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# Fruit and Vegetable Consumption Among an Ethnically Diverse Sample of Middle School-Aged Girls

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# FRUIT AND VEGETABLE CONSUMPTION AMONG AN ETHNICALLY DIVERSE SAMPLE OF MIDDLE SCHOOL-AGED GIRLS

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Obesity is a major health concern not only for adults, but for children and adolescents as well. Fruit and vegetable (F&V) consumption has been associated with a reduced risk of obesity among children and adolescents, but few children and adolescents meet the nationally recommended amount of daily F&V consumption. Also, few studies have examined this relationship among an ethnically diverse sample. Therefore, the purpose of the current study is to explore factors (parental F&V consumption and F&V self-efficacy) related to F&V consumption among 200 Middle school girls of Hispanic and Non-Hispanic descent. Multiple group path analyses were conducted. High self-efficacy for F&V consumption was associated with higher F&V consumption among Non-Hispanic girls, and vegetable consumption among Hispanic girls. No significant relationships were observed between BMI and child fruit and vegetable consumption, or parental fruit and vegetable consumption and child fruit and vegetable consumption. Future studies should examine these relationships in a longitudinal study to determine causality.

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## Chapter 1 - Introduction

Obesity is one of the leading causes of preventable deaths in the United States and around the world. Due to obesity's association with various chronic diseases and characteristics such as hypertension, cardiovascular diseases, type 2 diabetes and metabolic syndrome, obesity has been labeled one of the greatest threats to public health this century (Eckersley 2001; Kopelman, 2000; Mohindra, 2009). Over the past few decades, obesity has become an epidemic not only among adults, but among children and adolescents as well, and declining physical activity and poor nutrition have both contributed to the obesity epidemic (Zapata, Bryant, McDermott, & Hefelfinger, 2008). For children and adolescents, the status of overweight and obesity are determined by their sex and age specific normograms for body mass index (BMI). Children and adolescents with a BMI equal to or exceeding the age-gender-specific 85th percentile, but below the 95th percentile are defined as overweight and are at risk for obesity and obesity related co-morbidities (Raj & Kumar, 2010). Those with a BMI equal to or exceeding the 95th percentile are defined obese. According to a recent study conducted by Ogden and colleagues (2014), which examined 9120 participants in the 2011-2012 nationally representative National Health and Nutrition Examination Survey, 31.8% of youth (ages 2 to 19) were either overweight or obese, and 16.9% of youth were obese (Ogden, Carroll, Curtin, McDowell, Tabak, & Flegal, 2014). The percentage of adolescents 12 to 19 years of age with a BMI greater than or equal to 30, the adult definition of obesity, was 13.9% (Ogden et al., 2014). Among different ethnic/racial groups, obesity rates varied with the prevalence of obesity (95$^{th}$ percentile and above) lower among non-

Hispanic Asian youth (8.6%), than non-Hispanic white youth (14.1%), non-Hispanic black youth (20.2%), and Hispanic youth (22.4%) (Ogden et al., 2014). There were also difference observed between age groups, however, there were no significant differences between 6 to 11 and 12 to 19 years of age specifically (Ogden et al., 2014). There were no differences observed between boy and girls.

During childhood and adolescence, overweight/obesity is a primary predictor of overweight/obesity in adulthood (Field, Cook, & Gillman, 2005). Deckelbaum and Williams (2001) found that both men and women who were overweight during adolescence had increased age-specific morbidity and mortality relating to cardiovascular and other chronic diseases. Among women specifically, excess weight gained during adolescence that persists into adult life is compounded during childbearing years, with women having a higher prevalence of grade 3 obesity (BMI ≥40) compared to men (Ogden et al., 2014; Todd, Street, Ziviani, Byrne, & Hills, 2015).

Since the introduction of genetically modified foods, high fructose syrup, and fast food services, there has been a drastic change in the diet of Americans and people from other industrialized countries. These changes in diet have led to an increase in the consumption of sugar-sweetened beverages, refined grains and high calorie foods, and a decrease in fruit and vegetable consumption (Drewnowski, 2004). All of these changes have been associated with the increase in obesity rates among children and adolescents (Bourke, Whittaker, & Verma, 2014). The increase in obesity rates has led to a dramatic increase in health care costs due to overweight and obesity and related issues among

children and adolescents in the past two decades (Raj & Kumar, 2010; Wang & Dietz, 2002). Over the past few years, the rapid increase in overweight and obesity cases among children and adolescents in United States that was observed in the early 1990's seem to be plateauing (Ogden, 2006; Ogden, 2012). Nevertheless, obesity remains a serious health issue that requires attention.

Increased consumption of fruit and vegetables has been recommended as one of the key components of a healthy diet (Wang, 2014). Fruit and vegetable consumption has been associated with a reduced risk of obesity and obesity-related comorbidities such as diabetes, cancer, and cardiovascular diseases (Heo, Kim, Wylie-Rosett, Allison, Heymsfield, & Faith, 2011). According to the 2013 Behavioral Risk Factor Surveillance System (BRFSS), only 13.1% of adults met the national fruit intake recommendations and 8.9% met vegetable intake recommendations (Moore & Thompson, 2015). MyPlate, an icon created by the USDA with the intent to prompt consumers to think about building a healthy plate at meal times, recommends that half of every healthy plate should be fruits and vegetables. MyPlate food recommendations also emphasize "focus[ing] on fruits" and "vary[ing] . . . veggies" as the foundational building blocks for a healthy diet (CDC, 2013). Fruits and vegetables provide a diversified, low caloric, and protective, micronutrient rich diet (Sachdeva, Sachdev, & Sachdeva, 2013). The consumption of more fruits and vegetables also promotes healthy eating behavior change across food groups. Epstein and colleagues found that targeting fruit and vegetable consumption led to an increased in the intake of nutritionally dense healthy foods and to a decrease in the intake of low nutrient dense foods among participants (Epstein, Gordy, Raynor,

Beddome, Kilanowski, & Paluch, 2001). Likewise, instructing participants to eat more fruits and vegetables rather than to refrain from eating foods high in fat and sugar, adhering to a restrictive diet, had a greater impact on weight loss (Epstein et al., 2001).

Restrictive diets can result in negative outcomes such as binges and nutritional deficiencies among children and adolescents, and restrictive diets can lead to serious health issues, especially among young girls (Dietz, 1998). Girls have a higher prevalence and incidence of both obesity and eating disorders compared to boys (Field, 2001; Tanofsky-Kraff, 2014). In contrast to restrictive diets, encouraging children and adolescents to consume more fruit and vegetables could help them develop healthy eating behaviors and a healthier and positive attitude about food. However, despite the multiple health benefits of consuming more fruits and vegetables, about 68% of adolescents do not eat the daily-recommended servings of fruits and vegetables (Fahlman, Dake, McCaughtry, & Martin, 2008). Parental eating behaviors and self-efficacy are two factors that have been shown to influence fruit and vegetable consumption among children and adolescents (Pirouznia, 2001).

The differences in eating behaviors and the factors that influence particular eating patterns has been examined throughout the literature. A research study conducted by Field and colleagues (2001) found that girls were more influenced by their parents' views about diet than boys. Girls who reported that they believed it was important to their parent that they were thin were twice as likely as their peers to become highly concerned with weight (Field, 2001). On the other hand, the concern boys had about their weight

was unrelated to the perceived weight importance of their mother or the father (Field, 2001).

In addition to parental eating behaviors, self-efficacy has also been shown throughout the literature to be a strong determinant of eating behaviors among girls (Young, 2004). However, the majority of the studies that have examined the influential effect of parental eating behaviors and self-efficacy on child fruit and vegetable consumption have not examined the effect of these factors on fruit and vegetable consumption across the developmental stages of life from childhood into adolescence and the changes in eating behaviors form childhood to adolescence are mixed. By determining the relationship between different known influential factors of fruit and vegetable consumption and fruit and vegetable consumption during childhood and adolescence, intervention programs and health policies can effectively target and increase fruit and vegetable consumption among the two important developmental stages. The proposed study will examine the following effects on fruit and vegetable consumption among children and adolescents: 1) the direct effect of self-efficacy of fruit and vegetable consumption on child fruit and vegetable consumption; 2) the direct effect of parental fruit consumption on child fruit consumption; 3) the direct effect of parental vegetable consumption on child vegetable consumption; 4) the moderating effect of age on the direct effect of parental fruit and vegetable consumption on child fruit and vegetable consumption; 5) the direct effect of child fruit and vegetable consumption on child BMI; and 6) the moderating effect of ethnicity on all relationships.

The following review of the literature will examine the correlates of fruit and vegetable consumption among children and adolescents (child fruit and vegetable consumption) and obesity. First, the relationship between child fruit and vegetable consumption and obesity will be discussed. Next, the relationship between child fruit and vegetable consumption and parental fruit and vegetable consumption will be presented. Then, the relationship between child fruit and vegetable consumption and child fruit and vegetable self-efficacy will be examined. Lastly, the theoretical framework for the research study, social cognitive theory, and its explanation of the hypothesized relationship between the correlates of child fruit and vegetables consumption and obesity will be presented.

**Assessing Fruit and Vegetable Consumption**

At the individual level, research studies often use questionnaires or detail records to measure a participant's fruit and vegetable consumption. The three methods most commonly used to measure fruit and vegetable consumption at the individual level are 24-hour dietary recalls, food diaries, and food frequency questionnaires (Adamo, Prince, Tricco, Connor-Gorber, & Tremblay, 2009). Food diaries, also known as food records, require the participants to record all of the food they consumed within a specific period of time, usually one week. A food frequency questionnaire, which is often given as a self-report measure, contains structured lists of individual foods or food groups. Participants are asked to give an estimate of how many times they ate a particular food or a food from a particular food group over a specific period of time (day, week, and month). Lastly, 24-hour dietary recalls, unlike food frequency questionnaires and food diaries, require

trained interviewers. Interviewers ask participants to report all food consumed 24-hours prior to the interview, or simply all food consumed the previous day. 24-hour dietary recalls are often administered face-to-face but can also be administered over the phone. Unfortunately, 24-hour dietary recalls can be labor intensive, timely, costly, and require extensive training of interviewers (Fahlman, McCaughtry, Martin, Garn, & Shen, 2012).

Food frequency questionnaires, like 24-hour dietary recalls, can be very time consuming. Food frequency questionnaires can also be difficult to use due to memory recall problems, and the quantification of food can be inaccurate (Fahlman et al., 2012; Kristal, Peters, & Potter, 2005). Also, the reliability and validity estimates for food frequency questionnaires and 24-hour dietary recalls often vary and are underreported (Fahlman, 2012; Neumark-Sztainer, Story, Hannan, & Croll, 2002). The time, cost, and complexity of the 24-hour dietary recall or food frequency questionnaire make both measures the inadequate choices for use in a primary school setting with adolescents and children. Understanding the strengths and weaknesses of using 24-hour dietary recalls or food frequency questions in the primary school setting, Fahlman and colleagues (2012) developed an easy to use and validated food frequency questionnaire called the Eating Behavior Scale. The Eating Behavior Scale (EBS) is a 20-item easy to use, quick, simplistic, valid and reliable measure for students. The EBS also creates minimal disruption in the classroom when administered. For these reasons, the EBS will be used to assess the eating behaviors of middle school aged girls.

**Fruit and Vegetable Consumption and Obesity**

Fruits and vegetables have historically been recommended as a part of the national dietary guidelines because of their high concentration of vitamins, minerals, and phytochemicals (Slavin & Lloyd, 2012). As mentioned previously, adequate fruit and vegetable consumption is necessary for preventing various nutrition-related and chronic diseases (Heo, 2011; Stephens, McNaughton, Crawford, & Ball, 2014). Specifically, the daily consumption of fruit and vegetables is a key component of healthy eating and helps to protect against obesity (Osborne & Forestell, 2012; Szczepanska, Scholz, Liszewska, & Luszczynska, 2013). Diets high in fruits and vegetables have been associated with lower BMI (Buijsse, Feskens, Schulze, Forouhi, Wareham, Sharp, Palli, Tognon, Halkjaer, Tjønneland, & Jakobsen, 2009; Epstein et al., 2001; He, Hu, Colditz, Manson, Willett, & Liu, 2004). Dietary fiber from fruits and vegetables has been shown to enhance satiation, and reduces calorie and fat intake, (Ball, Mishra, & Crawford, 2003; Epstein, 2001; Neumark-Sztainer et al., 2002; Striegel-Moore, 2006). Dietary fiber found in fruits and vegetables has been linked to lower incidence of obesity (Slavin & Lloyd, 2012). Low fruit and vegetable consumption has also been associated with greater adiposity, and substituting fruits and vegetables for higher energy foods has also shown to be an effective strategy for weight management (Kipping, et al., 2014; Larson, Neumark-Sztainer, Hannan, & Story, 2007). Healthy weight management guidelines for adolescents and children identify increased fruit and vegetables intake as an essential dietary strategy in obesity prevention (Neumark-Sztainer et al., 2008; Szczepanska, 2013).

There has been a continuous push by national programs and organizations such as the Supplemental Nutrition Assistance Program and National Alliance for Nutrition and Activity to promote fruit and vegetable consumption across the United States. However, despite the significant improvements in public awareness of the health benefits of fruit and vegetables, the consumption of fruits and vegetables does not appear to have increased significantly. Although the increase of fruit and vegetable consumption is a seemingly feasible target for the general public to achieve, most individuals in the United States do not consume the recommended servings of fruits and vegetables (Casagrande, Wang, Anderson, & Gary, 2007; Evans, Christian, Cleghorn, Greenwood, & Cade, 2012; Kimmons, Gillespie, Seymour, Serdula, & Blanck, 2009). Zapata and colleagues (2008) examined the fruit and vegetable consumption of 4452 middle school-aged students (grade 6-8) and found that less than one fourth of the students met the recommendations for daily fruit and vegetable intake and less than one fifth of the students were aware of the daily recommended serving for fruit and vegetable. Childhood and adolescence are particularly important developmental stages to intervene on fruit and vegetable intake because of the high nutritional needs that are necessary to support the rapid growth of children and adolescents. One factor that has been shown to increase fruit and vegetable consumption among children and adolescents is parental fruit and vegetable consumption.

**Parental Obesity, Child Obesity and Fruit and Vegetable Consumption**

Parental dietary behaviors shape the ‘‘family food environment,’’ which influences the dietary behaviors of children (Campbell, Crawford, & Ball, 2006). One of

the components of the ‘‘family food environment’’ is the availability of fruits and vegetables in the home (Wroten, 2012; Ziegler, Briefel, Ponza, Novak, & Hendricks, 2006). Ideally, the family food environment should have a high availability of fruit and vegetables, parental promotion of fruit and vegetable consumption, and parental modeling of fruit and vegetable consumption (O'Connor et al., 2010; Wroten, 2012). Food availability and modeling have been regarded as two of the main characteristics of the home food environment (Gevers, Kremers, de Vries, & van Assema, 2014; Larsen, 2015). What parents decide to eat and buy for their household determines the accessibility and availability of foods, and their buying fruits and vegetables and making them accessible in the home has been shown to increase fruit and vegetable consumption of children (Cullen et al., 2003; Wroten, 2012).

A positive association between parental fruit and vegetable consumption and child fruit and vegetable consumption is supported throughout the literature (Larson et al., 2007). Parental fruit and vegetable consumption has also been identified as the strongest predictor of child fruit and vegetable consumption by various research studies (Cooke et al. 2004; Goldberg & Gunatsi, 2001; Wardle, Carnell, & Cooke 2005). The behaviors and attitudes of parents regarding fruit and vegetable consumption have also been shown to influence the fruit and vegetable consumption among adolescents (Larson et al., 2007). High parental fruit and vegetable consumption may indicate an increased availability and accessibility of fruits and vegetables in the home environment, which may provide greater opportunity for children to consume, try and become familiar with different types of fruits and vegetables (Fisher, 2002). Girls' fruit and vegetable intake specifically has

been positively associated with the fruit and vegetable intake of their parents, and stronger positive correlations have been observed between the diets of parents and their daughters compared to the diets of their sons (Beydoun & Wang, 2009; Fisher, 2002).

As previously stated, parents can influence their child's health behaviors by modeling healthy behaviors and expressing their attitude and beliefs about particular health behaviors (Cromely et al., 2010). A literature review conducted on the influence of parental modeling on child food intake found significant effects of parental food modeling regardless of methodology, social context, food type, or individual demographics (Larsen, 2015). It has also been suggested that family dinners can provide children with an opportunity to observe their parents' fruit and vegetable eating patterns, because adults are more likely to eat more vegetables, fruits, and fruit juices at dinner time (Larsen, 2015). Research suggests that more evening meals are eaten together by families with less educated mothers compared to families with more educated mothers because less educated mothers are likely to spend more time at home compared to educated mothers. As such, children with less educated mothers appear to have a greater chance to be directly impacted by model eating behavior at the dinner table (Campbell et al., 2002; Larsen, 2015). Mothers have also been shown to be strong role models for their child's health-related behaviors, and significantly positive correlations of fruit and vegetable consumption among mothers and their children have been observed ( Beydoun & Wang, 2009; Hart, Raynor, Jelalian, & Drotar, 2010; Papas et al., 2009; Wroten, 2012).

**Self-Efficacy and Child Fruit and Vegetable Consumption**

A research study by Young (2004) showed that self-efficacy completely mediated the relationship between parental modeling, and fruit and vegetable consumption among adolescents. Self-efficacy is an individual's beliefs about his or her ability to perform a specific required action to attain a desired outcome (Bandura, 1997). Self-efficacy also reflects a person's optimistic self-beliefs when he or she attempts to overcome temptations or adopt a new behavior (Fernandez, 2015). The beliefs about one's ability determines whether or not the person will engage in a behavior, how much effort he or she will expend, and how long the behavior will be sustained in the presence of obstacles and failures (Luszczynska, Tryburcy, & Schwarzer, 2007). Self-efficacy gives individuals who are motivated the confidence to carry out their intentions and to initiate and maintain their behavioral change in unpredictable stages of the change process (Fernandez, 2015; Gutirrez-Doa, Lippke, Renner, Kwon, & Schwarzer, 2009) As such, self-efficacy is an intrapersonal determinant of dietary intake among adults and adolescents (Rasmussen et al., 2006; Stephens, 2014; Young, 2004). Self-efficacy has been shown to help individuals form dietary goals, and a large body of evidence suggests that enhancing self-efficacy results in nutrition change (Fernandez, 2015; Godinho, Alvarez, Lima, & Schwarzer, 2014; Luszczynska, Tryburcy, & Schwarzer, 2007). When intervention studies incorporate behavior change techniques that lead to an increase in self-efficacy, there is an increase in more balanced diets among participants (Fernandez, 2015; Lhakhang, Godinho, Knoll, & Schwarzer, 2014; Luszczynska et al., 2007; Kreausukon, Gellert, Lippke, & Schwarzer, 2012).

Self-efficacy has been identified as one of the strongest and consistent factors associated with greater fruit and vegetables consumption, and individuals with high levels of dietary self-efficacy consume more fruit and vegetables compared to those with lower levels (Fernandez, 2015; Luszczynska et al., 2007; King et al., 2010). Adolescents with higher fruit and vegetable self-efficacy are more likely to consume more fruits and vegetables more frequently than adolescents with lower fruit and vegetable self-efficacy, therefore increasing self-efficacy can increase fruit and vegetable consumption among adolescents.

**Age and Child Fruit and Vegetable Consumption**

The intake of fruits and vegetables has been shown to decrease as a person grows older, and dietary patterns established during childhood and adolescence can persist into adulthood (Kann et al., 2000; Krebs-Smith et al., 1996; Larson et al., 2007; Lytle et al., 2000; Neumark-Sztainer et al., 2002; Reynolds et al., 1999). However, the findings in the literature in regards to the changes in fruit and vegetable consumption from childhood into adolescence are mixed. A systematic review of the literature conducted by Rasmussen and colleagues (2006), examined 22 research articles that studied changes in fruit and vegetable consumption across age and grade groups for children and adolescents (Rasmussen, Krolner, Klepp, Lytle, Brug, Bere, & Due, 2006). Ten studies found a decrease in fruit and vegetable consumption with increasing age, but nine studies found no association (Rasmussen et al., 2006). Seven out of the nine research articles that found no association between age and fruit and vegetable consumption were studies conducted in the United States with 24 hour dietary recalls while six of the ten studies that found

significant negative associations between age and fruit and vegetable consumption were conducted with food frequency questionnaires in European countries. It is unclear as to whether the relationship observed between age and fruit and vegetable consumption is measure or country specific. Observing the relationship between age and fruit and vegetable consumption across age groups in the United States with a food frequency questionnaire would help to answer this question and add to the literature.

**Ethnicity and Fruit and Vegetable Consumption**

Many studies have examined the relationship between fruit and vegetable consumption among ethnicity, but few studies have examined the moderating effect of ethnicity between two clearly defined ethnic groups, Hispanic and Non-Hispanic, on fruit and vegetable consumption (Cullen, Eagan, Baranowski, & Owens, 2000; Lytle, Varnell, Murray, Story, Perry, Birnbaum, & Kubik, 2003). Of the studies that have examined the relationship between ethnicity and fruit and vegetable consumption, significant differences of fruit and vegetable consumption patterns have been observed between ethnic groups, however, these findings are mixed (Reynolds, Baranowski, Bishop, Farris, Binkley, Nicklas, & Elmer, 1999; Videon, & Manning, 2003; Xie, Gilliland, Li, & Rockett, 2003).

According to the systematic review conducted by Rasmussen and colleagues (2006) the significant associations found between ethnicity and fruit and vegetable consumption were inconsistent, and depended on which ethnic groups were compared and the type of fruit and vegetables consumption pattern that was observed (e.g.

frequency versus serving size). Examining the moderating effect of ethnicity among clearly defined ethnic groups (e.g. Hispanic and Non-Hispanic) will help fill the gaps in the literature in regards to fruit and vegetable consumption and ethnicity.

**Theoretical Framework**

Social Cognitive Theory (SCT) is a theoretical framework that often underlies obesity prevention and intervention development for adolescents, and intervention studies to increase fruit and vegetable consumption among adults and children (Bandura, 1997; Granner, 2012; Szczepanska, 2013; Zenzen and Kridli, 2009). Social Cognitive Theory proposes that self-efficacy is one of the most powerful determinants of successful behavior change (Bandura, 1997). Fernandez (2015) proposes the influence of self-efficacy on motivation and action is the likely mechanism for behavior change, which is in line with SCT (Fernandez, 2015; Warner, Ziegelmann, Schüz, Wurm, & Schwarzer, 2011). As mentioned previously, self-efficacy is one of the strongest factors associated with greater fruit and vegetables consumption, and individuals with high levels of self-efficacy are more likely to consume fruit and vegetables compared to those with lower levels of self-efficacy (Fernandez, 2015; King et al., 2010; Luszczynska, 2007). SCT also proposes that modeling is a cognitive process that forms an individual's beliefs and attitudes about the behaviors he or she observes in others, which then shapes his or her own behavior (Bandura, 1997). Modeling is likely to affect the long-term consumption patterns of children and adolescents by the establishment of eating norms through the observation of food choices by parents (Hermans et al., 2012; Larsen, 2015). Parents' eating 'norms' serves as a reference for what is appropriate for their child (Herman &

Polivy, 2005). Food modeling can be placed within the SCT framework in that food modeling occurs when parental food intake behaviors are observed and eventually modeled by children (Herman & Polivy, 2005; Larsen, 2015).

**Conclusion**

In conclusion, the relationship among child fruit and vegetable self-efficacy, parental fruit and vegetable consumption and child fruit and vegetable consumption has been reviewed. Fruit and vegetable self-efficacy and also parental fruit and vegetable consumption/modeling have been shown to increase the fruit and vegetable consumption of children and adolescents. This review of available studies identified significant gaps in the literature. Although many studies have examined the correlates of fruit and vegetable consumption, no known research study has examined the effect of parental fruit and vegetable consumption, fruit and vegetable self-efficacy on child fruit and vegetable consumption, and BMI within an ethnical diverse sample of middle school aged girls (Fernandez, 2015; Young, 2004).

**Rationale and Hypotheses**

Due to the high prevalence of obesity among children and adolescents, the identification of predisposing factors for obesity remains imperative. (Passel, Cohn, & Lopez, 2011; Wright, 2011). Specifically, the relationships between: (1) child fruit and vegetable consumption and child fruit and vegetable self-efficacy, 2) parental and child

fruit and vegetable consumption, and (3) ethnicity and fruit and vegetable consumption, (4) age and fruit and vegetable consumption (5) child fruit and vegetable consumption and obesity should be examined.

The consumption of fruit and vegetables has been shown to protect against obesity and is a healthier alternative to restrictive diets, and examining the influential factors of fruit and vegetable consumption among children and adolescent girls who as a group have a high prevalence and incidence of both obesity and eating disorders is particularly imperative ((Dietz, 1998; Field, 2001; Osborne & Forestell, 2012; Szczepanska, Scholz, Liszewska, & Luszczynska, 2013; Tanofsky-Kraff, 2014). Furthermore, because women are more susceptible to excess weight gain later in life due in their childbearing years, contributing to the literature for the development of future obesity intervention and prevention programs that promote healthy lifestyle changes among young girls is essential (Ogden et al., 2014; Todd, Street, Ziviani, Byrne, & Hills, 2015). Girls also seem to be susceptible to the opinion of their parents compared to boys so it is highly likely that the relationship between parental and child behaviors among girls and their parents will be more salient (Beydoun & Wang, 2009; Fields, 2001; Fisher, 2002).

In addition to gender, age is another important characteristic to consider when examining fruit and vegetable consumption among adolescents and children. Many prevention and intervention programs target schools because of the large population of children and adolescents within the school environment. However, middle schools are uniquely comprised of children and adolescents, and research studies that have examined

the influential factors of fruit and vegetable consumption among children and adolescents are mixed (Papas, Hurley, Quigg, Oberlander, & Black, 2009;Wang et al., 2011; Wroten, 2012). For this reason, examining these relationships among the various age groups of middle school students will help fill a gap in the literature. Research studies have also examined fruit and vegetable consumption among homogeneous ethnic samples of adolescents and children although many schools, especially in urban settings, are ethnically diverse. Therefore, the current study will examine the before mentioned influential factors of fruit and vegetable consumption among an ethnically diverse group of middle school aged girls.

Parental fruit and vegetable consumption has been identified in multiple research studies as the strongest predictor of child fruit and vegetable consumption (Cooke et al. 2004; Goldberg & Gunatsi, 2007; Wardle, Carnell, & Cooke 2005). However, research studies that have assessed the relationship between parental diets and child diets show that children three to five years old have a stronger positive correlation to the diets of their parents than older children or adolescents (Papas, Hurley, Quigg, Oberlander, & Black, 2009;Wang et al., 2011; Wroten, 2012). These findings may suggest that parental influences on the dietary behaviors of their children change as a child gets older and reaches adolescence (Larsen, 2015). The possibility of a decline in parental influence makes the examination of the relationship between parental and child dietary behaviors among middle school students, whose ages range from childhood into adolescence, very informative for future studies and programs.

Recent meta-analyses have found significant effects of parental food modeling on child food intake regardless of the methodology used, social context, food type, or individual demographics (Cruwys et al., 2015; Larsen, 2015). For the current study, parent modeling and parent eating behavior will be operationalized using reported parental fruit and vegetable consumption. Lastly, self-efficacy is one of the strongest factors associated with greater fruit and vegetables consumption, but similarly to parental fruit and vegetable consumption, very few studies have examined this relationship among middle school aged girls. This study will fill the gap in the literature by presenting findings about the relationship between self-efficacy and fruit and vegetable consumption among middle school aged girls.

Because of the limitations presented in current research studies, this research study will address the aforementioned limitations by examining the relationships among parental fruit and vegetable consumption, fruit and vegetable consumption self-efficacy and vegetable consumption among middle school aged girls. The inclusion of middle school aged girls will help to expand previous findings for adolescents and children. Social cognitive theory will be used as an overarching framework to understand how parental fruit and vegetable consumption and self-efficacy influence fruit and vegetable consumption. In addition, BMI will be used an objective measure for obesity to examine the relationship between fruit and vegetable consumption and obesity among middle school aged girls.

The current research study will use the easy to administer, self-report, quick and simplistic Eating Behavior Scale (EBS) developed by Fahlman and colleagues (2012) instead of using the commonly used food frequency questionnaire and 24-hour dietary recall. The EBS is also a valid and reliable measure (Fahlman, 2012). The simplicity, short administration time (7 to 10 minutes), and easy administration of the EBS are ideal for the school setting. With accessibility to computers, a large number of students can complete the EBS simultaneously within 30 minutes. This study is designed to inform intervention and prevention programs, and the EBS is an ideal measure for a large sample of children and adolescents. The current cross-sectional study will utilize path analyses to answer the following research questions and test the following hypotheses:

(1) **Research Question.** Is there a significant relationship between parental fruit consumption and child fruit consumption, and does age and ethnicity moderate this relationship?

**Hypothesis 1.** Parental fruit consumption will have a positive relationship with child fruit consumption, and the relationship will be moderated by ethnicity and age.

(2) **Research Question.** Is there a significant relationship between parental vegetable consumption and child vegetable consumption, and does age and ethnicity moderate this relationship?

**Hypothesis 2.** Parental vegetable consumption will have a positive relationship with child vegetable consumption, and the relationship will be moderated by ethnicity and age.

(3) **Research Question.** Is a significant relationship between child fruit and vegetable self- efficacy and child fruit and vegetable consumption, and does ethnicity moderate this relationship?

**Hypothesis 3.** Self-efficacy will be positively correlated to child fruit and vegetable consumption, and this relationship will be moderated by ethnicity.

(4) **Research Question.** Is there a significant relationship between child fruit and vegetable consumption on child BMI, and does ethnicity moderate this relationship?

**Hypothesis 4.** Child fruit and vegetable consumption will be negatively correlated with BMI, and this relationship will be moderated by ethnicity.

## Chapter 2 - Method

### Participants

Participants were 206 middle school aged girls (age range: 11–14 years) who took part in a larger intervention study "Get in the GROOVE!" at the New York Hall of Science in New York or the Patricia and Phillip Museum of Science in Miami, Florida. "Get in the GROOVE!" is a randomized controlled trial (RCT), that explores how virtual environments can be used to encourage middle school girls to become involved in health sciences, while increasing their understanding of the importance of nutrition and physical activity for their overall health. Participants who met the study's inclusion criteria were randomized to the virtual world intervention group "GROVE! Plus" or the control group "GROOVE!". The inclusion and exclusion criteria for the study were the following: inclusion (1) girls between the ages of 11 and 14 and (2) currently a middle school student; exclusion (1) unable to understand the English language or speak English fluency (2) enrolled in a special education program at school (3) diagnosed with a health or physical condition that would prelude participation in dance or physical activities. The University of Miami and the New York Hall of Science Institutional Review Boards approved this study.

### Procedure

Staff members at the New York Hall of Science and the Patricia and Philip Museum of Science conducted recruitment for this study. Staff members recruited students through the museums' pipeline to schools and community groups. Interested parents/guardians completed a museum application form, a family background and habits

questionnaire, that provided demographic information about themselves and their child, an informed consent form and an assent form to be completed by their child. Eligible students, determined by reviewing the information from the program application form and the family background and habits questionnaire and clarifying information with parents/guardians, were then randomized to one of two 3-week summer sessions. Parents/guardians of eligible students were then notified of their child's session assignment.

Data collection took place at the Patricia and Phillip Museum of Science and New York Hall of Science under the supervision of program leaders, program mentors, and research assistants over the course of three summers. Participants completed a series of self-report questionnaires about their health behaviors, health knowledge, fruit and vegetable consumption, and self-efficacy for fruit and vegetable consumption online or using paper-pencil measures. The data from the surveys were collected and stored using LimeSurvey, an online survey tool. Lastly, the BMI for each participant was calculated as an objective measure of obesity. BMI was calculated once in the beginning of the summer program as baseline data.

The current study will focus on the following baseline data gathered from objective measurements and self-report questionnaires: demographic information, parental fruit and vegetable consumption, child fruit and vegetable consumption, child fruit and vegetable self-efficacy, and BMI.

**Measures**

Parents/guardians and participants completed the following self-report questionnaires. Research assistants and mentors obtained the anthropometric measurements.

**Family Background Questionnaire.** The Family Background Questionnaire is a 36-item measure developed by University of Miami researchers (see Appendix A). Items assess demographic variables, physical activity, and parental dietary habits. One parent/legal guardian for each participant completed a family background questionnaire. Specific information about the items used in this research study is described below.

***Demographic Information***. Adults indicated their child's age, ethnic background, and level of education of the child's mother.

***Age.*** Participants included in the study are 11 to 14 years of age. The 11-year-old participants represent the developmental stage of childhood, specifically middle childhood, and 12 to 14 year old participants represent the developmental stage of adolescence, specifically early adolescence (Harris, 2011; Pearson, Biddle, & Gorely, 2009; Skinner, Schindler, & Tschechne, 1990).

***Ethnicity.*** Parents were asked to identify their child's ethnic/racial background by choosing all that apply from the following categories: (1)White, non-Hispanic, (2) African-American, (3)Asian, (4) Dominican, (5) Cuban American, (6) Mexican American, (7) Puerto Rican, (8) Central American, (9) South American, (10) Other Hispanic/Latino Background, (11) American Indian, (12) Caribbean Black, (13) Haitian

American, and (14) Other Ethnic Background. Participants were then categorized into two ethnic groups: Hispanic and Non-Hispanic. "Hispanic" was defined as participants from Latin American, Spanish speaking countries or of Spanish descent Vogel, Atchley, Erlichman, Broglio, Ready, Valero, Amos, Hortobagyi, Lu, & Arun, 2007).

***Parental Fruit and Vegetable Consumption.*** Parental fruit and vegetable consumption was assessed using the 2-item fruit and vegetable consumption subscale of the Family Background Questionnaire. The two fruit and vegetable consumption subscale items were the following:

1. On a typical day, do you eat vegetables? (Do not count white potatoes)
2. On a typical day, do you eat fruit or drink 100% fruit juice?

Possible item responses were the following: "No;" "Once;" and "Twice or more. Parental vegetable consumption and parental fruit consumption will be "dummy" coded as: Dummy 1 (consumes fruit once per week) and Dummy 2 (consumes fruit twice or more per week) for statistical analysis.

**Adolescent Fruit and Vegetable Consumption.** The Eating Behavior Scale was used to assess participant fruit and vegetable consumption (See Appendix B). The Eating Behavior Scale consists of 28 items; 20 items from Fahlman et al. (2012) and 8 additional items from the 2009-2010 School Physical Activity and Nutrition Project (SPAN). The measure had good reliability with a Cronbach's alpha of .91. Both the Fahlman items and the SPAN items have been validated against 24-hour dietary recalls and compare favorably. The measure asks participants to indicate how many times they consumed an item the day before (e.g., fruits, vegetables, candy, etc). Adolescent fruit and vegetable

consumption was assessed using the 3-item fruit and vegetable subscale of the Eating Behavior Scale. The three fruit and vegetable consumption subscale items are the following:

1. Yesterday, how many times did you eat fruit?
2. Yesterday, how many times did you eat vegetables? Include all cooked and uncooked vegetables, salads, and boiled, baked, or mashed potatoes. Do not include French fries or chips.
3. Yesterday, how many times did you drink fruit juice? 100% juice like orange juice, apple juice, or grape juice. Do not count punch, Kool-aid, sports drinks or other fruit-flavored drinks.

Two items were combined to assess fruit consumption (item 1 and item 3) and one item was used to assess vegetable consumption (item 2). All items were scored and will be analyzed as continuous variables.

**Self-efficacy for Fruit and Vegetable Consumption.** Self-efficacy for fruit and vegetable consumption was assessed using the Self-Efficacy Survey - Eating, Asking, Preparing Fruits & Vegetables measure that consists of 17 items from Reynolds et al. (2002) (See Appendix C). The 18$^{th}$ item was added by the investigators. It asked participants to rate their confidence that they can adhere to the myplate.gov recommendation to fill half their plate with fruits and vegetables at each meal.

Examples of the self-efficacy scale items are shown below:

1. How sure am I that I can eat fruits I like (such as bananas or raisins) at Breakfast?
2. How sure am I that I can eat vegetables I like (such as salad or a plain

baked potato) at lunch?

3. How sure am I that I can eat fruits I like (such as apples or oranges) for dessert at dinner?

Participants rated their confidence about eating, asking for, and preparing fruits and vegetables on a 3-point Likert scale (1 = "not sure;" 2 = "I think so;" 3 = "moderately sure can do"). Seventeen of the eighteen items were combined for a total self-efficacy score and showed good reliability with a Cronbach's alpha of .84.

**BMI.** BMI for each participant was calculated using a Tanita TBF-300-A Body Composition Analyzer and Scale. The Tanita TBF-300-A uses foot-to-foot bio-electrical impedance analysis to measure the body composition of patients up to 440 pounds. Height was calculated by research assistants and manually entered into the Tanita program.

**Physical Activity.** Physical activity for each participant was assessed using the Activities and Habits Questionnaire (See Appendix D). The following question will be used for analysis:

"During the past 7 days, how many days were you physically active for a total of at least 60 minutes per day? (Add up all the time you spent in any kind of physical activity that increased your heart rate and made you breathe hard some of the time)." The participants were given the eight response options (0, 1, 2, 3, 4, 5, 6 and 7).

## Chapter 3- Data Analytic Plan

Descriptive statistics will be computed using SPSS 22 to examine possible differences for demographic and endogenous variables between Hispanic and non-Hispanic participants. Chi square ($\chi^2$) tests and *t* tests will be conducted for categorical and continuous variables, respectively. An $\alpha$ level of .05 (two-tailed) will be used as an indicator of statistical significance. Next, the data will be screened for missing data and normality.

The path model that will be tested is as follows: child fruit and vegetable self-efficacy, parental fruit and vegetable consumption, and maternal education are hypothesized to influence child fruit and vegetable consumption; age is hypothesized to mediate the influence of parental fruit and vegetable consumption on child fruit and vegetable consumption; child fruit and vegetable consumption and physical activity are hypothesized to influence child BMI, and ethnicity, the grouping variable, is hypothesized to moderate all influences on child fruit and vegetable consumption and BMI (See Figure 1). Parental fruit consumption and parental vegetable consumption are categorical variables and will be "dummy" coded before being entered in the model. An interaction term for age and parental fruit consumption, and age and parental vegetable consumption will be computed and entered into the model to test for moderation of age. The path analyses will be performed using Mplus v6 (Muthén and Muthén, Los Angeles, CA) and the maximum likelihood estimation method will be used to account for missing data (< 5%). Parameter estimates will be tested for statistical significance ($\alpha < .05$, two-tailed). Multiple fit indices, including the chi-square ($\chi^2$) test, the comparative fit index (CFI), the root square error of approximation (RMSEA), and standardized root mean

square residual (SRMR), will be assess for model fit. In the present study, the 90% confidence interval (CI) for the RMSEA will be reported, and a good fitting model will be indicated by CFI values >.95, RMSEA values ≤.06, and SRMR ≤ .08 (Hu & Bentler, 1998). Unstandardized coefficients controlling for other predictors in the model will be reported.

Multiple group path analyses will be performed to obtain estimates for each group (Hispanic and Non-Hispanics). First, all path coefficients will be estimated for both groups without constraints to establish a baseline model. Second, residual variances of the continuous exogenous variables (parental fruit consumption and parental vegetable consumption) will be constrained to test invariant across the two groups. Third, to assess the moderating effect of ethnicity, constrained models will be compared to the baseline model analyses. Chi-square difference tests for nested models will be used to compare each of the constrained models to the baseline model. A significant chi-square change value will indicate that ethnicity moderates the proposed relationships.

**Covariates.** The direct effect of physical activity on BMI, and the direct effect of maternal education on child fruit and child vegetable consumption were included in the model as covariates.

## Chapter 4 – Results

### Baseline and demographic characteristics

Demographic and baseline characteristics for participants (N=200) are reported in Table 1 and Table 2. The sample consisted of 109 Hispanic (54.4%) and 91 non-Hispanic girls (45.5%). There was no significant different for ethnicity between museum sites, New York Hall of Science and the Patricia and Philip Frost Museum of Science ($\chi$ =77, $p$ =.38). Independent t-test and chi-square analyses revealed that there were no significant differences between the two groups for the following variables: parental fruit consumption, age, and self-efficacy for fruit and vegetable consumption, child fruit and vegetable consumption, maternal education, and physical activity, weight and BMI status (See Tables 1 and 2). The prevalence of overweight and obesity was comparable between groups (Hispanic 41%; non-Hispanic 40%), $p > .05$ (See Table 2). Compared to 47% of Hispanic parents, 64% of non-Hispanic parents reported consuming two or more servings of vegetables on a typical day, ($\chi$ =4.6, $p$ =.03). Overall, Hispanic and Non-Hispanic girls were comparable on baseline and demographic characteristics.

### Multiple Group Path Analyses

To examine the relationships among and between: (1) the predictors of child fruit and vegetable consumption and child fruit and vegetable consumption (i.e., self-efficacy, parental fruit and vegetable consumption and age), (2) and reported child fruit and vegetable consumption and BMI status, a proposed model for these relationships was

tested (See data analytic section). To test model fit between the proposed model and data, a path analysis was conducted and model fit indices were assessed. Forty-three participants were removed by the program due to missing data leaving an n of 157 (examination of baseline and demographic characteristics for participants with complete data were virtually identical to those reported in Tables 1 and 2; there were 80 Hispanic and 77 Non-Hispanic girls). The fit indices indicated that a model with all parameters freely estimated for Hispanic and non-Hispanic girls fit the data [($\chi^2$ (36, $N$ = 157) = 36.65, p = .44); RMSEA = .02 (90% CI = [.00, .08]); CFI = .99; SRMR = .04]. A second model with constrained residual variances for child fruit and vegetable consumption and BMI status also fit the data [($\chi^2$ (39, $N$ = 157) = 41.97, p = .34); RMSEA = .03 (90% CI = [.00, .08]); CFI = .96; SRMR = .05]. The second model with constrained residual variances improved model fit and was identified as the baseline model for all model comparisons and path ($\Delta\chi^2$ = 5.32, $\Delta df$ = 2; $p < .05$).

**Self-Efficacy for Fruit and Vegetable Consumption.** To determine if self-efficacy for fruit and vegetable consumption among girls is associated with their actual consumption of fruits and vegetables, the paths between self-efficacy and fruit and vegetable consumption among Hispanic and non-Hispanic girls was examined. Results indicated that self-efficacy was associated with more fruit consumption among non-Hispanic girls (B =.08, SE=.03, $p$ =.02; See table 3 and Figure 2); however, no significant relationship was observed for Hispanic girls (B =.04, SE=.03 $p$=.27; See table 3 and Figure 3). Higher self-efficacy was indeed positively associated with vegetable intake among Hispanic (B =.17, SE=.07, $p$ =.02; See table 4) and non-Hispanic girls (B =.20, SE=.06, $p$ =.003; See

table 4 and Figure 2). The significant finding was not moderated by ethnicity ($\Delta\chi^2 = .550$, $\Delta df = 1$; $p > .05$). Similar to vegetable consumption, ethnicity did not moderate the relationship between self-efficacy and fruit consumption although significance was only observed among non-Hispanic girls ($\Delta\chi^2 = .477$, $\Delta df = 1$; $p > .05$).

**Parental Fruit and Vegetable Consumption.** To determine if patterns of parental fruit and vegetable consumption were associated with patterns of child fruit and vegetable consumption, the paths between parental fruit and vegetable consumption and child fruit and vegetable consumption among Hispanic and non-Hispanic girls were examined. Parental fruit and vegetable consumption was separated into three categories: no servings per day, one serving per day, and two or more servings per day. No servings per day was used as the baseline. There was a non-significant relationship between parental fruit consumption and child fruit consumption for non-Hispanic (1 serving per day, B =.18, SE=.61 $p$ = .77; 2 or more servings per day, B = .65, SE=.62, $p$ =.30; See table 3) and Hispanic girls (1 serving per day, B = -.68, SE=.64, $p$ =.29; 2 or more servings per day, B = -.46, SE=.67, $p$ =.49; See table 3). Parental vegetable consumption was hypothesized to have a direct effect on child consumption. This hypothesis was also rejected. Parental vegetable consumption was not significantly related to child vegetable consumption for non-Hispanic (1 per serving day, B =-.68, SE=1.4, $p$ =.63; 2 or more servings per day, B = -.53, SE=1.3, $p$ =.69; See table 4) or Hispanic girls (1 serving per day, B = .74, SE=1.3, $p$ =.55; 2 or more servings per day, B = .54, SE=.1.2, $p$ =.66; See table 4).

**Age.** Age was hypothesized to moderate the relationship between parental and child consumption. This hypothesis was rejected, age did not moderate the relationship between parental and child fruit consumption for non-Hispanic (1 serving per day, B = -1.2, SE=1.0, $p$ =.24; 2 or more servings per day, B =-1.3, SE= 1.0, $p$ =.18; See table 3) or Hispanic girls (1 serving per day, B = -.06, SE=.56, $p$ =.92; 2 or more servings per day, B = .21, SE=.54, $p$ =.70; See table 3). Similar to the findings for parental and child fruit consumption, age did not moderate the relationship between parental vegetable consumption and child vegetable consumption among non-Hispanic (1 serving per day, B = 4.1, SE =2.2, $p$ = .06; 2 or more servings per day, B =3.6, SE= 2.1, $p$ = .09; See table 4) or Hispanic girls (1 serving per day, B = .85, SE =1.2, $p$ =.50; 2 or more servings per day, B = .84, SE=1.2, $p$ =.48; See table 4). These findings suggest that within this sample, there was no moderation effect of age on the relationship between parental and child consumption.

Age was also examined as an independent predictor for child fruit and vegetable consumption in the analyses and a significant association was observed among non-Hispanic participants. Older non-Hispanics girls consumed fewer vegetables than younger girls (B = -5.1, SE= 2.1, $p$ =.02; See table 4 and Figure 2). A non-significant path between age and vegetable consumption was observed among Hispanic girls (B = -2.0, SE= 1.0, $p$ =.06; See table 4 and Figure 3). Ethnicity did not moderate the difference in findings observed between Hispanic and non-Hispanic girls although there was a significant path observed only for non-Hispanic girls ($\Delta\chi^2 = 1.866$, $\Delta df = 1$; $p < .05$). Non-significant paths were observed between age and child fruit consumption for non-

Hispanic and Hispanic girls (B = .95, SE=.97, *p* =.33; B = -.44, SE=.48, *p* =.36; See table 3) respectively.

**BMI status.** To determine if higher fruit and vegetable consumption was more closely associated with a normal weight rather than overweight or obesity among Hispanic and non-Hispanic girls, the paths between child fruit and vegetable consumption and BMI were tested. A non-significant relationship was observed between child fruit and vegetable consumption and BMI status among Non-Hispanic (Fruit B = .01, SE=.06, *p* = .89; Vegetable B = -.02, SE=.03, *p* =.57; See table 3 and 4) and Hispanic girls (Fruit B = -.01, SE= .07, *p* =.87; Vegetable B = -.01, SE=.03, *p* =.63) respectively (See table 3 and 4).

**Covariates: Maternal Education and Physical Activity.** Contrary to our expectations, Non-Hispanic girls who reported more physically activity also had higher BMI (B = .12, SE=.04, *p* =.01; See table 5 and Figure 2). A non-significant association was observed between physical activity and BMI status among Hispanic girls (B = -.04, SE=.04, *p* =.33; See table 5). Non-significant association were also observed between physical activity and child fruit consumption among Non-Hispanic and Hispanic girls respectfully (B = -.02, SE=.09, *p* =.83; B = .12, SE=.08, *p* =.16; See table 5); physical activity and child vegetable consumption among Non-Hispanic girls (B =.11, SE=.19, *p* =.56; See table 5). There was a significant relationship between physical activity and vegetable consumption among Hispanic girls (B = .41, SE=.18, *p* =.02; See table 5), suggesting that

Hispanic girls who were more physically active were also more likely to consume more servings of vegetables than girls who reported less physical activity.

Non-significant relationships were observed between maternal education and child fruit consumption (B = -.01, SE=.04, $p$ =.80; B = -.02, SE=.05, $p$ =.76; See table 5), vegetable consumption (B = -.08, SE=.10, $p$ = .40; B = -.18, SE= .11, $p$ =.11; See table 5), and BMI status (B = -.03, SE=.02, $p$ = .20; B = .03, SE= .03, $p$ =.23; See table 5) among Non-Hispanic participants and Hispanic participants respectively.

## Chapter 5 - Discussion

This cross-sectional study contributes to the literature by examining the factors that influence fruit and vegetable consumption among Hispanic and Non-Hispanic middle school-aged girls. More specifically, this study examined whether age, parental fruit and vegetable consumption and self-efficacy were significantly associated with fruit and vegetable consumption among girls. This study also tested whether age and ethnicity moderated these relationships. The Social Cognitive Theory served as the underlying theoretical framework to examine whether child eating behaviors are influenced by self-efficacy and parental eating behaviors. This study found significant positive associations between self-efficacy and fruit and vegetable consumption among Non-Hispanic girls and a significant positive relationship between self-efficacy and vegetable consumption among Hispanic girls, suggesting more fruit and vegetable consumption with higher degrees of confidence (self-efficacy). A significant negative relationship between age and vegetable consumption among Non-Hispanic girls was also observed, suggesting a decrease vegetable consumption with increasing age among Non-Hispanic girls. No significant relationship was observed between child fruit and vegetable consumption and parental fruit and vegetable consumption among Hispanic or Non-Hispanic girls.

### Self-Efficacy

The significant findings for self-efficacy with fruit and with vegetable consumption among Non-Hispanic girls, and with vegetable consumption alone among Hispanic girls were in concordance with previous studies, which have found self-efficacy

to mediate the relationship between perceived food environment and fruit and vegetable consumption and predict fruit and vegetable consumption among Non-Hispanic and Hispanic girls (Bruening, Kubik, Kenyon, Davey, & Story, 2010; Gase, Glenn, & Kuo, 2015); Ma, Betts, Horacek, Georgiou, White, & Nitzke, 2002; Smith, Annesi, Walsh, Lennon, Bell., 2010). In a randomized controlled trial (RCT), Franko and colleagues (2013) examined the effect of self-efficacy on the daily consumption of five servings of fruits and vegetables among Non-Hispanic (African American and European Americans) and Hispanic adults and children. Participants with higher self-efficacy were more likely to consume the recommended five daily servings of fruits and vegetables compared to those who reported lower self-efficacy. Similarly, a systematic review (N=34 studies) of the determinants of fruit and vegetable consumption conducted by Thomson and Ravia (2011) also found self-efficacy to be positively associated with consumption.

One unexpected finding was the non-significant relationship between self-efficacy and fruit consumption among Hispanic girls. This finding among Hispanic girls is contrary to previous research findings, as mentioned previously. This non-significant finding could be due to the strong influence of familiarity/culturally specific food preferences of the Hispanic participants. To assess barriers to fruit and vegetable consumption among Hispanic, African-American and White adults, Yeh and colleagues (2008), conducted focus groups among each ethnic group. Hispanic participants reported that they did not consume multiple servings of fruit on a daily basis because it was difficult to find tropical or specific fruits, such as plantains, they were used to eating in the home environment. The participants also voiced hesitation to try fruits they did not

recognize because they did not know how they would taste. If Hispanic parents are less likely to purchase common fruits found in American grocery stores or markets, despite their child's confidence (self-efficacy), they could eat "a type" of fruit for breakfast lunch and dinner, their parent's cultural preference/familiarity might prove to be a stronger determinant of consumption. Cultural preference/familiarity could also potentially influence vegetable consumption; however, ethnicity was not a significant factor of vegetable consumption in the current study. Another possible explanation for the non-significant finding is the manner in which fruits and vegetables consumption were measured and examined in the current study.

Previous research studies have often combined fruit and vegetable consumption into a single variable when assessing correlates (Osborne & Forestell, 2012; Szczepanska, Scholz, Liszewska, & Luszczynska, 2013). To our knowledge, this study is the first study to examine the correlates of fruit and vegetable consumption separately among Hispanic middle school-aged girls. By separately examining fruit and vegetable consumption, it was possible to distinguish differences in their relationship with various predictors. Therefore, the significant findings found between self-efficacy and vegetable consumption and the non-significant findings for fruit consumption among Hispanic girls could support the following two notions: (1) different factors influence fruit consumption compared to vegetable consumption, (2) fruit and vegetable consumption are affected by the same correlates but to varying degrees. If fruits and vegetables are affected by different variables, or affected by the same variables to various degrees, by targeting fruit and vegetable consumption separately, researchers and intervention/prevention programs

can better plan and promote fruit and vegetable consumption among participants. Nonetheless, the significant findings from the current study and prior studies identify self-efficacy as an important variable to target for obesity intervention/prevention programs and study across ethnic groups (Bruening, et al., 2010; Ma, et al., 2002; Smith, et al., 2010).

**Parental Fruit and Vegetable Consumption**

The findings from the current study suggest no significant influence of parental fruit and vegetable consumption on child fruit and vegetable consumption among Hispanic or Non-Hispanic girls, which is also contrary to the findings of previous research and our hypotheses. A study conducted by Draxten and colleagues (2014) concluded that children (8-12 years old) are often aware of the fruit and vegetable consumption of their parents and occasionally report similar fruit and vegetable consumption patterns of their parents, but because awareness and knowledge alone do not predict health behavior choices, it is possible that parental consumption is not always an influential factor for child fruit and vegetable consumption (Ferris, von Gunten, & Emanuel, 2001; Tomasone, Martin Ginis, Pulkkinen, & Krassioukov, 2014). However, a systematic review conducted by Pearson, Biddle, and Gorely (2009) found that parental fruit and vegetable consumption was consistently and positively associated with child fruit and vegetable consumption in many studies.

Another explanation for the null findings of the current study is the possible weak construct validity of the measure used to operationalize parental fruit and vegetable

consumption. A single-item question was used to assess fruit and vegetable consumption independently for parents at one-time point, which did not allow for the psychometric testing of reliability and validity. In contrast, research studies that have found significant findings between parent and child consumption have used multiple item measures such as a Food Frequency Questionnaire to assess parental fruit and vegetable consumption or assessed fruit and vegetable consumption at multiple time points (Fisher, Mitchell, Smiciklas-Wright, & Birch, 2002; Pearson, Biddle & Gorely, 2009). A more robust measure of parental fruit and vegetable consumption or the same measure assessed at multiple times might have yielded results more in line with findings commonly reported throughout the literature. The further clarification of the influence of parental consumption across food groups and ages by future studies will enhance efforts of child obesity intervention and prevention programs through the targeting of parental eating patterns in addition to those of children.

**Age and Vegetable Consumption**

Age was negatively associated with vegetable consumption among Non-Hispanic girls, which suggests older Non-Hispanic middle school girls consume fewer vegetables in comparison to younger girls. This finding is consistent with previous research findings that found decreases in fruit and vegetable consumption as a person gets older (Rasmussen et al., 2006). To our knowledge, this is the first study to show a significant decrease in vegetable consumption across this particular age range (11 to 14 years old) and demographic group (Non-Hispanics middle school aged girls). This significant negative relationship between age and vegetable consumption suggests a significant

decrease in vegetable consumption over a few years (i.e., 1 to 3 years) and highlights the importance of targeting vegetable consumption throughout childhood and adolescence. Although the association between age and vegetable consumption was not found among Hispanic girls, the relationship approached significance (p=.06). The lack of significance observed could have been due to the small sample size issue of power. There was no significant association found between age and fruit consumption for either group. The significant findings for age and vegetable consumption and non-significant findings for age and fruit consumption are similar to the findings for self-efficacy. Again, this supports the possibility that fruits and vegetables could be influenced to varying degrees by particular variables.

**Additional Variables**

Of the covariates included in the model, physical activity was significantly associated with BMI classifications (normal weight, obese, overweight) among Non-Hispanic girls but not Hispanic girls. However, the relationship was a positive association and contrary to what we expected. It is plausible that the positive association reflects a difference in health status rather than associated with regular activity habits (Charlton, Lambert, & Kreft, 1997). Perhaps the participants with higher BMI were more motivated to engage in physical activity due to personal comparisons to the other participants in the study with lower BMI. It is also possible that the findings observed could be due to low reliability. Studies that have used validated, multi-item self-report questionnaires such as the Physical Activity Questionnaire for Older Children have also found non-significant findings between self-reported physical activity and BMI (Sandercock, Voss, & Dye, 2010; Warner, Wolin, Duncan, Heil, Askew, & Bennett, 2012). Poor recall has been

cited as a possible reason for the null findings (Sandercock, Voss, & Dye, 2010). A study conducted by Warner and colleagues found that obese persons misclassified the intensity of their physical activity, specifically vigorous physical activity more than non-obese participants (Warner, et al., 2012). An objective measure of physical activity such as that obtained with the Actigraph accelerometer could have better controlled for the effect of physical activity on BMI (Ness et al., 2007; Warner, et al., 2012). Physical activity was also significantly associated with vegetable consumption among Hispanic girls, which suggests that Hispanic girls who were more physically active were also more likely to consume more servings of vegetables compared to Hispanic girls who reported less physical activity.

**Study Limitations**

There are several limitations of this study. A cross-sectional design was used for this study, which prevented the identification of any causal relationships among variables. Although the cross-sectional design has many benefits, such as the possibility to examine multiple population groups and variables at one time, the inability to determine causality among variables limits the interpretation of findings. The "snapshot" of associations between variables offered by the cross-section study design is definitely beneficial and informative, but to further examine the relationships identified in this study, a RCT with a longitudinal design could help determine causality of this relationship (Rassen, Brookhart, Glynn, Mittleman, & Schneeweiss, 2009; Kraemer, Wilson, Fairburn, & Agras, 2002). The clear distinction between causal factors and

outcome variables will enhance efforts of obesity intervention and prevention programs that are informed and influenced by this line of research.

Other limitations of this study were the small sample size and the single item question taken at one-time point used to assess parental fruit and vegetable consumption. Although some mixed findings are present, the relationship between parental and child fruit and vegetable consumption is substantially supported throughout the literature. It is possible that a more extensive and robust measure for parental fruit and vegetable consumption, such as a Food Frequency Questionnaire and a larger sample size would have yielded significant results. Bentler and Chou (1987) suggest five participants for every single free parameter for sufficient power. Therefore, according to Bentler and Chou, the current study was under powered, and a sufficient sample size for the proposed model would have been 225 participants (45 free parameters).

**Strengths of the Current Study**

This study adds to the literature in a number of ways; one way is by investigating some of the known correlates of fruit and vegetable consumption among a unique sample of Hispanic and Non-Hispanic middle school aged girls. Utilizing path analysis also allowed us to examine the possible moderating effect of age on the relationship between parental consumption and child consumption between ethnic groups simultaneously, which is not possible with multiple a regression model or separate Pearson and Spearman correlations. The moderating effect of ethnicity on each association was also tested. From testing moderation, we can determine the influence of one variable on a particular

relationship. For example, testing the moderating effect of ethnicity examines whether the magnitude of a specific relationship is significantly different across ethnic groups. We would then conclude that ethnicity was a significant factor for the relationship.

This study is also one of the few studies to examine the correlates of fruit and vegetable consumption of girls using an ethnicity grouping rather than the informative but commonly used minority/majority grouping. Many studies, such as the study conducted by Franko and colleagues (2013), African American and Hispanic are combined into one "minority" group (Franko, et al., 2013; Gase, et al., 2015; Thomson & Ravia, 2011). Grouping participants according to Hispanic ethnicity allowed us to look at the possible influence of ethnicity on health behaviors rather than minority/majority status only. The United States is becoming more diverse, with the predicted emergence of a minority-majority group by 2050 (Camarillo, 2007; Roberts, 2008). Examining differences in health behaviors among different ethnic groups regardless of their previous majority/minority classification or from the deficit model, a model where ethnicity is viewed as a factor that subtracts away from the characteristics that are deemed as primary or "fundamental" for group members compared to the standard group (i.e. majority group), may prove to be more informative to health research in years to come (Schaefer, 2008; Valencia, 2012). Also, many studies have included small sample sizes of Hispanics and have often categorized them into the "other" category (Bruening, Kubik, Kenyon, Davey, & Story, 2010; Ma, Betts, Horacek, Georgiou, White, & Nitzke, 2002; Smith, Annesi, Walsh, Lennon, Bell, 2010). This is one of the few studies that have examined

the relationship between self-efficacy and fruit and vegetable consumption among a large group of Hispanic participants.

Another contribution of this study to the literature is its examination of fruit and vegetable consumption separately. To our knowledge, this study is the first to examine the correlates of fruit and vegetable consumption as two distinct constructs among Hispanic and Non-Hispanic middle school aged girls. Many studies combine fruit and vegetable consumption into one construct by calculating a total score or asking about weekly or daily fruit and vegetable consumption together in a single item (Krølner, Rasmussen, Brug, Klepp, Wind, & Due, 2011; Pearson, Timperio, Salmon, Crawford, & Biddle, 2009; Pearson, Atkin, Biddle, & Gorely, 2010; Osborne & Forestell, 2012; Szczepanska, Scholz, Liszewska, & Luszczynska, 2013). However, the findings of this study and others support the value of independent scores and individual constructs for fruits and vegetables (Camarillo, 2007; Pearson, N., Biddle, & Gorely, 2009). By separating fruit from vegetable consumption and finding significant associations for one and not the other in two instances in the current study, support for the further examination the correlates of fruit and vegetable consumption separately.

**Future Directions and Considerations**

In light of the limitations of this study, future studies should conduct longitudinal randomized control trials to determine causality for the significant associations identified. Establishing causality will help healthcare professionals and researchers identify variable

risk factors and variable markers for the planning of obesity prevention and fruit and vegetable intervention programs (Offord & Kraemer, 2000). As previously mentioned, determining the causal variables underlying the observed relationship between self-efficacy and fruit and vegetable consumption among middle school-aged Hispanic and Non-Hispanic girls is important. To effectively and consistently promote particular health behaviors and decrease particular unhealthy behaviors, it is important to understand the basis of the behavior. Future studies should also examine these associations across a larger age range of Hispanic and Non-Hispanic girls.

Although the current study found a significant linear association between age and vegetable consumption among Non-Hispanic girls, expanding the age range of participants to represent the developmental stages of childhood and adolescence more extensively, will allow for the examination and testing of a quadratic relationship. A quadratic relationship will identify a change in the influence of self-efficacy on fruit and vegetable consumption from childhood into adolescence. A quadratic relationship between age and fruit and vegetable consumption has been examined among adult participants, but not among children and adolescents (Kimmons, Seymour, & Serdula, 2008). Exploring this relationship among girls will add to the body of literature in significant ways. This information could more effectively equip health professionals to target self-efficacy and increase fruit and vegetable consumption at the most impactful times throughout a child's development.

Lastly, future studies should conduct longitudinal randomized control trials to examine the correlates of fruit and vegetable consumption separately among an ethnically diverse sample of girls. These studies should randomly assign participants to either the control or intervention group, implement an intervention that increases correlates of fruit and vegetable consumption among the intervention group (i.e. self-efficacy, health knowledge, etc.), and measure fruit and vegetable consumption separately. Although fruits and vegetables are often combined unitarily, it is possible fruits and vegetables have independent correlates or are influenced by similar correlates to varying degrees. If indeed there are different determinants for fruit and vegetable consumption, promoting particular factors that significantly increase fruits but not vegetables could be insufficient and possibly detrimental.

**Conclusion**

In conclusion, this study supports the promotion of self-efficacy for increased fruit and vegetable consumption among Non-Hispanic girls and for increased vegetable consumption among Hispanic girls. Self-efficacy has been supported as a consistent significant correlate of health behaviors such as fruit and vegetable consumption throughout the literature. The findings of this study further corroborate the assessment and promotion of self-efficacy among middle school aged girls for higher levels of fruit and vegetable consumption. In contrast to typical findings in the literature, non-significant findings were observed between parental consumption and child consumption and should be explored further with the recommendations mentioned above. Additional research is also needed to distinguish the potential difference in correlates of fruit and vegetable consumption separately.

With the high prevalence of obesity and low fruit and vegetable consumption among girls, identifying the different risk factors that influence fruit and vegetable consumption continues to be an imperative task for researchers and healthcare professionals. Taken all together, the findings from this study and previous studies strongly support the promotion of self-efficacy for higher fruit and vegetable consumption among Hispanic and vegetable consumption among Non-Hispanic girls. More research is needed to examine the relationship between self-efficacy and fruit consumption among Hispanic girls. Due to the fact that, in comparison to Non-Hispanic groups, few studies have examined the correlates of fruit and vegetable consumption among Hispanics, future studies should conduct research across various Hispanic subgroups (i.e. Puerto Rican, Venezuelan, Mexican, Cuban, etc.), developmental stages (i.e. adult, adolescent, young adult) and citizenship status (i.e. first generation US citizen, recent immigrant, etc.).

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***Table 1.*** **Demographic information (T-tests) for the full sample (*N* = 200), Hispanic (n=109) and non- Hispanic girls n=91).**

| Variables | 0verall Sample M (SD) | Hispanic M (SD) | Non-Hispanic M (SD) | *T* Statistic |
|---|---|---|---|---|
| Age | 11.8 (.90) | 12 (.95) | 11.8 (.85) | -1.9 |
| F&V Self-Efficacy[a] | 30.7 (5.5) | 31 (5.4) | 30.8 (5.64) | -.34 |
| Maternal Education[b] | 15.5 (3.9) | 15.2 (.35) | 15.8 (.44) | .1.2 |
| Child Vegetable Consumption[c] | 7.2 (3.9) | 7.0 (4.2) | 7.3 (3.5) | -.54 |
| Child Fruit Consumption[d] | 3.3 (1.6) | 3.4 (1.6) | 3.3 (1.7) | .49 |
| Physical Activity[e] | 3.8 (2.1) | 3.7 (2.2) | 3.9 (2.1) | -.68 |
| Weight | 111.6 (33.6) | 111.5(34.4) | 111.59(32.8) | -.01 |

*Notes: [a] Range for total score is 0 to 39, 3-likert scale (1=not sure, 2=I think so, 3=moderately sure can do) 17 items. [b]Range for total score is 1 to 23. [c] Range for total score is 0 to 15(How many times participant ate a piece of fruit or drank 100% fruit juice the previous day). [d] Range for total score is 0 to 6 (How many times participant ate vegetables the previous day). [e] Number of days engaging in at least 60 minutes of moderate physical activity* p < .05.*

***Table 2.*** **Demographic information (percentages and chi-square tests) for the full sample(N = 200), Hispanic (n=109) and non- Hispanic girls n=91).**

| Variables | Overall Sample (%) | Hispanic (%) | Non-Hispanic (%) | $\chi^2$ |
|---|---|---|---|---|
| **Parental Vegetable Consumption** | | | | |
| 0 per day | 9.5% | 14% | 7% | 1.6 |
| 1 per day | 35% | 39% | 29% | 2.1 |
| 2 or more per day | 55.5% | 47% | 64% | **4.6*** |
| **Parental Fruit Consumption** | | | | |
| 0 per day | 7% | 9% | 6% | .11 |
| 1 per day | 44.5% | 44% | 45% | .01 |
| 2 or more per day | 48% | 47% | 49% | .07 |
| **BMI** | | | | |
| Normal weight | 58.6% | 62% | 51% | 3.9 |
| Overweight | 22.6% | 17% | 27% | |
| Obese | 18.8% | 23% | 14% | |

*Note: * $p < .05$. ** $p<.01$*

*Table 3.* **Path coefficients, standard error and significance for direct effects of fruit consumption**

| | Hispanic Girls | | | Non-Hispanic Girls | | |
|---|---|---|---|---|---|---|
| **Specific Path** | **B** | **SE** | ***p*** | **B** | **SE** | ***p*** |
| Parental Fruit Consumption-One per day → Child Fruit Consumption | -.68 | .64 | .29 | .18 | .61 | .77 |
| Parental Fruit Consumption-Two or more per day → Child Fruit Consumption | -.46 | .67 | .49 | .65 | .62 | .30 |
| Age → Child Fruit Consumption | -.44 | .48 | .36 | .95 | .97 | .33 |
| Parental Fruit Consumption-One per day*Age → Child Fruit Consumption | -.06 | .56 | .92 | -1.2 | 1.0 | .24 |
| Parental Fruit Consumption-Two or more per day*Age → Child Fruit Consumption | .21 | .54 | .70 | -1.3 | 1.0 | .18 |
| Child Self Efficacy for Fruit and Vegetable consumption → Child Fruit Consumption | .04 | .03 | .27 | .08 | .03 | **.02*** |
| Child Fruit Consumption → BMI | .01 | .07 | .87 | .01 | .06 | .89 |

*Note:* * $p < .05$. ** $p < .01$

*Table 4.* **Path coefficients, standard error and significance for direct effects of vegetable consumption**

| | Hispanic Girls | | | Non-Hispanic Girls | | |
|---|---|---|---|---|---|---|
| **Specific Path** | **B** | **SE** | ***p*** | **B** | **SE** | ***p*** |
| Parental Vegetable Consumption- One per day → Child Vegetable Consumption | .74 | 1.3 | .55 | -.68 | 1.4 | .63 |
| Parental Vegetable Consumption-Two or more per day → Child Vegetable Consumption | .54 | 1.2 | .66 | -.53 | 1.3 | .69 |
| Age → Child Vegetable Consumption | -2.0 | 1.0 | .06 | -5.1 | 2.1 | **.02*** |
| Parental Vegetable Consumption-One per day *Age → Child Vegetable Consumption | .85 | 1.2 | .50 | 4.1 | 2.2 | .06 |
| Parental Vegetable Consumption-Two or more per day *Age → Child Vegetable Consumption | .84 | 1.2 | .48 | 3.6 | 2.1 | .09 |
| Child Self Efficacy for Fruit and Vegetable consumption → Child Vegetable Consumption | .17 | .07 | **.02*** | .20 | .06 | **.003**** |
| Child Vegetable Consumption → BMI | -.01 | .03 | .63 | -.02 | .03 | .57 |

*Note: Self-efficacy* $p < .05$. ** $p < .01$*

***Table 5.*** **Path coefficients, standard error and significance for covariates**

| | *Hispanic Girls* | | | *Non-Hispanic Girls* | | |
|---|---|---|---|---|---|---|
| **Specific Path** | **B** | **SE** | ***p*** | **B** | **SE** | ***p*** |
| Maternal Education → Child Fruit Consumption | -.02 | .05 | .76 | -.01 | .04 | .80 |
| Maternal Education → Child Vegetable Consumption | -.18 | .11 | .11 | -.08 | .10 | .40 |
| Maternal Education → BMI | .03 | .03 | .23 | -.03 | .02 | .20 |
| Physical Activity → Child Fruit Consumption | .12 | .08 | .16 | -.02 | .09 | **.**83 |
| Physical Activity → Child Vegetable Consumption | .41 | .18 | **.02*** | .11 | .19 | .56 |
| Physical Activity → BMI | -.04 | .04 | .33 | .12 | .04 | **.01*** |

*Note: * p < .05. ** p<.01*

**Figure 1. Proposed Model**

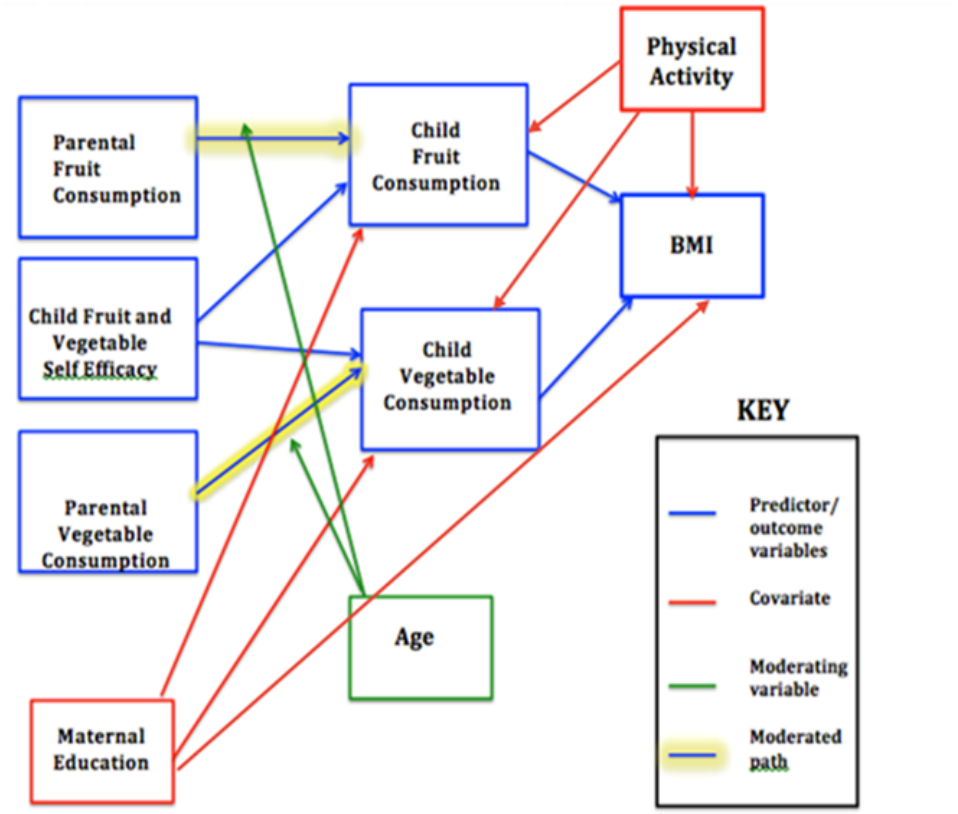
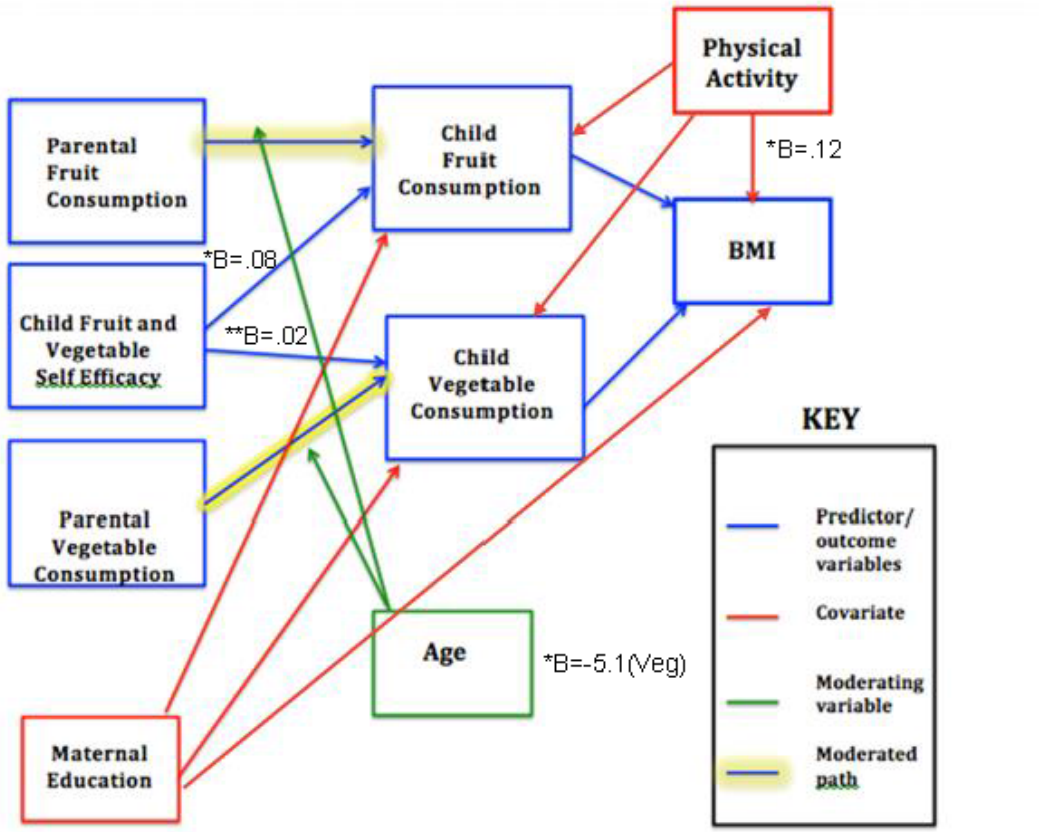
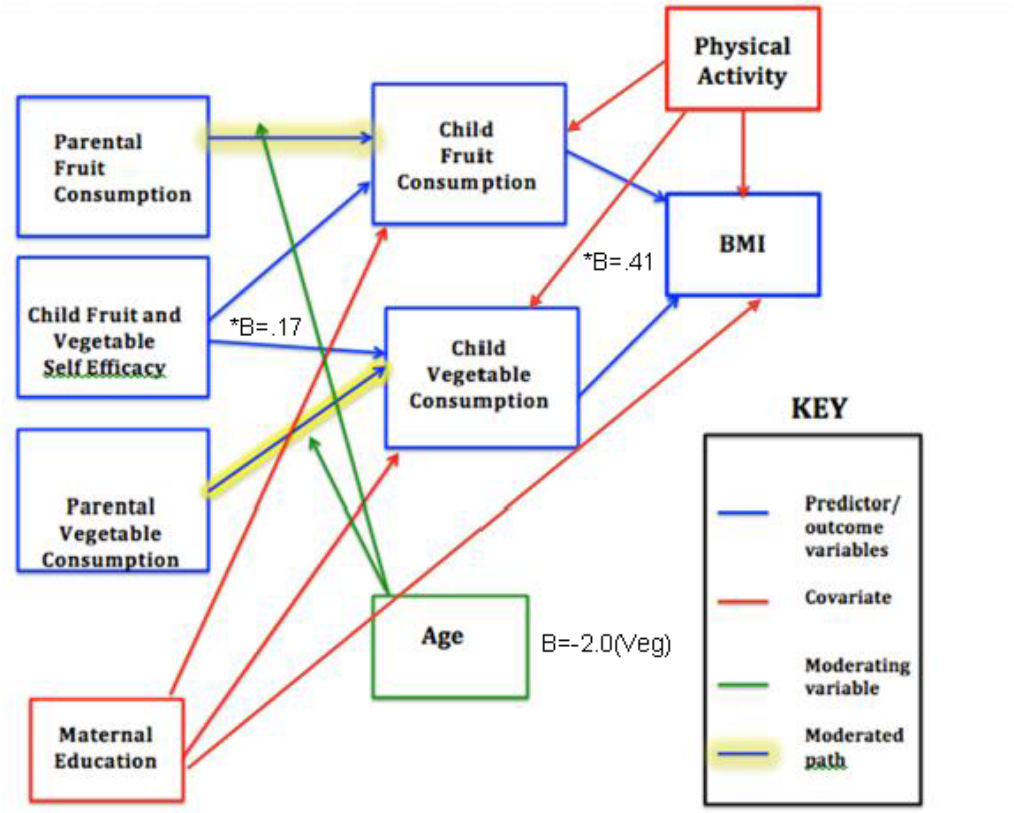


***Figure 2.*** **Final Model with Significant Paths: Non-Hispanic Girls**




*Note: * p < .05. ** p<.01*

***Figure 3.*** **Final Model with Significant Paths: Hispanic Girls**




*Note:* * $p < .05$

# Appendices

Appendix A

**What is your ID number?** __ __ __ __ __

**GROOVE**
**Family Background and Habits Questionnaire**

Instructions: Please answer each question about your child's background, health, activities and interests. Also, answer questions (32-38) about your habits. Pick only one answer for each question.

1. What is **today's date?** _____

2. **Adult** completing this form. *Choose one of the following answers:*
   ☐ Mother ☐ *Father* ☐ *Guardian*

3. What is your **child's age**? *Choose one of the following answers:*
   ☐11 ☐12 ☐13 ☐14

4. What **grade is your child** in? *Choose one of the following answers:*
   ☐5th ☐6th ☐7th ☐8th

5. Country where the **child's grandparents** were born:
   _____

6. Country where your **child** was born:
   _____

7. If born outside the USA, how many years has your **child** lived in the USA? _____

8. What is your child's background/heritage? *Choose all that apply:*
   A. White, non-Hispanic
   B. African-American
   C. Asian
   D. Dominican
   E. Cuban American
   F. Mexican American
   G. Puerto Rican
   H. Central American
   I. South American
   J. Other Hispanic/Latino background *(fill in below)*
   _____
   K. American Indian
   L. Caribbean Black
   M. Haitian American
   N. Other ethnic background *(fill in below)*
   _____

9. What is **your** marital status? *Choose one of the following answers:*
   A. Single
   B. Married
   C. Divorced
   D. Widowed

10. Circle the highest year of school completed by the **Father** of the child: *Choose one of the following answers:*
    1 2 3 4 5 6 7 8 9 10 11 12
    13 14 15 16 17 18 19 20 21 22
    23+

11. Circle the highest year of school completed by the **Mother** of the child: *Choose one of the following answers:*
    1 2 3 4 5 6 7 8 9 10 11 12
    13 14 15 16 17 18 19 20 21 22
    23+

12. How many people live in your home? _____

13. How many children are in the family? _____

14. How many days a week does the **family** usually **eat dinner together**? *Choose one of the following answers:*
    0 1 2 3 4 5 6 7

15. How many days a week does your **child** usually **eat fast food**? *Choose one of the following answers:*
    0 1 2 3 4 5 6 7

16. How many days a week does your **child** usually eat breakfast? *Choose one of the following answers:*
    0 1 2 3 4 5 6 7

17. Does your **child** eat fruit every day? *Choose one of the following answers:*
    A. Yes
    B. No

18. Does your **child** eat vegetables *(do not count white potatoes)* every day? *Choose one of the following answers:*
    A. Yes
    B. No

**What is your ID number?** __ __ __ __ __

19. Rate your **child's** eating habits: *Choose one of the following answers:*
    A. Poor
    B. Fair
    C. Good
    D. Very Good

20. How physically activity is your **child**? *Choose one of the following answers:*
    A. Not active
    B. Somewhat active
    C. Active
    D. Very active

21. Describe your **child's** weight: *Choose one of the following answers:*
    A. Very underweight
    B. Slightly underweight
    C. About the right weight
    D. Slightly overweight
    E. Very overweight

22. During the past 12 months, how many sports teams has your **child** played on? *(Include any school or community sports teams.) Choose one of the following answers:*
    0 1 2 3 4 5 6 7
    (Sports teams played on)

23. How many hours a night does your child usually sleep? *Choose one of the following answers:*
    1 2 3 4 5 6 7 8
    9 10 11 12 13 14 15+
    (Hours per night)

24. How many days a week is your **child** usually physically active for a total of at least 60 minutes? *(Add up all the time she spent in any kind of physical activity that would increase her heart rate and make her breathe hard some of the time.) Choose one of the following answers:*
    0 1 2 3 4 5 6 7
    (Days per week)

25. On an average school day, how many hours a day does your **child** usually play video or computer games or use a computer for something that is not schoolwork? *(Include activities such as Nintendo, Game Boy, PlayStation, Xbox, computer games, and the Internet.) Choose one of the following answers:*
    0 1 2 3 4 5 6 7 8 9 10
    (Hours per day)

26. How many hours a day does your **child** usually watch TV? *Choose one of the following answers:*
    0 1 2 3 4 5 6 7 8 9 10
    (Hours per day)

27. How would you describe your **child's** health? *Choose one of the following answers:*
    A. Poor
    B. Fair
    C. Good
    D. Very Good
    E. Excellent

28. How interested is your **child** in learning about health topics? *Choose one of the following answers:*
    A. Not interested
    B. Somewhat interested
    C. Interested
    D. Very interested

29. How interested is your **child** in learning about science? *Choose one of the following answers:*
    A. Not interested
    B. Somewhat interested
    C. Interested
    D. Very interested

30. Does your child have any learning accommodations? *Choose one of the following answers:*
    A. No
    B. Yes

31. If your child has any learning accommodations, please describe them below:
    _____

**What is your ID number?** _ _ _ _ _ _

**For each question below, please answer what is true for YOU *(the ADULT completing this questionnaire)*.**

| On a typical day, do **YOU**: | *Choose one of the following below:* | | |
|---|---|---|---|
| 32. drink a can, bottle, or glass of SODA or POP, such as Coke, Pepsi, or Sprite? (*Do not include diet soda or diet pop.)* | NO | ONCE | TWICE OR MORE |
| 33. eat VEGETABLES? (*Do not count white potatoes.)* | NO | ONCE | TWICE OR MORE |
| 34. eat FRUIT or drink 100% FRUIT JUICE? | NO | ONCE | TWICE OR MORE |
| 35. eat FAST FOOD? | NO | ONCE | TWICE OR MORE |
| 36. eat CANDIES or SWEETS such as Cookies, Doughnuts, Pie, or Cake? | NO | ONCE | TWICE OR MORE |
| 37. eat DINNER that is COOKED by you or someone else in the family? | NO | YES | |
| 38. take part in physical activity for at least 30 minutes? *(Add up all the time YOU spent in any kind of physical activity that would increase your heart rate and make you breathe hard some of the time).* | NO | YES | |

Appendix B

ID: ___ ___ ___ ___ ___ Timepoint: _____ Date: __ / __ /____

**EBS**

**Instructions:** Think of everything you ate yesterday. Think of breakfast, lunch, dinner and any snacks you had. This survey is going to ask you about the "number of times" you ate certain foods yesterday. For example, if you ate a sandwich and you had 2 pieces of bread, those count as "2 times" for eating bread. **Select the number of times you ate each food listed below by MARKING an "X" in the column that applies to you.**

**Yesterday, how many times did you…**

| | None | 1 time | 2 times | 3 or more times |
|---|---|---|---|---|
| 1. Eat fruit? (*Do not count* juice.) | | | | |
| 2. Eat vegetables? (Include all cooked and uncooked vegetables, salads, and boiled, baked, or mashed potatoes. *Do not include* French fries or chips.) | | | | |
| 3. Eat starchy vegetables like potatoes corn or peas? (*Do not count* French fries or chips.) | | | | |
| 4. Eat any orange vegetables like carrots squash, or sweet potatoes? | | | | |
| 5. Eat a salad made with lettuce, or any green vegetables like spinach, green beans, broccoli, or other greens? | | | | |
| 6. Eat any other vegetables like peppers tomatoes, zucchini, asparagus, cabbage, cauliflower, cucumbers, mushrooms, eggplant, celery, or artichokes? | | | | |
| 7. Eat beans such as pinto beans, black beans, kidney beans, refried beans, or pork and beans? (*Do not count* green beans). | | | | |
| 8. Eat peanuts or peanut butter? | | | | |

**Yesterday, how many times did you…**

| | None | 1 time | 2 times | 3 or more times |
|---|---|---|---|---|
| 9. Drink fruit juice? (100% juice like orange juice, apple juice, or grape juice. *Do not count* punch, Kool-aid, sports drinks or other fruit-flavored drinks.) | | | | |
| 10. Drink any punch, Kool-Aid, sports drinks, or other fruit-flavored drinks? (*Do not count* fruit juice.) | | | | |
| 11. Drink any regular (NOT diet) sodas or soft drinks? | | | | |
| 12. Drink any diet sodas or soft drinks? | | | | |
| 13. Drink a bottle or glass or water? (Include sparking or any other water drink that has 0 calories). | | | | |
| 14. Drink any kind of milk? (Include chocolate or other flavored milk, milk on cereal, and drinks made with milk.) | | | | |

ID: ___ ___ ___ ___ ___ Timepoint: _____ Date: __ / __ /____

**Yesterday, how many times did you…**

| | None | 1 time | 2 times | 3 or more times |
|---|---|---|---|---|
| 15. Eat brown rice, macaroni, and spaghetti or pasta noodles? | | | | |
| 16. Eat white rice, macaroni, and spaghetti or pasta noodles? | | | | |
| 17. Eat any whole-grain or wheat bread, buns, bagels, tortillas, or rolls? | | | | |
| 18. Eat any white bread, buns, bagels, tortillas, or rolls? | | | | |
| 19. Eat hot or cold cereal? | | | | |

**Yesterday, how many times did you…**

| | None | 1 time | 2 times | 3 or more times |
|---|---|---|---|---|
| 20. Eat hamburger meat, hot dogs, sausage (chorizo), steak, bacon, or ribs? | | | | |
| 21. Eat battered or fried chicken, chicken nuggets, chicken fried steak, fried pork chops, or fried fish? | | | | |
| 22. Eat food from any type of restaurant? (Restaurants include fast-food, sit-down restaurants, pizza places, and coffee shops). | | | | |
| 23. Eat French fries or chips? (Include potato chips, tortilla chips, Cheetos, corn chips, or other snack chips.) | | | | |
| 24. Eat sweet rolls, doughnuts, cookies, brownies, pies, or cake? | | | | |

**Yesterday, how many times did you…**

| | None | 1 time | 2 times | 3 or more times |
|---|---|---|---|---|
| 25. Eat any kind of cheese, cheese spread, or a cheese sauce? (Include cheese on pizza or in dishes such as tacos, enchiladas, lasagna, sandwiches, cheeseburgers, or macaroni & cheese.) | | | | |
| 26. Eat yogurt or cottage cheese or drink a yogurt drink? (*Do not count* frozen yogurt.) | | | | |
| 27. Eat some type of frozen dessert? (A *frozen dessert* is a cold, sweet food like ice cream, frozen yogurt, an ice cream bar, or a Popsicle.) | | | | |
| 28. Eat any candy? (*Do not count* brownies or chocolate cookies.) | | | | |

Appendix C

ID: ___ ___ ___ ___ ___ Timepoint: _____ Date: ___ / ___ / _____

**SE Survey – Eating, Asking, Preparing FVs**

**Instructions:** Please read each statement below and MARK an "X" in the column that best describes how sure you are that you can do the following.

| How sure am I that I can: | Not sure | I think so | Very Sure |
|---|---|---|---|
| 1. Eat fruits I like (such as bananas or raisins) at BREAKFAST | | | |
| 2. Eat vegetables I like (such as green peppers or tomatoes) at BREAKFAST | | | |
| 3. Drink a glass of my favorite juice (such as orange juice or apple juice) with my BREAKFAST | | | |
| 4. Eat fruits I like (such as applesauce or fruit cocktail) at LUNCH | | | |
| 5. Eat vegetables I like (such as salad or a plain baked potato) at LUNCH | | | |
| 6. Drink a glass of my favorite juice (such as grape juice or V-8 juice) with my LUNCH | | | |
| 7. Eat fruits I like (such as apples or oranges) for dessert at DINNER | | | |
| 8. Eat vegetables I like (such as corn or beans) at DINNER | | | |
| 9. Drink a glass of my favorite juice (such as tomato juice or orange juice) with my DINNER | | | |
| 10. Snack on fruits I like (such as grapes or bananas) instead of on foods like cake or cookies | | | |
| 11. Snack on vegetables I like (such as carrot or celery sticks) instead of foods like potato or corn chips | | | |
| 12. Drink a glass of my favorite juice (such as apple juice or grape juice) with my snack | | | |
| 13. Ask my mom or dad to buy fruits for snacks | | | |
| 14. Ask my mom or dad to fix my favorite vegetable dishes at DINNER | | | |
| 15. Ask my mom or dad to keep 100% juice in the refrigerator | | | |
| 16. Help my mom or dad fix a fruit or vegetable snack | | | |
| 17. Cook a vegetable (like corn-on-the-cob) for DINNER | | | |
| 18. Fill half of my plate with fruits and vegetables when I eat a meal | | | |

ID: _ _ _ _ _ _ Appendix D Date: ___ / ___ / _____

**GROOVE Activities and Habits Questionnaire**

**Instructions**: Please answer each question about your habits, activities, and interests. Pick ONLY ONE ANSWER for each question.

1. During the past 12 months, how many sports teams did you play on? *(Include any teams run by your school or community groups. **DO NOT** INCLUDE Physical education classes).*
   A. 0 teams
   B. 1 team
   C. 2 teams
   D. 3 or more teams

2. How physically active are you?
   A. Not active
   B. Somewhat active
   C. Active
   D. Very active

3. **During the past 7 days**, how many days did you do muscle-strengthening activities (*for example, strength training, resistance training, or weight lifting*)?
   A. 0
   B. 1
   C. 2
   D. 3
   E. 4
   F. 5
   G. 6
   H. 7

4. **During the past 7 days,** how many days were you physically active for a total of **at least 60 minutes per day**? (*Add up all the time you spent in any kind of physical activity that increased your heart rate and made you breathe hard some of the time*).
   A. 0
   B. 1
   C. 2
   D. 3
   E. 4
   F. 5
   G. 6
   H. 7

6. How many **hours per day** do you **usually** watch TV, DVDs, or movies away from school?
   A. 0 hours
   B. Less than 1 hour
   C. 1 hour
   D. 2 hours
   E. 3 hours
   F. 4 hours
   G. 5 hours
   H. 6 or more hours

5. How many **hours per day** do you **usually** spend playing video games like PlayStation®, Xbox®, or arcade games away from school?
   A. 0 hours
   B. Less than 1 hour
   C. 1 hour
   D. 2 hours
   E. 3 hours
   F. 4 hours
   G. 5 hours
   H. 6 or more hours

7. Do you have a TV in your bedroom?
   A. Yes
   B. No

8. Do you have a smartphone?
   A. Yes
   B. No

ID: _ _ _ _ _ _ Date: ___ / ___ / _____

**GROOVE Activities and Habits Questionnaire**

9. How many **hours per day** do you **usually** spend on a computer away from school? *(Time on the computer includes time spent on Instagram, Facebook, Twitter, instant messaging, surfing the web, and playing online video or computer games, etc).*
   A. 0 hours
   B. Less than 1 hour
   C. 1 hour
   D. 2 hours
   E. 3 hours
   F. 4 hours
   G. 5 hours
   H. 6 or more hours

10. During the past 12 months, how many organized physical activities or lessons, such as martial arts, dance, gymnastics, or tennis, have you participated in?
   A. 0 activities
   B. 1 activity
   C. 2 activities
   D. 3 or more activities

11. What type of milk do you **usually** drink?
   A. Regular (whole) milk
   B. 2% milk
   C. 1% (low-fat) or fat-free (skim/non-fat) milk
   D. Soy milk, almond milk, rice milk or other milk
   E. I don't drink milk

12. The foods that I usually eat and drink are healthy so there is no reason for me to make changes.
   A. Yes, all of the time
   B. Yes, most of the time
   C. Yes, some of the time
   D. Never

13. Where do you **usually** get your lunch on school days?
   A. From the main lunch line in the school cafeteria
   B. From a snack bar, a kiosk, or a la carte line in the school cafeteria
   C. From a vending machine at school
   D. From somewhere off-campus
   E. From home
   F. I don't usually eat lunch

14. Do you **usually** eat an evening meal?
   A. Yes, I usually eat an evening meal that is homemade
   B. Yes, I usually eat an evening meal at home that is not homemade (frozen pizza, microwave meal, etc.)
   C. Yes, I usually eat an evening meal from a fast food restaurant
   D. Yes, I usually eat an evening meal from a sit-down restaurant or pizza place
   E. Yes, I usually eat an evening meal from a place other than home or a restaurant
   F. No, I don't usually eat an evening meal

15. Do you help prepare meals or cook at home?
   A. Yes, all of the time
   B. Yes, most of the time
   C. Yes, some of the time
   D. Never

16. Do you **usually** eat something for breakfast?
   A. Yes, all of the time
   B. Yes, most of the time
   C. Yes, some of the time
   D. Never

ID: _ _ _ _ _ _ Date: ___ / ___ / _____

**GROOVE Activities and Habits Questionnaire**

17. How would you describe your health?
My health right now is:
A. Bad
B. Not so good
C. Good
D. Very Good
E. Excellent

18. Are you in good shape physically? My physical shape is:
A. Bad
B. Not so good
C. Good
D. Very Good
E. Excellent

19. How interested are you in learning about science?
A. Not interested
B. Somewhat interested
C. Interested
D. Very interested

20. How interested are you in learning about health topics?
A. Not interested
B. Somewhat interested
C. Interested
D. Very interested

21. Are you in a club about health at school?
A. Yes
B. No
C. My school doesn't have this club.

22. Are you in a science club at school?
A. Yes
B. No
C. My school doesn't have this club.

23. Are you in a computer or technology club at school?
A. Yes
B. No
C. My school doesn't have this club.

24. How many hours a night do you usually sleep? _____

25. Tell us about your computer access at home (select one):
A. I have a computer at home but DO NOT have internet
B. I have a computer at home AND I DO have internet
C. I DO NOT have a computer at home