environmental that embodies characteristics of both transformational and path-goal leadership characteristic. An ideal school environment to promote obesiogenic change would minimally provide classroom teachers with the appropriate resources, training, coaching, and genuine autonomy. Providing adequate supports and autonomy while collectively employing the recommended change strategies based on health behavior theory in the context of transformational and path-goal leadership styles will help educational leaders effectively meet the implied accountability responsibility of addressing overweight and obesity in the school environment.

Opportunities for Future Research

The study's findings, limitations, and methodology shed light on several areas that warrant additional inquiry. The study findings suggest further identification and delineation of social relationships to determine associative influences on child weight status. Social network analysis, a theoretical concept gaining popularity in health behavior research, involves the methodological examination of social relationships within the context of a network. Most of the current social network analysis research on health behaviors has involved substance use, yet the application of this analysis technique may help to elucidate significant influential associations through specific social network characteristics. The literature on social network research in health behaviors has demonstrated that adolescents develop social strategies through their social networks (Berkman & Glass, 2000). Berkman and Glass (2000) suggested the use of social networks multivariate models that specifically examine levels of influence and social

support, social engagement, and per-to-person contact, with less emphasis on the size of the network. Future research examining the indirect influences of social networks on child weight status through individual level ecological factors may help identify a solution to reverse the epidemic.

As previously noted in the limitations section of this chapter, several of the measures used for the study performed poorly among the study population, despite acceptable internal consistency reliability values published in the literature. Continued research is needed in an effort to develop adequate tools for use among an urban, minority adolescent female population. More specifically, these tools should be culturally appropriate and brief, yet offer a large response format, as suggested, to ensure scale reliability (Hatcher, 1994).

During the data collection phase, a parent expressed concern with the manner in which the BMI risk was communicated, specifically referring to the use of the terms "overweight" and "obese." The current study utilized previously developed materials, but no data exist on its cultural appropriateness in the context of the specific study population. Additional qualitative research and pilot studies are warranted to develop culturally sensitive tools and methodology to communicate findings of BMI screenings that will prompt caregivers and teens to take action. Qualitative research findings from caregivers, adolescents, teachers, and school staff could help to determine the best way to communicate BMI screening information, which may include the use of lay terms, pictures, colors, and common symbols to describe weight status and appropriate treatment and prevention alternatives. An additional area for future inquiry includes conducting pilot studies that offer parents and caregivers a variety of platforms to access

the BMI risk screening information and then assess how the information was used to seek prevention or treatment services. Examples of delivery platforms could include electronic delivery via e-mail, website, and mobile apps interface, as well as standard paper hard copies.

Conclusion

Childhood overweight and obesity prevalence rates have reached epidemic proportion over the last 30 years, with African-American adolescent females demonstrating exponential rates of increase. With no conclusive answers on a specific cause or the reasons for the observed racial and gender disparity, researchers believe that examining the problem from an ecological perspective may help to identify factors affecting these dramatic increases. To this end, the present study applied an adapted ecological model to examine the influences of social-environmental and individual level factors on weight status in urban African-American adolescent females. The results of the study demonstrated that friend and teacher social support indirectly influence child weight status through nutrition self-efficacy and diet behaviors, yet with clear differences in the specific paths of influence by which each type of social support exercises their effect on child weight status. Friend social support's influence occurs through nutrition self-efficacy and diet behaviors, while teacher social support's influence occurs through diet behaviors only.

It should be noted that the present study did not occur in the absence of challenges. The most inherent challenge relates to the use of an adaptive model due to limitations of data availability. The present study used an adaptation of Story et al.'s (2008) ecological framework, only examining two of the four environmental levels of

influence on diet due to the time and financial constraints. Story et al.'s full model offered a robust and comprehensive examination of the critical environmental factors impacting weight status. The final structural model, although based on substantive theory and prior research, only considered factors from the individual and social environmental levels of influence.

Furthermore, the specific target population for the present study limits the ability to generalize the study findings broadly, as the inquiry only examined the behaviors and weight status of urban, African-American adolescent females at a specific point in time. The study did not take into considerations variations in normal diet or weight patterns at the time of data collection. Finally, the inconsistencies between the present study's findings and the literature may be related to the use of self-reported data. Self-reported data collection methods, such as survey research, often offer as many challenges as benefits. Although it is the least burdensome on participants and most cost effective, self-reported data also often is subject to introducing social desirability error.

Unfortunately, one simple solution or antidote will not solve the public health concern of childhood overweight and obesity, as its foundation roots deep within individual and social-environmental influences and behaviors. The results and recommendations from the current study offer an optimistic piece to the complex public health puzzle of gender disparities in overweight and obesity prevalence. Educational leaders must integrate health behavior change theory into traditional education and leadership practice and prepare themselves to begin actively addressing the concern in the school environment by implanting health behavior change strategies at various ecological environmental levels. The efforts exerted by educational leaders, if collectively and

concertedly executed, have the potential to significantly impact childhood overweight and obesity prevalence rates and eliminate associated racial and gender disparities.

Appendix A: Cover Letter

College of Education and Human Services
Department of Leadership, School Counseling, and Sports Management
1 UNF Drive, Jacksonville, FL 32224-2676
Fax (904) 620-2982 · Counseling (904) 620-2838 · Educational Leadership (904) 620-2990
Katherine Kasten, Ph.D., Professor, Doctoral Program Director

Month, XX, 2010

[School or Community Organization]

[Address]

Jacksonville, FL, 322XX

Dear [Principal or Community Organization Administrator]:

Greetings! My name is Jevetta Stanford and I am currently a doctoral candidate in the Department of Leadership, School Counseling, and Sports Management at the University of North Florida. I would like to take this opportunity to solicit your help in understanding the childhood obesity epidemic.

In an effort to better understand how different factors impact weight, I would like to administer a one-time questionnaire about diet and perceived behaviors and collect height and weight information from African-American adolescent girls participating in the Team-Up afterschool program in your school. Trained dietetic students from the University of North Florida will give the questionnaires and collect the height and weight information. Giving the questionnaire and collecting height and weight information will take about 30-45 minutes to complete. This study is a part of my doctoral dissertation and will help to better understand the influences of ecological and social cognitive factors on weight status among African-American adolescent girls. Hopefully this information will help health educators and professionals in Jacksonville, Florida to better serve this population and help them lead healthy lifestyles. This is an anonymous and confidential questionnaire and the participation in this study is voluntary. This study has been approved by University of North Florida Institutional Review Board and the Duval County Public Schools, Office of Research, Assessment and Evaluation.

This study will begin in March 2011. If you agree to allow your school to participate in this study, please fill out the attached Approval Form and send it back to me using the self-addressed and pre-paid envelope. I will contact your Team-Up coordinator to schedule and confirm dates and time to give the questionnaire. If you need additional information about my study, please feel free to contact me at 904-874-8045 or e-mail me at staj0042@unf.edu. Thank you in advance for your help, cooperation and time.

In Good Health,

Signature Deleted

Jevetta Stanford, Doctoral Candidate
University of North Florida

Appendix B: On-Site Data Collection Approval Form

College of Education and Human Services
Department of Leadership, School Counseling, and Sports Management
1 UNF Drive, Jacksonville, FL 32224-2676
Fax (904) 620-2982 · Counseling (904) 620-2838 · Educational Leadership (904) 620-2990
Katherine Kasten, Ph.D., Professor, Doctoral Program Director

APPROVAL FORM TO CONDUCT DATA COLLECTION

TITLE OF RESEARCH: Ecological Influences on Child Weight in African-American Middle School Females in Jacksonville, Florida: A Structural Equation Analysis

#1: ☐ I, _____, give Jevetta Stanford permission to administer the Youth Diet and Behavior Questionnaire and collect height and weight information from our program's youth participates at _____.

#**2:** ☐ I am sorry. I cannot give Jevetta Stanford permission to administer

The Youth Diet and Behavior Questionnaire and collect height and weight information.

If you have checked box # 2, you do not have to finish the following section; thank you for your time.

Please provide contact information for your organization.

ORGANIZATION/SCHOOL NAME	
CONTACT'S NAME	
TITLE	
MAILING ADDRESS	
PHONE	
ALTERNATE PHONE	
E-MAIL	

_____ _____

Organizational Representative Date

Recruitment Script

My name is Jevetta Stanford and I am a doctoral candidate at the University of North Florida, conducting a study to better understand how different factors influence weight under the supervision of Dr. Katherine Kasten. The purpose of this research study is to look at how diet and perceived behaviors influence weight in African-American adolescent girls. The results of the study may help health educators and professionals understand the causes of childhood obesity and help African-American girls' live healthier lives. I would like to ask you, as an African-American girl, to take part in the study and permission from caregivers for your daughters to take part in the study.

Girl participants will be asked to answer 39 questions about the foods she ate yesterday, how sure she is about the foods she eats, and what others want her to eat. After answering the questions, she will be weighed and measured for height. Trained UNF students will assist in collecting the height and weight information. Participants will not have to answer any question or give height and weight information if they do not wish to. Height and weight information will be taken in a screened area to make sure no one other than the UNF student and the girl participant sees the height and weight information. After answering the questions and giving height and weight information, the UNF students will use the height and weight information to calculate the girl participant's body mass index (BMI) and record it in a parent toolkit. The toolkit will be sealed and given to the girl participants' to give to their caregivers to let them know their daughter's level of risk is for overweight or obesity. The toolkit will have tips for caregivers to help their kids eat better and be more active. The study will be advertised during your health and/or physical education class. The entire procedure will take between 30-45 minutes to complete and will take place between the months of May and June 2011. The answers and height and weight information will be kept on a secure computer network at the University of North Florida and destroyed after the study is complete, and only the research team will be able to see her responses. No identifiable information will be connected to any of the girl participant's individual responses and all responses and information given will be anonymous.

A possible risk of the study is feeling anxiety about weight and body image. Caregivers will receive referral information on ways to improve obesity risk in the obesity awareness toolkit. Also, working together with your caregiver to act quickly in seeking help can reduce or eliminate this potential risk. Girls that take part in the study will be able to take part in the 5210 Party and learn Zumba fitness and ways to eat healthy. The benefits include helping to identify the causes of obesity in this group of girls.

The study is completely voluntary and you (and your daughter) have the right to change your mind about taking part in the study at anytime with no negative action. If you have any questions about this study, please contact me at 904-874-8045, or my dissertation chair, Dr. Kasten, at (904) 620-1789. Questions or concerns about your child's rights as research participant may be directed to Dr. Kareem Jordon, UNF Institutional Review Board, (904) 620-2498.

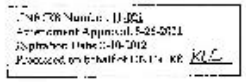
Appendix D: Recruitment Brochure

University of North Florida
College of Education and Human Services
Department of Leadership, School Counseling, and Sports Management
1 UNF Drive, Jacksonville, FL 32224-2676
Fax (904) 620-2982
Counseling (904) 620-2838
Educational Leadership (904) 620-2990
Katherine Kasten, Ph.D., Professor,
Doctoral Program Director

For more information about the study, please contact:
Principal Investigator: Jevetta Stanford
Telephone: 904-874-8045
E-mail: staj0042@unf.edu

Faculty Advisor: Dr. Katherine Kasten
Telephone: 904-620-1789
E-mail: kkasten@unf.edu

Questions or concerns about your child's rights as research participant may be directed to Dr. Kathaleen Bloom, UNF Institutional Review Board, (904) 620-1472.



RESEARCH STUDY TITLE:

Ecological Influences on Child Weight in African-American Adolescent Females in Jacksonville, Florida: A Structural Equation Analysis

A Dissertation Project for
College of Education and Human Services
Department of Leadership, School Counseling, and Sports Management

Principal Investigator: Jevetta Stanford
Telephone: 904-874-8045
E-mail: staj0042@unf.edu

Faculty Advisor: Dr. Katherine Kasten
Telephone: 904-620-1789
E-mail: kkasten@unf.edu

What is this all about?

- This is a research study to better understand the causes of childhood obesity in African-American adolescent girls.
- The purpose of this study is to look at how diet and perceived behaviors influence weight in African-American adolescent girls.
- We need your permission to allow your daughter to participate in the study.

What Will Happen in the Study?

- The study will take place during the 2011-2012 school year in your daughter's health or physical education class.
- The study will take about 30-45 minutes from start to finish.
- Your daughter will:
  - Answer 39 questions about the foods they ate yesterday, how sure they are about the foods they eat, and what others want them to eat, and
  - Give their height and weight.
- Trained UNF students will record your daughter's height and weight on the answer sheets with the answers to that your daughter will give for the diet and perceived behavior questions.
- Height and weight will be taken in a screened area for privacy; no will see their height and weight other than the trained UNF student and your daughter.
- Your daughter does not have to answer any question or give height and weight if she does not want to.
- UNF students will use the height and weight information to calculate the body mass index (BMI) and provide it for you in an obesity awareness toolkit.
- Caregivers will receive an obesity awareness toolkit to learn your daughter's risk for obesity..
- The toolkit also has tips for you to help your kids eat better and be more active.
- A possible risk of the study is your daughter experiencing anxiety about her weight or body image. You will receive information on ways to reduce her level of risk. Acting quickly to get help in improving risk and involving her in the process will help to prevent these feelings in your daughter.
- Only the research team will see your daughter's answers and information and there is no way to connect answers and information given back to your daughter.
- The answers and information will be kept on a secure computer network and destroyed after the study is complete.
- The study is voluntary and you and your daughter have the right to stop taking part in the study at anytime without any negative action.
- Taking part in the study will allow your daughter to take part in the 5210 Party where she will learn Zumba fitness and ways to eat healthier.

Lead Investigator: Jevetta Stanford
Telephone: 904-874-8045
E-mail: sta0042@unf.edu

Faculty Advisor: Dr. Katherine Kasten
Telephone: 904-620-1789
E-mail: kkasten@unf.edu

Appendix E: Recruitment Promotional Flyers

Are you an African-American girl aged 12-17 years old?

- If so, we need your help with a research study to learn about the causes of childhood obesity!
- *What do I have to do?*
  - •Answer some questions about:
    - •The foods you ate yesterday,
    - •How sure you are about the foods you eat,
    - •What others want you to eat, and
  - •Give your height and weight.

UNF IRB Number: 11-021
Amendment Approval: 06-01-2011
Expiration Date: 03-10-2012
Processed on behalf of UNF's IRB

Signature Deleted

•*How long will it take?* Answering the questions and giving the information will take about 30-45 minuets from start to finish.

•*What are the risk, compensation, and benefit?* Risks of the study are related to the way you may feel after finding out your level of risk. But your parents will learn ways to help you improve your level of risk. You will get to take part in the 5210 Party for taking part in the study. The benefit is that we will learn how to reduce the risk of obesity for girls like yourself.

•Your parents/caregiver will get a toolkit to let them know your obesity risk and ways to help you eat better and be more active.

Get help for those at risk!

Take part in the study and join the

5 2 1 0 Party!

Learn Zumba Fitness & Get Free Food!

When is it?

Where is it?

What time are they doing it?

Only researchers will see your answers!

Who do I talk to if I have more questions?

Jevetta Stanford, Lead Investigator
(904) 874-8045 staj0042@unf.edu

Dr. Katherine Kasten Faculty Advisor
(904) 620-1789 kkasten@unf.edu

Appendix F: Survey & Answer Sheet

UNF IRB Number: 11-003
Approval Date: 03-10-2011
Expiration Date: 03-10-2012
Processed on behalf of UNF's IRB KLC

YOUTH DIET AND BEHAVIOR QUESTIONNAIRE (YDBQ)

INSTRUCTIONS: Tell us about the foods you usually eat and drink. Fill in one answer for each question that is true for you.

1.		**Yesterday, did you eat cheese by itself or on your food?** *Count cheese on pizza or in foods like tacos, enchiladas, sandwiches, cheeseburgers, or macaroni and cheese.*	A NO, I did not eat cheese yesterday.	B YES, I ate cheese 1 time yesterday.	C YES, I ate cheese 2 times yesterday.	D YES, I ate cheese 3 or more times yesterday.
2.		**Yesterday, did you drink any kind of milk?** *Count chocolate or other flavored milk, milk on cereal, or drinks make with milk?*	A NO, I did not drink milk yesterday.	B YES, I drank milk 1 time yesterday.	C YES, I drank milk 2 times yesterday.	D YES, I drank milk 3 or more times yesterday.
3.		**Yesterday, did you eat yogurt or cottage cheese or drink a yogurt drink?** *Do not count frozen yogurt.*	A NO, I did not eat any of the foods listed yesterday.	B YES, I ate one of those foods 1 time yesterday.	C YES, I ate one of those foods 2 times yesterday.	D YES, I ate one of those foods 3 or more times yesterday.
4.		**Yesterday, did you eat rice, macaroni, spaghetti or pasta noodles?**	A NO, I did not eat any of the foods listed yesterday.	B YES, I ate one of those foods 1 time yesterday.	C YES, I ate one of those foods 2 times yesterday.	D YES, I ate one of those foods 3 or more times yesterday.
5.		**Yesterday, did you eat bread, buns, bagels, tortillas, or rolls?**	A NO, I did not eat any of the foods listed yesterday.	B YES, I ate one of those foods 1 time yesterday.	C YES, I ate one of those foods 2 times yesterday.	D YES, I ate one of those foods 3 or more times yesterday.
6.		**Yesterday, did you eat hot or cold cereal?**	A NO, I did not eat any cereal yesterday.	B YES, I ate cereal 1 time yesterday.	C YES, I ate cereal 2 times yesterday.	D YES, I ate cereal 3 or more times yesterday.
7.		**Yesterday, did you eat vegetables?** *Vegetables are all cooked and uncooked vegetables; salads; and boiled, baked, and mashed potatoes. Do not count French fries or chips.*	A NO, I did not eat any vegetables yesterday.	B YES, I ate vegetables 1 time yesterday.	C YES, I ate vegetables 2 times yesterday.	D YES, I ate vegetables 3 or more times yesterday.

Approved by the UNF Institutional Review Board Protocol #XXXX, for use through XX-XX-XXXX. The questionnaire is a adaptation of CATCH/TEMI Mini Surveys 1a, 1, & 7, developed by Mikhael & Susan Dall Center for Advancement of Healthy Living, University of Texas School of Public Health. Reference: Hoelscher D.M., Day, R.S., Kelder, S.H. & Ward, J.L. (2003) Reproducibility and validity of the secondary level School-Based Nutrition Monitoring student questionnaire. Journal of American Dietetic Association, 103(2),186-94.

YOUTH DIET AND BEHAVIOR QUESTIONNAIRE (YDBQ)

8. 

Yesterday, did you eat fruit? *Do not count fruit juice.*

A. NO, I did not eat any fruit yesterday.
B. YES, I ate fruit 1 time yesterday.
C. YES, I ate fruit 2 times yesterday.
D. YES, I ate fruit 3 or more times yesterday.

9. 

Yesterday, did you drink fruit juice? Fruit juice is a drink that 100% fruit juice, like orange juice, apple juice, or grape juice. Do not count punch, Kool-Aide, sports drinks, or other fruit-flavored drinks.

A. NO, I did not drink fruit juice yesterday.
B. YES, I drank fruit juice 1 time yesterday.
C. YES, I drank fruit juice 2 times yesterday.
D. YES, I drank fruit juice 3 or more times yesterday.

10. 

How sure are you that you can eat whole grain, low sugar cereal instead of high sugar cereal?

A. Not Sure
B. A Little Sure
C. Very Sure

11. 

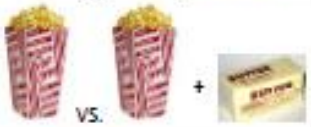
How sure are you that you can ask your caregiver for fresh fruit as a snack?

A. Not Sure
B. A Little Sure
C. Very Sure

12. 

How sure are you that you can eat a baked potato instead of French fries?

A. Not Sure
B. A Little Sure
C. Very Sure

13. 

How sure are you that you can eat popcorn without butter instead of popcorn with butter?

A. Not Sure
B. A Little Sure
C. Very Sure

14. 

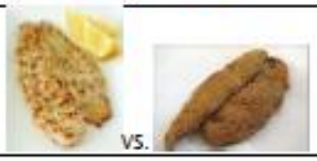
How sure are you that you can eat a grilled chicken sandwich instead of a hamburger?

A. Not Sure
B. A Little Sure
C. Very Sure

15. 

How sure are you that you can eat fresh fruit instead of candy?

A. Not Sure
B. A Little Sure
C. Very Sure

16. 

How sure are you that you can eat a grilled fish instead of a fried fish?

A. Not Sure
B. A Little Sure
C. Very Sure

UNF IRB Number: 11-023
Approval Date: 03-10-2011
Expiration Date: 03-10-2012
Processed on behalf of UNF's IRB JKLC

YOUTH DIET AND BEHAVIOR QUESTIONNAIRE (YDBQ)

17.	 VS.	How sure are you that you can eat whole grain bread instead of white bread? A Not Sure B A Little Sure C Very Sure
18.	 VS.	How sure are you that you can drink water instead of a fruit drink? A Not Sure B A Little Sure C Very Sure
19.	 VS.	How sure are you that you can drink low-fat milk instead of a soft drink (soda)? A Not Sure B A Little Sure C Very Sure
20.	 VS.	How sure are you that you can eat 1 scoop of ice cream instead of 3 scoops of ice cream? A Not Sure B A Little Sure C Very Sure
21.		How sure are you that you can eat breakfast every day? A Not Sure B A Little Sure C Very Sure
22.		How sure are you that you can ask your caregiver for vegetables at dinner? A Not Sure B A Little Sure C Very Sure
23.		How sure are you that you can order a salad at a restaurant? A Not Sure B A Little Sure C Very Sure
24.		How sure are you that you can ask your caregiver for whole-grain bread? A Not Sure B A Little Sure C Very Sure
25.	My parents tell me to eat lots of fruits and vegetables. A Never or Almost Never B Sometimes C Always or Almost Always	
26.	My parents tell me to drink water instead of a soft drink (soda). A Never or Almost Never B Sometimes C Always or Almost Always	

YOUTH DIET AND BEHAVIOR QUESTIONNAIRE (YDBQ)

27. My parents tell me to eat whole-grain bread instead of white bread.

A Never or Almost Never | B Sometimes | C Always or Almost Always

28. My parents tell me to eat breakfast every morning.

A Never or Almost Never | B Sometimes | C Always or Almost Always

29. My parents tell me to drink low-fat milk.

A Never or Almost Never | B Sometimes | C Always or Almost Always

30. My teachers tell me to eat lots of fruits and vegetables.

A Never or Almost Never | B Sometimes | C Always or Almost Always

31. My teachers tell me to drink water instead of a soft drink (soda).

A Never or Almost Never | B Sometimes | C Always or Almost Always

32. My teachers tell me to eat whole-grain bread instead of white bread.

A Never or Almost Never | B Sometimes | C Always or Almost Always

33. My teachers tell me to eat breakfast every morning.

A Never or Almost Never | B Sometimes | C Always or Almost Always

34. My teachers tell me to drink low-fat milk.

A Never or Almost Never | B Sometimes | C Always or Almost Always

35. I think my friends want me to eat lots of fruits and vegetables.

A Never or Almost Never | B Sometimes | C Always or Almost Always

36. I think my friends want me to drink water instead of a soft drink (soda).

A Never or Almost Never | B Sometimes | C Always or Almost Always

37. I think my friends want me to eat whole-grain bread instead of white bread.

A Never or Almost Never | B Sometimes | C Always or Almost Always

38. I think my friends want me to eat breakfast every morning.

A Never or Almost Never | B Sometimes | C Always or Almost Always

39. I think my friends want me to drink low-fat milk.

A Never or Almost Never | B Sometimes | C Always or Almost Always

YOUTH DIET AND BEHAVIOR QUESTIONNAIRE (YDBQ)

Data Collection Form

Site Name	Ht	Wt	BMI	BMI %

Age ✔ one	☐ 12	☐ 13	☐ 14	☐ 15	☐ 16	☐ 17

1.	1	2	8	6	21.	1	2	8
2.	1	2	8	6	22.	1	2	8
3.	1	2	8	6	23.	1	2	8
4.	1	2	8	6	24.	1	2	8
5.	1	2	8	6	25.	1	2	8
6.	1	2	8	6	26.	1	2	8
7.	1	2	8	6	27.	1	2	8
8.	1	2	8	6	28.	1	2	8
9.	1	2	8	6	29.	1	2	8
10.	1	2	8	6	30.	1	2	8
11.	1	2	8		31.	1	2	8
12.	1	2	8		32.	1	2	8
13.	1	2	8		33.	1	2	8
14.	1	2	8		34.	1	2	8
15.	1	2	8		35.	1	2	8
16.	1	2	8		36.	1	2	8
17.	1	2	8		37.	1	2	8
18.	1	2	8		38.	1	2	8
19.	1	2	8		39.	1	2	8
20.	1	2	8					

Appendix G: Parent Consent

INFORMED CONSENT AND PARENT INFORMATION LETTER

RESEARCH STUDY TITLE:

Ecological Influences on Child Weight in African-American Adolescent Females in Jacksonville, Florid: A Structural Equation Analysis

My name is Jevetta Stanford and I am a doctoral candidate at the University of North Florida conducting a study to better understand how different factors influence weight under the supervision of Dr. Katherine Kasten. The purpose of this study is to look at how diet and perceived behaviors influence weight in African-American adolescent girls. The results of the study may help health educators and professionals understand the causes of childhood obesity and help African-American girls' live healthier lives. With your permission, I would like to ask your daughter to volunteer for this study.

Your daughter will be asked to answer 39 questions about the foods she ate yesterday, how sure she is about the foods she eats, and what others want her to eat. After answering the questions, she will be weighed and measured for height. Trained UNF students will assist in collecting the height and weight information from her. Your daughter will not have to answer any question or give height and weight information if she does not wish to. Height and weight information will be taken in a screened area to make sure no one other than the UNF student and your daughter sees the height and weight information. After she answers the questions and gives height and weight information, the UNF students will use the height and weight information to calculate your daughter's body mass index (BMI) and record it in an obesity awareness toolkit. The toolkit will be sealed and given to you to let you know what your daughter's level of risk is for obesity. The toolkit will have tips for caregivers to help their kids eat better and be more active. The study will be advertised during your daughter's health or physical education class at school by flyers and brochures. The entire procedure will take between 30-45 minutes to complete and will take place during the 2011-2012 school year. The answers and height and weight information will be kept on a secure computer network at the University of North Florida and destroyed after the study is complete, and only the research team will be able to see her responses. No identifiable information will be connected to any of your daughter's individual responses and all responses and information given by your daughter will be anonymous.

A possible risk of the study is your daughter feeling anxiety about her weight and body image. You will receive referral information on ways to improve her obesity risk in the obesity awareness toolkit. In addition, acting quickly to seek help and involving her in the process can reduce or eliminate this potential risk. For taking part in the study, your daughter will be able to attend the 5210 Party to learn Zumba fitness and ways to eat healthy. The benefits include helping to identify the causes of obesity in this group of girls.

The study is completely voluntary and you and your daughter have the right to change your mind about taking part in the study at anytime with no negative action. If you have any questions about this study, please contact me at 904-874-8045, or my dissertation chair, Dr. Kasten, at (904) 620-1789. Questions or concerns about your child's rights as research participant may be directed to Dr. Kathaleen Bloom, UNF Institutional Review Board, (904) 620-1472.

UNF IRB Number: 11-021
Amendment Approval: 8-26-2011
Expiration Date: 3-10-2012
Processed on behalf of UNF's IRB KLC

INFORMED CONSENT/ASSENT SIGNATURE PAGE

RESEARCH STUDY TITLE:

Ecological Influences on Child Weight in African-American Adolescent Females in Jacksonville, Florida: A Structural Equation Analysis

The study investigator or the investigator's representative has provided a written explanation to the participant's legal representative outlining the purpose, the procedures, the possible benefits, and the risks of this research study; the alternatives to being in the study; and how privacy will be protected:

Signature Deleted

_____ _____
Signature of Study Investigator Date

PARENT/ADULT LEGALLY REPRESENTING THE STUDY PARTICIPANT. By signing this form, you voluntarily give your permission for the person named below to participate in this study and acknowledge receipt of a copy of the study description. You are not waiving any legal rights for yourself or the person you are legally representing. After your signature, please print your name and your relationship to the study participant.

_____ _____
Consent Signature of Parent/Legal Representative Date

_____ _____
Print: Name of Legal Representative Print: Relationship to Study Participant

_____
Print: Name of Study Participant

UNF IRB Number: 11-021
Amendment Approval: 8-26-2011
Expiration Date: 3-10-2012
Processed on behalf of UNF's IRB KLC

Informed Consent and Parent Information Letter

RESEARCH STUDY TITLE:

Ecological Influences on Child Weight in African-American Adolescent Females in Jacksonville, Florida: A Structural Equation Analysis

Parent Copy-Please Keep for your Records!

My name is Jevetta Stanford and I am a doctoral candidate at the University of North Florida conducting a study to better understand how different factors influence weight under the supervision of Dr. Katherine Kasten. The purpose of this study is to look at how diet and perceived behaviors influence weight in African-American adolescent girls. The results of the study may help health educators and professionals understand the causes of childhood obesity and help African-American girls' live healthier lives. With your permission, I would like to ask your daughter to volunteer for this study.

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UNF IRB Number: 11-023
Amendment Approval: 8-26-2011
Expiration Date: 3-10-2012
Processed on behalf of UNF's IRB KLC

College of Education and Human Services
Department of Leadership, School Counseling, and Sports Management
1 UNF Drive, Jacksonville, FL 32224-2676
Fax (904) 620-2982 - Counseling (904) 620-2838 - Educational Leadership (904) 620-2990
Katherine Kasten, Ph.D., Professor, Doctoral Program Director

RESEARCH STUDY TITLE:

Ecological Influences on Child Weight in African-American Adolescent Females in Jacksonville, Florida: A Structural Equation Analysis

YOUTH ASSENT

Hello! My name is Jevetta Stanford and I am a student at the University of North Florida. I am trying to learn about the causes of childhood obesity. I will be working with several other girls in health and physical education classes at your school. If you decide to take part in this research study, you will give your height and weight and answer questions about the foods you ate yesterday, how sure you are about the foods you eat, and what you think others want you to eat. It will take about 30-45 minutes for you to give the information. You do not have to be in this study if you don't want to and you can quit the study at any time. Other than the researchers, no one will know your answers, including other people from the program you are involved with, and there no way to connect the answers you give back to you. If you don't like a question, you don't have to answer it and, if you ask, your answers will not be used in the study. For taking part in the study, you will be able to take part in the 5210 Party to learn Zumba fitness and ways to eat healthier. The benefits of taking part in the study include learning more about your health. A potential risk of taking part in the study is feeling anxiety about your weight and body image. Your caregiver will receive information on places you can go to get help and working with your caregiver to get help can help reduce theses feeling. I also want you to know that whatever you decide, this will not affect anything you do with the program you are involved with. If you have any questions about this study, please contact me at 904-874-8045, or my dissertation chair, Dr. Kasten, at (904) 620-1789. Questions or concerns about your rights as research participant may be directed to Dr. Kathaleen Bloom, UNF Institutional Review Board, (904) 620-1472.

PARTICIPANTS WHO CANNOT CONSENT BUT CAN READ AND/OR UNDERSTAND ABOUT THE STUDY. Although legally you cannot "consent" to be in this study, we need to know if you want to take part. If you decide to take part in this study, and your parent or the person legally responsible for you gives permission, we will need a signed parent consent from the person legally responsible for you. Your signing below means that you agree to take part (assent) and have received a copy of the study description. The signature of your parent/legal representative on the parent consent form means he or she gives permission (consent) for you to take part.

_____ _____
Print-Name of Study Participant Date

_____ _____
Assent Signature of Participant Date

The study investigator or the investigator's representative has provided a written explanation to the participant's legal representative outlining the purpose, the procedures, the possible benefits, and the risks of this research study; the alternatives to being in the study; and how privacy will be protected:

Signature Deleted

_____ _____
Signature of Study Investigator Date

UNF IRB Number: 11-021
Amendment Approval: 8-26-2011
Expiration Date: 3-10-2012
Processed on behalf of UNF's IRB KLC

College of Education and Human Services
Department of Leadership, School Counseling, and Sports Management
1 UNF Drive, Jacksonville, FL 32224-2676
Fax (904) 620-2982 - Counseling (904) 620-2838 - Educational Leadership (904) 620-2990
Katherine Kasten, Ph.D., Professor, Doctoral Program Director

RESEARCH STUDY TITLE:

Ecological Influences on Child Weight in African-American Adolescent Females in Jacksonville, Florida: A Structural Equation Analysis

Youth Assent ***YOUTH COPY-PLEASE KEEP FOR YOUR RECORDS!***

YOUTH ASSENT

Hello! My name is Jevetta Stanford and I am a student at the University of North Florida. I am trying to learn about the causes of childhood obesity. I will be working with several other girls in health and physical education classes at your school. If you decide to take part in this research study, you will give your height and weight and answer questions about the foods you ate yesterday, how sure you are about the foods you eat, and what you think others want you to eat. It will take about 30-45 minutes for you to give the information. You do not have to be in this study if you don't want to and you can quit the study at any time. Other than the researchers, no one will know your answers, including other people from the program you are involved with, and there no way to connect the answers you give back to you. If you don't like a question, you don't have to answer it and, if you ask, your answers will not be used in the study. For taking part in the study, you will be able to take part in the 5210 Party to learn Zumba fitness and ways to eat healthier. The benefits of taking part in the study include learning more about your health. A potential risk of taking part in the study is feeling anxiety about your weight and body image. Your caregiver will receive information on places you can go to get help and working with your caregiver to get help can help reduce theses feeling. I also want you to know that whatever you decide, this will not affect anything you do with the program you are involved with. If you have any questions about this study, please contact me at 904-874-8045, or my dissertation chair, Dr. Kasten, at (904) 620-1789. Questions or concerns about your rights as research participant may be directed to Dr. Kathaleen Bloom, UNF Institutional Review Board, (904) 620-1472.

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_____ _____
Print-Name of Study Participant Date

_____ _____
Assent Signature of Participant Date

The study investigator or the investigator's representative has provided a written explanation to the participant's legal representative outlining the purpose, the procedures, the possible benefits, and the risks of this research study; the alternatives to being in the study; and how privacy will be protected.

Signature Deleted

_____ _____
Signature of Study Investigator Date

UNF IRB Number: 11-033
Amendment Approval: 6-26-2011
Expiration Date: 5-30-2012
Processed on behalf of UNF's IRB: M.C.

Appendix I: UNF IRB Approval & Amendment Approvals

UNF
UNIVERSITY of NORTH FLORIDA.
Office of Research and Sponsored Programs
1 UNF Drive
Jacksonville, FL 32224-2665
904-620-2455 FAX 904-620-2457
Equal Opportunity/Equal Access/Affirmative Action Institution

MEMORANDUM

UNF IRB Number: 11-021
Approval Date: 03-10-2011
Expiration Date: 03-10-2012
Processed on behalf of UNF's IRB KLC

DATE: March 10, 2011

TO: Ms. Jevetta Stanford

VIA: Dr. Katherine Kasten
LSCSM

FROM: Dr. Kareem Jordan, Vice Chairperson
On behalf of the UNF Institutional Review Board

RE: Review by the UNF Institutional Review Board IRB#11-021:
"Ecological Influences on Child Weight in African-American Adolescent Females in Jacksonville, Florida: A Structural Equation Analysis"

This is to advise you that your project, "Ecological Influences on Child Weight in African-American Adolescent Females in Jacksonville, Florida: A Structural Equation Analysis," has undergone "expedited, category #4 & 7" review on behalf of the UNF Institutional Review Board and was approved.

This approval applies to your project in the form and content as submitted to the IRB for review. Any variations or modifications to the approved protocol and/or informed consent forms as they relate to dealing with human subjects must be cleared with the IRB prior to implementing such changes. Any unanticipated problems involving risk and any occurrence of serious harm to subjects and others shall be reported promptly to the IRB within 3 business days.

Your study has been approved for a period of 12 months. If your project continues for more than one year, you are required to provide a Continuing Status Report to the UNF IRB prior to **2/10/2012** if your study will be continuing past the 1-year anniversary of the approval date. *We suggest you submit your status report 11 months from the date of your approval date as noted above to allow time for review and processing.*

As you may know, **CITI Course Completion Reports are valid for 3 years**. Ms. Stanford's completion report is valid through 6/13/2013, Mr. Abountiolas' completion report is valid through 1/21/2014, Ms. Acquaviva's completion report is valid through 2/13/2014, Ms.

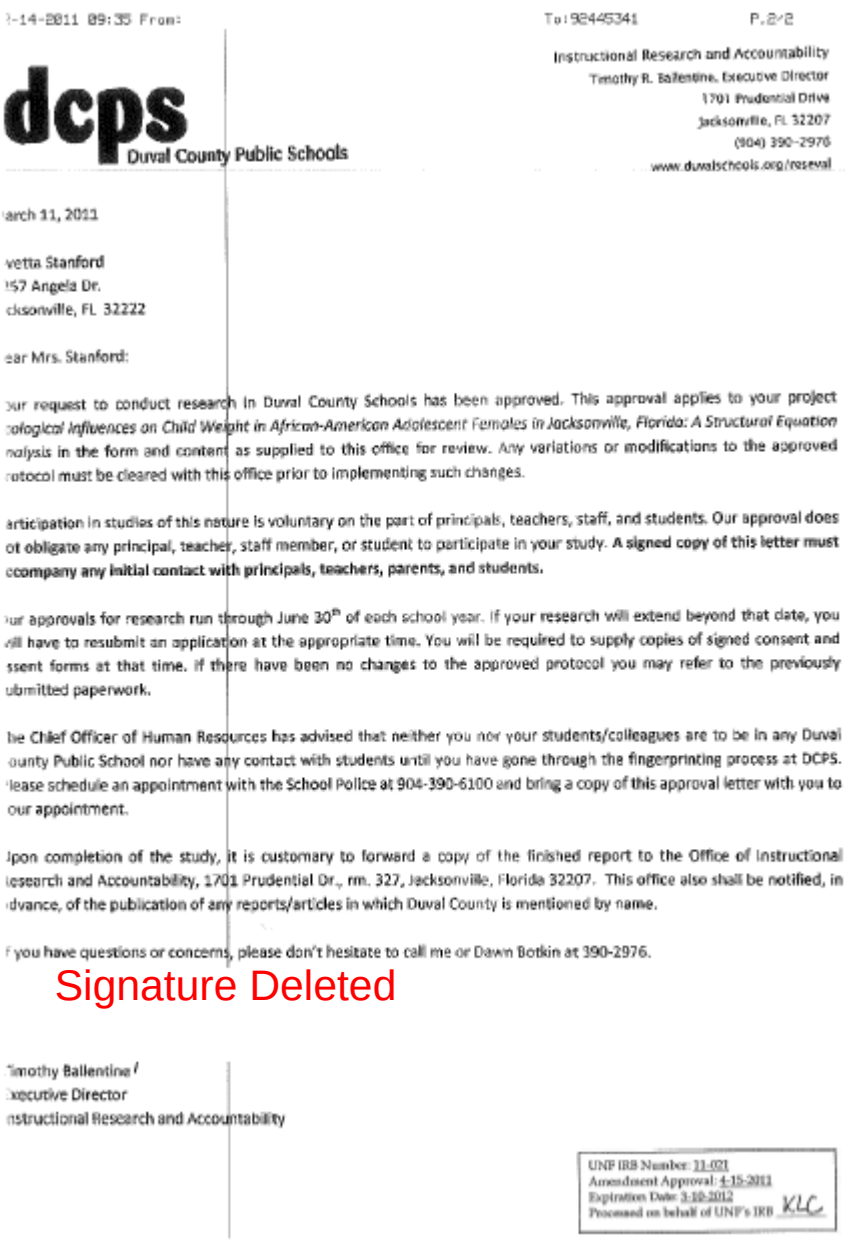
Almenas-Garcia's completion report is valid through 1/20/2014, Mr. Archbold's completion report is valid through 1/20/2014, Ms. Brown's completion report is valid through 1/21/2014, Mr. Campese's completion report is valid through 1/21/2014, Mr. Davis' completion report is valid through 1/20/2014, Ms. Delamater's completion report is valid through 1/21/2014, Ms. Emmons' completion report is valid through 1/21/2014, Ms. Georgeopoulos' completion report is valid through 1/24/2014, Ms. Griffith's completion report is valid through 1/15/2014, Ms. Harrell's completion report is valid through 2/07/2014, Ms. Harrop's completion report is valid through 1/21/2014, Ms. Harwood's completion report is valid through 1/20/2014, Ms. Hogue's completion report is valid through 1/09/2014, Mr. Mahaney's completion report is valid through 1/19/2014, Mr. Martin's completion report is valid through 1/18/2014, Ms. A. Matthews' completion report is valid through 1/23/2014, Ms. D. Matthews' completion report is valid through 1/19/2014, Nr. Mendoza's completion report is valid through 1/18/2014, Ms. Morton's completion report is valid through 1/20/2014, Ms Patel's completion report is valid through 1/19/2014, Ms. Picard's completion report is valid through 1/21/2014, Ms. Gunasekaran's completion report is valid through 1/19/2014, Ms. Ryan's completion report is valid through 1/19/2014, Ms. Smith's completion report is valid through 1/19/2014, Ms. Steinmetz's completion report is valid through 1/19/2014, Ms. Villanueva's completion report is valid through 1/20/2014, and Ms. Zuber's completion report is valid through 1/21/2014.

If your completion report expires within the next 60 days or has expired, please take CITI's refresher course and contact us to let us know you have completed that training. If you have not yet completed your CITI training or if you need to complete the refresher course, please do so by following this link: http://www.citiprogram.org/. Based on your research interests we ask that you complete either the "Group 1 Biomedical Research Investigators and Key Personnel" CITI training or the "Group 2 Social Behavioral Researcher Investigators and Key Personnel" CITI training.

Should you have questions regarding your project or any other IRB issues, please contact Kayla Champaigne at 904-620-2312, or K.Champaigne@unf.edu.

UNF IRB Number: 11-021
Approval Date: 03-10-2011
Expiration Date: 03-10-2012
Processed on behalf of UNF's IRB KLC

Appendix J: Duval County Public Schools Office of Research, Assessment, and Evaluation Approval and Amendment Approval



-14-2011 09:35 From: To:9245341 P.2/2

dcps Duval County Public Schools

Instructional Research and Accountability
Timothy R. Ballentine, Executive Director
1701 Prudential Drive
Jacksonville, FL 32207
(904) 390-2976
www.duvalschools.org/reseval

arch 11, 2011

vetta Stanford
157 Angela Dr.
cksonville, FL 32222

ear Mrs. Stanford:

our request to conduct research in Duval County Schools has been approved. This approval applies to your project *ological Influences on Child Weight in African-American Adolescent Females in Jacksonville, Florida: A Structural Equation nalysis* in the form and content as supplied to this office for review. Any variations or modifications to the approved rotocol must be cleared with this office prior to implementing such changes.

articipation in studies of this nature is voluntary on the part of principals, teachers, staff, and students. Our approval does ot obligate any principal, teacher, staff member, or student to participate in your study. **A signed copy of this letter must ccompany any initial contact with principals, teachers, parents, and students.**

our approvals for research run through June 30th of each school year. If your research will extend beyond that date, you ill have to resubmit an application at the appropriate time. You will be required to supply copies of signed consent and ssent forms at that time. If there have been no changes to the approved protocol you may refer to the previously ubmitted paperwork.

he Chief Officer of Human Resources has advised that neither you nor your students/colleagues are to be in any Duval ounty Public School nor have any contact with students until you have gone through the fingerprinting process at DCPS. lease schedule an appointment with the School Police at 904-390-6100 and bring a copy of this approval letter with you to our appointment.

Upon completion of the study, it is customary to forward a copy of the finished report to the Office of Instructional esearch and Accountability, 1701 Prudential Dr., rm. 327, Jacksonville, Florida 32207. This office also shall be notified, in dvance, of the publication of any reports/articles in which Duval County is mentioned by name.

f you have questions or concerns, please don't hesitate to call me or Dawn Botkin at 390-2976.

Signature Deleted

Timothy Ballentine
Executive Director
nstructional Research and Accountability

UNF IRB Number: 11-021
Amendment Approval: 4-15-2011
Expiration Date: 3-10-2012
Processed on behalf of UNF's IRB KLC

dcps
Duval County Public Schools

Instructional Research and Accountability
Timothy R. Ballentine, Executive Director
1701 Prudential Drive
Jacksonville, FL 32207
(904) 390-2976
www.duvalschools.org/reseval

July 21, 2011

Jevetta Stanford
7257 Angela Dr.
Jacksonville, FL 32222

Dear Mrs. Stanford:

Your request for an extension of your research in Duval County Schools has been approved. This approval applies to your project *Ecological Influences on Child Weight in African-American Adolescent Females in Jacksonville, Florida: A Structural Equation Analysis* in the form and content as supplied to this office for review. Any variations or modifications to the approved protocol must be cleared with this office prior to implementing such changes.

Participation in studies of this nature is voluntary on the part of principals, teachers, staff, and students. Our approval does not obligate any principal, teacher, staff member, or student to participate in your study. **A signed copy of this letter must accompany any initial contact with principals, teachers, parents, and students.**

Our approvals for research run through June 30th of each school year. If your research will extend beyond that date, you will have to resubmit an application at the appropriate time. You will be required to supply copies of signed consent and assent forms at that time. If there have been no changes to the approved protocol you may refer to the previously submitted paperwork.

The Chief Officer of Human Resources has advised that neither you nor your students/colleagues are to be in any Duval County Public School nor have any contact with students until you have gone through the fingerprinting process at DCPS. Please schedule an appointment with the School Police at 904-390-6100 and bring a copy of this approval letter with you to your appointment.

Upon completion of the study, it is customary to forward a copy of the finished report to the Office of Instructional Research and Accountability, 1701 Prudential Dr., rm. 327, Jacksonville, Florida 32207. This office also shall be notified, in advance, of the publication of any reports/articles in which Duval County is mentioned by name.

If you have questions or concerns, please don't hesitate to call me or Dawn Botkin at 390-2976.

Signature Deleted

Timothy Ballentine
Executive Director
Instructional Research and Accountability

UNF IRB Number: 11-021
Amendment Approval: 8-26-2011
Expiration Date: 3-10-2012
Processed on behalf of UNF's IRB KLC

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BIOGRAPHICAL STATEMENT

Jevetta Stanford is the Community Research Associate for Jacksonville in the UF College of Medicine's Clinical and Translation Science Institute, Community Engagement and Research Program. In this role, she facilitates the coordination and implementation of research studies conducted by UF investigators outside of Jacksonville and assist in building successful academic-community partnerships in efforts to conduct community based research. She began her professional career in 2004 with the Baker County Health Department as the Health Educator for an outreach program designed to connect limited resource residents with health resources During her tenure with the Health Department, she also lead the community through a county wide health needs assessment to raise awareness of identified health priorities.

Mrs. Stanford began her tenure with the University of Florida in the Institute of Food Agricultural Science in 2005 as County Extension Faculty for the Youth EFENP program in Duval County. In this role, she developed community partnerships to propel the program into a variety of settings such as after school programs, schools, summer camps and community outreach venues. In 2009, she accepted the position as a State Specialist/ Nutrition Education Coordinator for the Family Nutrition Program. In this role, she provided leadership to 47 county faculty members in nutrition education curriculum selection, program development and evaluation.

Mrs. Stanford received a Bachelor of Science in Dietetics from Florida State University in 2001 and a Masters of Regional and Community Planning from Kansas State University in 2004.