

# Nutrition Literacy And Demographic Variables As Predictors Of Adolescent Weight Status In A Florida County

2013

Leslee D'Amato-Kubiet  
University of Central Florida

Find similar works at: <http://stars.library.ucf.edu/etd>

University of Central Florida Libraries <http://library.ucf.edu>

 Part of the [Nursing Commons](#)

## STARS Citation

D'Amato-Kubiet, Leslee, "Nutrition Literacy And Demographic Variables As Predictors Of Adolescent Weight Status In A Florida County" (2013). *Electronic Theses and Dissertations*. 2881.  
<http://stars.library.ucf.edu/etd/2881>

This Doctoral Dissertation (Open Access) is brought to you for free and open access by STARS. It has been accepted for inclusion in Electronic Theses and Dissertations by an authorized administrator of STARS. For more information, please contact [lee.dotson@ucf.edu](mailto:lee.dotson@ucf.edu).

NUTRITION LITERACY AND DEMOGRAPHIC VARIABLES AS PREDICTORS OF  
ADOLESCENT WEIGHT STATUS IN A FLORIDA COUNTY

by

LESLEE A. D'AMATO-KUBIET  
B.S.N. University of Florida, 1990  
M.S.N. University of Florida, 1998

A dissertation submitted in partial fulfillment of the requirements  
for the degree of Doctor of Philosophy  
in the College of Nursing  
at the University of Central Florida  
Orlando, Florida

Summer Term  
2013

Major Professor: Mary Lou Sole

© 2013 Leslee D'Amato-Kubiet

## **ABSTRACT**

In recent years, childhood obesity has increased to epidemic proportions across the United States (U.S.) in parallel with adult obesity, which often reflects poor dietary choices and bad nutritional habits. Nutrition literacy, which encompasses the constructs of nutrition knowledge and skills, is considered a basic tool for good dietary habits and health promotion undertakings; however, its more definitive relationship to adolescent children's weight status is unknown. Most children's weight status studies have focused solely on behavioral aspects of adolescent food intake, taking into consideration parental influence, peer pressure, and societal expectations. Studies evaluating the measurement of nutrition literacy with regard to adolescent weight status are non-existent. The primary purpose of this study was to examine the effects of parent and adolescent nutrition literacy expressed as nutrition knowledge and skills, with total household income and parent level of education, as predictors of weight status in adolescents that live in a Florida community. The secondary purpose of this study was to examine the implications for nutrition literacy levels within parent/adolescent dyads to identify public health initiatives aimed at adult and adolescent populations.

Parent/adolescent dyads were screened against inclusion criteria and 110 dyads were chosen to participate. Following informed consent from the parent and assent from the adolescent, demographic data were collected and the parent/adolescent participants were asked to complete two study instruments: the Nutrition Literacy Survey (NLS) testing nutrition knowledge (Diamond, 2007) and the Newest Vital Sign (NVS) assessing nutrition skills (Weiss, Mays, Martz, Castro, DeWalt, Pignone, Mockbee, Hale, et al., 2005). The written instruments were administered to both parents and the adolescent child simultaneously, directly following the collection of adolescent height and weight.

First, paired *t*-tests were used to compare means for the NLS and NVS survey in parent-adolescent dyads. Next, bivariate correlation scores were computed between the two variables of parent/adolescent NLS and NVS scores. Higher total correct scores indicated higher levels of nutrition knowledge, whereas lower total correct scores indicated lower nutrition knowledge. Next, a correlation analysis using the Pearson *r* correlation coefficient was computed to determine if a relationship existed between nutrition knowledge and nutrition skills in parent-adolescent dyads. Lastly, regression models for examining adolescent BMI were compared with the independent variables of the study. The first model used standard multiple regression analysis to determine the correlation between parent/adolescent level of nutrition knowledge and parent/adolescent level of nutrition skills to children's weight status (BMI). The second model used logistic regression analysis to determine if a correlation between parent/adolescent level of nutrition knowledge, parent/adolescent level of nutrition skills, and demographic characteristics, to children's BMI could be predicted. The third model used the same procedure for logistic regression with all IV data as categorical data rather than actual values. Gender was included in the final model, since it was of relevance to BMI for adolescent populations.

The study results indicate that adolescent male participants had higher BMI ( $27 \pm 3.48$ ) than females ( $24 \pm 2.90$ ),  $t(108) = 4.83$ , ( $p = < .001$ ). The results suggest that percentage underweight/normal weight for males (32.8%) and females (75.5%) and percentage overweight/obese for males (67.2%) and females (24.5%) differed comparatively between the two groups, with a larger percentage of adolescent males having greater BMI than female adolescents.

The mean Nutrition Literacy Scale score ( $M=19$ ) for parent (adult) study participants indicated low overall levels of general nutrition knowledge whereas the mean Nutrition Literacy

Scale score (M=21.7) for adolescent study participants demonstrated slightly greater aptitude for general nutrition knowledge than parental scores. The mean Newest Vital Sign score (M=4.1) for parents suggests adequate levels of nutrition skills. Likewise, the mean Newest Vital Sign score (M= 4.1) for adolescents suggests adequate levels of nutrition skills, similar to scores attained in the adult population.

Spearman rho correlations yielded positive correlations between parents' nutrition knowledge and adolescents' nutrition knowledge, ( $r_s = .224, p = .019$ ), and parents' nutrition knowledge and skills ( $r_s = .596, p < .001$ ). Positive correlations were also noted between adolescents' nutrition knowledge and parents' nutrition skills ( $r_s = .257, p = .007$ ) and adolescents' nutrition knowledge and nutrition skills ( $r_s = .260, p = .006$ ).

For the first model, a multiple regression was calculated to predict BMI from parent/adolescent nutrition knowledge and parent/adolescent nutrition skills. These variables did not statistically predict adolescent BMI,  $F(4,109) = .348, p < .845, R^2 = .013$ . All four variables did not significantly add to the prediction,  $p < .05$ .

In the second model, a logistic regression was computed to predict adolescent underweight/normal weight and overweight/obese from parent/adolescent nutrition knowledge and parent/adolescent nutrition skills, household income, and parent education level. These variables did not statistically predict adolescent weight status, ( $\chi^2(6) = 3.31, p = .769$ ; -2 Log Likelihood 149.036;  $R^2 .03$ ; Hosmer and Lemeshow Goodness-of-Fit  $\chi^2(8) = 12.36, p = .136$ ).

In the third model, a logistic regression was calculated to predict adolescent underweight/normal weight and overweight/obese from parent/adolescent nutrition knowledge and parent/adolescent nutrition skills, household income, and parent education level, and adolescent gender. These variables did not statistically predict adolescent weight status, ( $\chi^2(11)$

= 14.506,  $p = .206$ ; -2 Log Likelihood 137.841;  $R^2 .124$ ; Hosmer and Lemeshow Goodness-of-Fit  $\chi^2 (8) = 10.864$ ,  $p = .210$ . Analysis of regression coefficients indicates none of the variables demonstrated significance.

The results of the study suggest that parents and adolescents may have similar amounts of nutrition literacy when examining the constructs of nutrition knowledge and skills; however, BMI is not solely dependent on these skill sets. Gender may play an important role in the prediction of BMI in adolescents. Examination of the factors that influence parents and children's weight status are important elements in shaping families adoption of sound dietary habits and improving health outcomes.

I would like to dedicate this dissertation to my wonderful husband, Martin Kubiet. His constant support and love helped me survive the process. He never had a doubt that I would finish, even when I doubted myself. I would also like to express my thanks to our wonderful sons, Alexander and Nicholas Kubiet. They had to endure late dinners, Chinese food take-out, dirty laundry, and many other “Mom is working on dissertation” moments over the last few years. Their love and enthusiasm for life was a driving force towards finishing this research. I would like to express my sincere thanks to Leo and Jean Kubiet. They have always encouraged me to work hard and be proud of my achievements. Lastly, I would like to thank my parents, Nannette and Richard D’Amato. They have always encouraged me to be the best I can be and have fostered the attainment of higher education as a part of my life goals. I wouldn’t be who I am today without them.



## **ACKNOWLEDGMENTS**

I would like to thank my committee members, Dr. Mary Lou Sole, Dr. Angeline Bushy, Dr. Norma Conner and Dr. Steven Berman for their support and commitment throughout the dissertation process. I owe the completion and guidance for this research to their patience and dedication to helping students succeed. I would specially like to thank my chairperson, Dr. Mary Lou Sole, for being a wonderful mentor, statistician, cheer-leader, trouble-shooter, and colleague. Dr. Sole is a loyal student advocate that believes in supporting the next generation of researchers. This dissertation would have been impossible without her unending support.

## TABLE OF CONTENTS

LIST OF FIGURES .....	xiv
LIST OF TABLES .....	xv
CHAPTER 1: THE PROBLEM.....	1
Introduction .....	1
Background .....	1
Statement of the Problem .....	3
Purpose of the Study .....	4
Research Questions .....	4
Hypotheses .....	5
Definition of Terms .....	5
Assumptions .....	7
Summary .....	7
CHAPTER 2: REVIEW OF THE LITERATURE/THEORETICAL FRAMEWORK .....	9
Introduction .....	9
Definitions and Measurement .....	9
Individual Traits .....	12
Adolescent Nutrition Literacy .....	12
Race/Ethnicity .....	13
Socio-Economic Status.....	16
Education.....	17
Health Outcomes .....	18
Environmental Considerations .....	18

Sources of Nutrition Knowledge .....	20
Health Costs and Service Use.....	22
Health and Weight Status .....	23
Framework .....	24
CHAPTER 3: METHODS .....	30
Research Design .....	30
Sample and Setting .....	30
Eligibility/Exclusion Criteria.....	30
Parental Inclusion Criteria .....	31
Adolescent Inclusion Criteria .....	31
Exclusion Criteria .....	31
Power Analysis .....	32
Setting.....	32
Ethical Considerations.....	33
Protection of Human Participants.....	33
Informing Participants .....	33
Protecting Respondents .....	34
Risks and Benefits to Participants .....	34
Procedures .....	35
Sampling Procedure.....	35
Recruitment .....	35
Data Collection Process.....	36
Inter-rater Reliability of Research Assistants.....	37

Data Analysis Procedures.....	38
Data Storage .....	38
Pilot Study.....	38
Instruments .....	39
Demographic Data.....	39
Nutrition Literacy Survey.....	40
Validity .....	40
Reliability.....	41
Scoring .....	41
The Newest Vital Sign.....	41
Validity and Reliability.....	42
Scoring .....	42
Body Mass Index.....	43
Data Analysis .....	47
Summary .....	50
CHAPTER 4: RESULTS.....	51
Description of the Sample.....	51
BMI Demographics of Sample.....	54
Scores on BMI Measures .....	54
Outliers .....	55
Tests of Normality of Distribution .....	55
Estimation of Internal Consistency .....	56
Hypothesis Testing.....	57

Correlations among Categorical Demographic Variables.....	57
Questions 1 and 2 .....	58
Question 3 .....	59
Question 4 .....	62
Summary .....	66
CHAPTER 5: DISCUSSION.....	67
Sample.....	67
Adolescent BMI .....	69
Nutrition Literacy .....	70
Nutrition Knowledge.....	70
Nutrition Skills .....	71
Implications.....	73
Nursing Practice .....	73
Nursing Education.....	75
Public Health Policy .....	75
Recommendations for Future Research .....	77
Study Limitations .....	77
Summary and Conclusion .....	80
APPENDIX A: PARENT DEMOGRAPHIC SURVEY .....	81
APPENDIX B: ADOLESCENT DEMOGRAPHIC SURVEY .....	85
APPENDIX C: THE NUTRITION LITERACY SURVEY (NLS) .....	88
APPENDIX D: THE NEWEST VITAL SIGN (NVS).....	93
APPENDIX E: GROWTH CHARTS – BMI BOYS, AGE 2 TO 20.....	96

APPENDIX F: GROWTH CHARTS – BMI GIRLS, AGE 2-20 .....	98
APPENDIX G: IRB APPROVAL LETTER .....	100
APPENDIX H: CONSENT FOR RESEARCH.....	102
LIST OF REFERENCES .....	106

## **LIST OF FIGURES**

Figure 1. Framework for Adolescent Health Literacy .....	25
Figure 2. Model for Client-Centered Nutrition Literacy in Adolescents (D'Amato-Kubiet).....	27
Figure 3. Model for Client-Centered Nutrition Literacy in Adolescents (D'Amato-Kubiet).....	29

## LIST OF TABLES

Table 1. Theoretical and Operational Definitions of Study .....	5
Table 2. Description, Administration, and Scoring of Study Instruments .....	46
Table 3. Demographic Characteristics of the Sample.....	52
Table 4. BMI Demographics of the Sample .....	54
Table 5. Normality of Distribution for Continuous Independent Variables .....	55
Table 6. Estimates of Internal Consistency.....	56
Table 7. Correlation of Demographic Variables with Adolescent BMI .....	58
Table 8. Nutrition Knowledge of Parents and Adolescents .....	58
Table 9. Nutrition Skills of Parents and Adolescents .....	59
Table 10. Correlation for Parent and Adolescent Nutrition Knowledge and Nutrition Skills.....	60
Table 11. Mean Differences in Parent/Adolescent Nutrition Knowledge and Skills Scores.....	61
Table 12. Relationships ( $\rho$ ) between Nutrition Knowledge and Skills by Categorical Classifications as High/Low in Parents and Adolescents .....	62
Table 13. Collinearity Statistics .....	63
Table 14. Model 1 Summary of Regression .....	64
Table 15. Logistic Regression with Categorical and Continuous Predictors of Overweight/Obesity .....	65
Table 16. Independent Sample t-test for Gender as a Comparison with BMI.....	66



## **CHAPTER 1: THE PROBLEM**

### ***Introduction***

Poor dietary patterns and health behaviors have contributed to worldwide increases in chronic diseases. Type 2 diabetes and cardiovascular disease, often associated with obesity, have increased to epidemic proportions in the past decade in global populations that were once symptom free. Lack of pro-active health behaviors and undesirable dietary habits contribute to the etiology of many chronic disease pathologies despite major efforts to raise public awareness through increased preventive health campaigns.

In recent years, childhood obesity has increased to epidemic proportions across the United States (U.S.) in parallel with adult obesity, which often reflects poor dietary choices and bad nutritional habits (Klein & Dietz, 2010; Ogden, Carroll, Curtin, Lamb, & Flegal, 2010). The ability of parents and their adolescent children to comprehend the language associated with health and nutrition information can be challenging. Nutrition literacy is a critical component for the implementation of health education programs directed at lifestyle changes to prevent chronic disease (Savage, Fisher, & Birch, 2007). Nutrition literacy and nutrition knowledge are considered basic tools for good dietary habits and health promotion undertakings; however, their more definitive relationship to adolescent children's weight status is unknown. Examination of the factors that influence parents and children's weight status are important elements in shaping families adoption of sound nutritional standards and improving health outcomes.

### ***Background***

Despite the expanded use of the Nutrition Labeling and Education Act (NLEA) food labels on packaged products since 1990 and the Healthy People 2020 initiatives, childhood

obesity persists (Birch & Davison, 2001; Blitstein & Evans, 2006). Children's weight status is acutely vulnerable to their parent's knowledge of nutrition literacy and how it affects behaviors that guide food choices made for them in the family meal environment (Lindhorst, Corby, Roberts, & Zeiler, 2007). Little has been documented on this phenomenon in family settings. As children develop into the adolescent phase of maturity, they exert greater influence over their health and nutrition choices. These decisions are often based on their social, cognitive, and physical abilities, as well as exposure to family and peer influences, the mass media, and the education system (Manganello, 2008).

Families living in conditions of low socio-economic status are exceptionally vulnerable to the effects of obesity due to the decreased access to healthful foods and related healthcare and educational disparities (Seligman, Laraia, & Kushel, 2010). Within the context of socio-economic status (SES), low-income level has been linked to higher levels of childhood obesity due to lack of access to nutritious food (DeVoe, Krois, & Stenger, 2009). The SES of families is an environmental factor that can have profound influence on healthful weight management behaviors and strategies in family groups (Chang, Nitzke, Brown, & Baumann, 2011).

Research suggests that parent education level has an indirect association with children's weight status; however, studies that compare education level with nutrition literacy are inconclusive (Crossman, Anne Sullivan, & Benin, 2006). Also, there is a paucity of studies that explores the relationship of nutrition literacy and dietary knowledge relative to parent and children's weight status. Since obese children often become obese adults, the relationship between parental health behaviors and environmental predictors of a child's weight status warrants further investigation.

Several theoretical frameworks attempt to provide explanations of human behavior related to diet and weight status outcomes using unidirectional, assumptive, models that emphasize an individual's control over environmental or internal determinants of personal behavior. For example, linear relationships often portray health outcomes as the result of a specific health behavior. The reverse can occur when a health outcome leads to significant changes in health behaviors. In contrast, the framework for adolescent health literacy, imbedded within the Ecological Model (EM), is unique in integrating multiple parent-child factors into personal, behavioral, and environmental factors in the family nutrition and dietary environment (Manganello, 2008). The framework further suggests that different levels of influence contribute to individual development and future health behaviors. Constructs of nutrition literacy have mirrored the overarching theme of health literacy to reflect specific dietary knowledge brought forth in review of the literature. The model has been adapted to meet the underpinnings of adolescent nutrition literacy and its multidimensional effect on health outcomes.

### ***Statement of the Problem***

Despite massive public health initiatives designed to raise public awareness about health promoting dietary and nutrition practices, such as Healthy People 2020, the food pyramid/my plate, and NLEA food labels on store bought food products, obesity in all ages continues to escalate as a major public health concern (Office of Disease Prevention and Health Promotion, 2007). Given the constellation of risk factors for all-cause mortality related to diabetes, cardiovascular disease, brain injury, and some cancers, efforts continue to focus on individuals' abilities to read and understand health education materials that could improve health outcomes (Ogden, Carroll, Curtin, Lamb, & Flegal, 2010; Rao, 2008). While previous research has

explored the relationship between parental influences in nutrition behaviors to children's weight patterns, no study to date has explored the effect of these variables to nutrition literacy skills of adolescent populations. Questions also emerged as to contextual factors that can reach children beyond the influences of parental boundaries.

### ***Purpose of the Study***

The primary purpose of this study was to examine the effects of parent and adolescent nutrition literacy expressed as nutrition knowledge and skills, together with total household income and parent level of education, as predictors of weight status in adolescents that live in a Florida community. The secondary purpose of this study was to examine the implications for nutrition literacy levels within parent-adolescent dyads to identify public health initiatives aimed at adult and adolescent populations.

### ***Research Questions***

Several questions were addressed in this study:

1. What is the nutrition knowledge level of parent-adolescent dyads?
2. What are the nutrition skill levels of parent-adolescent dyads?
3. Is there a relationship between nutrition knowledge and nutrition skills in parent-adolescent dyads?
4. Which model of the six predictor variables—parent nutrition knowledge, adolescent nutrition knowledge, parent nutrition skills, adolescent nutrition skills, total household income, or parent level of education—best predicts adolescent weight status measured in body mass index (BMI)?

### *Hypotheses*

- Questions 1 and 2: No stated hypotheses.
- Question 3:
  - H<sub>0</sub>: There is no correlation between nutrition knowledge and nutrition skills in parent-adolescent dyads.
  - H<sub>1</sub>: Adolescent nutrition knowledge and nutrition skills will be correlated to parent nutrition knowledge and skills.
- Questions 4:
  - H<sub>0</sub>: The six predictor values will not significantly predict weight status in adolescent children.
  - H<sub>1</sub>: One or more of the six predictor values will significantly predict weight status in adolescent children.

### *Definition of Terms*

Several terms are used throughout the study. Table 1 contains both theoretical and operational definitions of independent and dependent variables examined in this study.

Table 1. Theoretical and Operational Definitions of Study

<b>Concept</b>	<b>Theoretical Definition</b>	<b>Operational Definition/Instrumentation</b>
Adult/Parent	An adult that is a legal guardian of a minor is defined as: “being of minimum age to engage in a contract, such as marriage, driving, voting” (Dictionary, 2012).	An adult, age 18 or older, that is the legal guardian of a minor, per self-report.

<b>Concept</b>	<b>Theoretical Definition</b>	<b>Operational Definition/Instrumentation</b>
Child/Adolescent	Adolescent is generally defined as: “a stage of development from puberty to maturity terminating legally at the age of majority” (Dictionary, 2012).	A child that has reached 13 chronologic years of age but is less than 18 years of age.
Nutrition Literacy	Nutrition literacy is defined as: “the degree to which people have the capacity to obtain, process, and understand basic nutrition information” (Diamond, 2007; Zoellner, 2009).	<p>Nutrition literacy is assessed as two components: skills and knowledge.</p> <p><i>Skills:</i> The ability to read and calculate nutrition information from a food label. <i>Measurement tool:</i> Newest Vital Sign (NVS)</p> <p><i>Nutrition knowledge:</i> The ability to apply and understand nutrition information. <i>Measurement Tool:</i> Nutrition Literacy Survey (NLS).</p>
Weight Status	Weight Status is defined as: Measured weight references commonly based on observed population distributions (Belfort, Zupancic, Riera, Turner, & Prosser, 2011).	Body Mass Index (BMI) score will be calculated according to the Center for Disease Control guidelines for childhood BMI using the indices of height in centimeters and weight in kilograms.
Demographic Characteristics	Level of education and overall household level of income have been shown to influence adolescent children’s weight status; however these variables have not been evaluated with comparison to nutrition literacy within parent-adolescent dyads (Baker, 2006; Carbone & Zoellner, 2012).	<p>Demographic data collection tool modified from the Behavioral Risk Factor Surveillance System (BRFSS) (CDC, 2011). Items adapted from the BRFSS include data about the adolescent child’s age, gender, race/ethnicity, and scholastic grade level.</p> <p>Parental data adapted from the BRFSS include: Age, gender, race/ethnicity, highest level of education completed, and household level of income.</p>

### *Assumptions*

The study was based on two assumptions: The first is that respondents will answer survey questions honestly and without assistance from family or peers. The second was that respondents can read and follow instructions related to the study's materials.

### *Summary*

Overweight and obesity are leading nutrition-related disorders in the U.S. with prevalence rates that are steadily climbing in people of all ages (Overweight and obesity, 2013). Contributing factors such as inadequate nutrition literacy and knowledge continues to be an emerging public health concern that can be contributing to increased weight status (Carbone & Zoellner, 2012; Fitzgerald, 2009; Manganello, 2008). There is also a great deal of variation among low socioeconomic status (SES) subgroups of the population and the effects on nutrition literacy levels (Moestue & Huttly, 2008; Nutbeam, 2000). Health behaviors can be described as a set of individual capacities, including literacy skills that allow a person to acquire and use new information to improve health status (Manganello, 2008). Nutrition literacy involves a constellation of skills necessary for reading and comprehending important dietary and nutritional information (Baker, 2006). Nutrition literacy skills include individual capacities related to knowledge, skills, and attitude about dietary behaviors that can potentially improve health outcomes.

There is a paucity of information on the measurement of nutrition literacy and knowledge within family groups; even less is understood concerning parent's and adolescent's nutrition literacy levels and how they relate to health status outcomes in children, such as BMI. Gaining an understanding of the modifiable factors that contribute to improved health status in adolescent

children can guide public health initiatives in developing and implementing programs that will optimize individual traits and lead to better health outcomes.

Nutrition literacy may be an important concept in an adolescent's health status. This study assessed nutrition literacy in parent-adolescent dyads. Chapter 2 describes the relevant literature and the framework to guide the study. Chapter 3 includes the methods. Findings are described in Chapter 4. Discussion of findings is included in Chapter 5.



## **CHAPTER 2: REVIEW OF THE LITERATURE/THEORETICAL FRAMEWORK**

### ***Introduction***

To evaluate the state of the science of health and nutrition literacy research within the context of parent and adolescent child dyads, a review of Medline Plus, Pubmed, CINAHL, and PsychInfo databases was conducted using the key search terms of nutrition literacy, weight and body mass index, health outcomes, family, and adolescent. Secondary searches were brought forth from the reference list of selected articles and refined within the constructs of the study's theoretical framework. All articles selected were written in the English language with priority allotted to articles that were from peer-reviewed sources and published within the last 10 years. Articles older than 10 years considered classic or seminal works were included in the review when deemed relevant to the study's constructs. Evaluation of earlier research regarding the definition of nutrition literacy, measurement, occurrence, conclusions, and categories of contributing factors within the parent- adolescent child dyad that identified gaps in the current body of knowledge was done.

### ***Definitions and Measurement***

Nutrition literacy is an important skill that can enable an individual to engage in health promoting activities and can assist with adherence to prescribed dietary interventions. The spectrum of individual capacities necessary to achieve optimal nutritional literacy abilities encompasses basic reading skills at an eighth grade level, knowledge about health and diet, and decision making about preventive health practices and nutritional food choices (Montori, 2005; Sanders, Guez, Baur, Rudd, & Shaw, 2009).

Frequently, literacy and knowledge are confused or mistaken for the same idea. Although the constructs for literacy and knowledge are often times dependent on one another, the definitions and connotations are very different. A consensus definition describes knowledge as forming the basis for understanding, whereas literacy demonstrates the comprehension of the terminology used to depict the underlying knowledge base (Baker, 2006). Lack of knowledge associated with the broader taxonomy of communication often creates misunderstanding or uncertainty when trying to decipher the complexities of mainstream health and nutrition education (Baker, 2006; Diamond, 2007). Understanding the approach individuals use to comprehend important nutrition and dietary facts provides insight into the possible causes of ongoing chronic disease conditions and aids in disease management practices (Gazmararian, Williams, Peel, & Baker, 2003).

The ability of a parent to read and understand health related material and food labels, and then to interpret the meaning of the elements has significant implications towards an adolescent's general health, well-being, and likelihood for increased longevity (Kaati, Bygren, Pembrey, & Sjastram, 2007). Designing labels and educational material that take into account a variety of literacy levels is essential for a wide range of individuals to decipher the complex intricacies of nutrition and dietary concepts (Borra, 2006; Levi, Chan, & Pence, 2006). The ability of an individual to interpret dietary labels has led to the measurement of nutrition literacy and its contributing factors to be dichotomized into an all or nothing phenomenon (literate/non-literate). Further exploration of how parental nutrition literacy affects adolescent children, who are subject to parental health and dietary behaviors, and how it influences their personal choices will contribute to the multidimensional nature of dietary intake. Combined, these attributes can

influence long term preventive health and dietary habits that form the groundwork on which individuals base life choices that affect themselves, their families, and the community at large.

Measurement of nutrition literacy is in the early stages of research and development. Instruments to evaluate nutrition literacy are confined to measurement tools associated with health literacy constructs, rather than focusing on nutrition literacy as its own entity. Common themes brought forth in measurement tools for nutrition literacy define literacy as a universal term that implies general reading ability, comprehension of the written word, numeracy, and application (Carbone & Zoellner, 2012). Measurement tools used for the evaluation of nutrition literacy consist of several layers of literacy assessment, including functional reading literacy, numeracy, and basic comprehensive skills, as they apply to nutrition knowledge application (Baker, 2006; Carbone & Zoellner, 2012; Wilson, 1995, 2000). A recently developed measurement tool designed to quantify the level of nutrition literacy in adults remains to be tested and applied to adolescents within the constructs of nutrition knowledge (Diamond, 2007). Nutrition literacy tools measuring aggregate data related to cardiovascular disease, food insecurity, and cultural barriers to literacy have proven useful in the identification of chronic disease management concerns (Montori, 2005; Yin et al., 2009). However, the use of nutrition literacy instruments to examine relationships between nutrition knowledge and skills, in order to improve or maintain health status of the individual, have not been evaluated within the parent-adolescent dyad. Although very few studies have attempted to target a relationship between literacy and adolescent health, the divergence between complex health information and low parental health literacy may be an important factor in managing children's health disparities (Sanders, Shaw, Guez, Baur, & Rudd, 2009).

Lastly, nutrition literacy measurement tools were evaluated for philosophical underpinnings in accordance with reductionist and non-reductionist methodologies of health care traits and value-based theory. Recent studies among adults suggest an independent association exists between lower health literacy and poorer understanding of preventive care information and reduced access to preventive care services (Sanders et al., 2009). Though research and scholarly inquiry have attempted to advance the measurement of nutrition literacy and its contributing factors, further clarification of specific populations and between-groups measures remain to be explored.

### *Individual Traits*

#### *Adolescent Nutrition Literacy*

An individual's capacity for reading and understanding health and nutrition literacy is subject to multiple influencing factors. While a growing body of research has targeted adult's nutrition literacy skills and related constructs, few have focused on adolescents. Adolescents often have fewer provider contacts and costs within the health care system, yet they are increasingly involved in their health care decisions and choices (Manganello, 2008). Adolescents are frequently targeted by mass media and various technologic venues about health-related materials and are a readily accessible group for health education offered within secondary education school systems. These resources may influence their health behaviors and outcomes as adults.

In addition, adolescents are in a critical stage of development that involves many physical, emotional, and behavioral changes. They are expanding and refining their cognitive and reasoning abilities, allowing them to grasp more abstract ideas and attain greater autonomy

over their lives (Steinberg, 2005). However, in a survey conducted by the Nemours Foundation that evaluated adolescents' perceptions of their health and its relationship to health literacy, 80% of respondents reported they were 'very' or 'sort of interested' in learning more about health, but approximately a quarter (22%) described health information as 'very' or 'sort of hard to understand' (Kidshealth, 2012). These results are consistent with studies that suggest adolescents' dietary intake is influenced by gender, ethnicity, family income, and education. In adolescents aged 11 to 20 years who participated in a cohort study that used a 131-item youth/adolescent food frequency questionnaire, dietary patterns were found to be considerably varied by gender, ethnicity, income, and education (Xie, Gilliland, Li, & Rockett, 2003). Gender differences were found in intakes of energy, total fat, saturated fat, monounsaturated fat, and calcium ( $P < 0.05$ ). Non-Hispanic Whites had the lowest intakes of fruits while Blacks and Asians had significantly higher intakes of vegetables ( $P < 0.05$ ). Adolescents from higher income families had greater intakes of polyunsaturated fat, protein, calcium, and folate and regularly consumed more dairy products. Adolescents from families with parents who had higher educational attainment were more likely to meet the recommendations of dairy products, fruits, and vegetables, and intakes of cholesterol in adolescent diets was decreased (Xie et al., 2003). To date, in studies examining healthful dietary practices and demographic variables of the family food environment, adolescent participants did not exhibit consistently healthy dietary intake patterns and no consistent factor was identified to account for this phenomenon.

### ***Race/Ethnicity***

Recent studies conducted by the U.S. Department of Health and Human Services have attempted to identify racial and ethnic groups at risk for low health literacy. Most suggest that

limited health literacy affects adults in all racial and ethnic groups (Office of Disease Prevention and Health Promotion, 2008). Of all the groups of adults in the study, whites had the highest levels of health literacy, with only 28% reporting 'basic' or 'below basic' health literacy levels. Hispanic and black populations combined reported 65% as 'basic' or 'below basic' health literacy levels (Office of Disease Prevention and Health Promotion, 2008). No studies exist to report adolescent health literacy levels that specifically address race/ethnicity disparities. The Nation's Report Card stated that in 2007, for a national sample of eighth graders of all races, 26% of students scored below the basic reading level score (Explorer, 2007). In 2005, 41% of eighth graders scored below the basic level of understanding for science information (Explorer, 2007). Basic reading level scores and the ability to understand complex science information are even lower in Hispanic and black populations by approximately 10-15% in each category respectively. Since the constructs of health literacy are often a strong predictor of literacy capabilities across race and ethnic groups, a review of health literacy skills is of value when attempting to understand nutrition literacy in population studies.

The prevalence of familial obesity and chronic disease conditions is disproportionately higher in many racial and ethnic minority families with diverse family food environments. Ethnicity is related to preferences for particular foods, as well as dietary behaviors and social influences that potentially contribute to higher than average risk for increased weight status among children and young adults in U.S. ethnic and minority populations (Kumanyika, 2008). Qualitative studies suggest that food consumption can be an expression of identity in ethnic, regional, and religious groups. It also recognizes ethnic expression in the form of culinary behaviors that are symbolic and convey multiple meanings that are portrayed in the preparation, service and consumption of food (Jones, 2007). Exposure to food environments of lower than

average availability of nutritious foods with increased accessibility to nutrient sparse, high-calorie snacks or fast food restaurants, along with ethnically directed food marketing, can contribute to unhealthy eating practices. This can increase family weight status due to dietary habits that become socially and culturally valued (Kumanyika, 2008; Wardle, Guthrie, Sanderson, Birch, & Plomin, 2001). In a longitudinal study examining race differences in weight gain over a 34-year period, African-American women weighed 4.96 kg ( $P < .001$ ) more at baseline and gained 0.10 kg/year ( $P = .043$ ) more weight than Caucasian women. In the same study, African-American men weighed 2.41 kg ( $P = .006$ ) more at baseline but did not gain more weight than Caucasian men (Baltrus, Lynch, Everson-Rose, Raghunathan, & Kaplan, 2005).

In a similar study describing childhood overweight for BMI using the National Health and Nutrition Examination Survey (NHANES) data spanning a 30 year period (1971-2003)( $n = 29,146$ ), weight, and height among Caucasian, African-American, and Mexican-American children, the prevalence of overweight increased approximately 3-fold (4% to 13%) among 6- to 11-year-old Caucasian children but 5-fold (4% to 20%) among African-American children (Freedman, Khan, Serdula, Ogden, & Dietz, 2006). In age-sex related groups, Mexican-American children had increases in BMI and overweight within ranges recorded for African-Americans and Caucasians (Freedman et al., 2006). Although race and/or ethnicity factors have significant value in trends related to children's weight status within the family food environment, it is not the only mechanism that potentially explains the risk for increased weight status and unhealthy behaviors in adolescent children.

### ***Socio-Economic Status***

In a study based on adult household income, uninsured adults and those enrolled in Medicare and Medicaid were more likely to be at the below basic or basic level of health literacy than those adults who received insurance from an employer (Office of Disease Prevention and Health Promotion, 2008). About one-fourth of adults with employment-based or privately-funded health insurance were in the ‘below basic’ or ‘basic’ health literacy group. However, more than half of uninsured persons, Medicare beneficiaries, and Medicaid beneficiaries were in the ‘below basic’ or ‘basic’ level of health literacy groups (Office of Disease Prevention and Health Promotion, 2008).

There are few studies that examine factors related to family characteristics as predictors of nutrition literacy in parent-adolescent dyads. A limited number of articles compared family characteristics of marital status, income, race, and education with parental control over their child’s food intake and beliefs in causes of fatness, as predictors of children’s health and weight status (Alaimo, Olson, & Frongillo, 2001; Birch & Davison, 2001; Krahnstoever Davison, Francis, & Birch, 2005; Siegel, 2007). The only family characteristic that has emerged as a weak predictor of children’s susceptibility to chronic disease and obesity is gross household income; although parental beliefs related to diet and activity contribute to children’s weight status, no further explanatory power after income is adjusted for has been revealed (Gray et al., 2007).

There is consistent evidence that interventions aimed at improving children’s overall health status and preventing childhood obesity should be directed at healthful nutrition and exercise opportunities, especially in low-income populations, rather than at parental control issues (Joffe, 2007; Townsend, Ontai, Young, Ritchie, & Williams, 2009). According to the 2005 Dietary Guidelines, a low-income family would be required to dedicate 43% to 70% of their food



budget to the purchase of fruits and vegetables to achieve the minimum healthy nutrition goals set forth by the American Dietetic Association (ADA) (Cassady, Jetter, & Culp, 2007; Dunn, Sharkey, Lotade-Manje, Bouhlal, & Nayga, 2011; Webber, Sobal, & Dollahite, 2010). In addition, households with low-incomes were less likely to have parents that openly discussed nutritional value of food and preventive health issues, but were more likely to discuss food and exercise in relation to children's outward appearance or functional capacity (Coveney, 2005). In order to understand the impact of health and nutrition literacy levels on parent-child dyads, targeting relationships among family income and factors influencing literacy, will help bridge the knowledge gap that currently exists.

### ***Education***

In the last decade, studies have attempted to identify a link between nutrition literacy and education level; yet major inconsistencies exist in establishing an interrelationship between the two. Nutrition literacy and knowledge levels involve multidimensional phenomena that when tested, are dependent on a dynamic set of personal, behavioral, and environmental variables. Thus, the level of parental education measured in family-based samples often fails to solely emerge as a strong predictor of adolescent health behaviors. The impact of parental level of education has been identified as a personal characteristic prompting further investigation since educational achievement has direct bearing on household income, access to nutritious foods, and the potential for increased health and nutrition literacy levels (Dammann & Smith, 2009) .

Higher household educational levels are often associated with higher household income and the perception that more healthful foods and lifestyle behaviors are affordable (Dammann & Smith, 2009). Since parents play a central role in shaping children's eating behavior through

food selection and by making some foods more readily available than others, affordability of nutritious foods will impact the family food environment and what foods adolescents purchase outside the home (Savage et al., 2007). In a few instances, it has been suggested that increased parental education level leads to improved healthy lifestyle behaviors in family groups, such as exercise and preventive care health habits, but no definitive link has been identified (Sanders et al., 2009). Since the influence of health and nutrition literacy has not been explored within the context of education level for parent-adolescent dyads, further research is necessary to better understand the role it may play for adolescent health and nutrition outcomes.

### ***Health Outcomes***

#### ***Environmental Considerations***

An environmental factor that can have significant impact on a family's weight status is low socio-economic status (SES). SES is defined as a multifactorial phenomenon consisting of the combined factors of household income, household level of education, and occupation (Shavers, 2007). Populations in communities with low SES usually have limited exposure to affordable health services and access to nutritious foods is often financially unattainable to many families (DeVoe et al., 2009). Although there is exposure to health care providers, such as school nurses and public health facilities, circumstances related to work obligations, lack of insurance, privacy concerns, or long wait times can inhibit individuals from receiving routine health care services (DeVoe et al., 2009). Family health and weight status in low SES households are often predisposed to lack of education on the complexities of dietary and nutrition knowledge, limited exposure to nutrition information resources and food variety, and low income and parental levels of education (Castro et al., 2007; Cherry, Huggins, & Gilmore, 2007; DeVoe et al., 2009). The

family meal environment, public schools, and county health departments serve as the only potential sources for nutrition education in many U.S. households with low SES. Adults and children living in communities with depressed economies are prone to poor dietary habits, with diets consisting primarily of non-nutritive foods that are prepared fried or cooked in saturated fats (Cherry et al., 2007). Likewise, correlates with median adult education levels proved low literacy levels, at a third to fifth grade reading level, for the focus population compared with a sixth to eighth grade national adult reading level (Cherry et al., 2007).

Although the mechanisms are unclear, research suggests positive correlations between the effects of SES and adults and children's overall health status (Shavers, 2007). There is currently no uniform standard for measuring SES, but it is commonly measured as a person's work experience and a family's social position with comparison to others based on income, occupation, and education (Li, Law, Lo Conte, & Power, 2009). Methods examined SES factors and family health in nationwide surveys from the U.S. (NHANES III, 1988-1994), China (1993), and Russia (1992).

Body mass index (BMI) cut-off points to define obesity (>95th percentile) and overweight (85th-95th percentile) were used from the World Health Organization (WHO) guidelines (Wang & Zhang, 2006). Results showed inconsistency in the relationship between obesity and SES across countries. Higher SES subjects were more likely to be obese in China and Russia, but in the U.S., low SES groups were at greater risk for unhealthy lifestyle behaviors, including obesity, than adults and children living in higher SES groups (Wang & Zhang, 2006). Since SES proved to have great variation on an international level, examination of individual family characteristics with separated components of SES as predictors of health and weight status with comparison to actual BMI in children has been undertaken. Results suggest

low household income as a primary predictor of child overweight and poorer overall health, and a weaker relationship of child weight status to parental level of education (Gray et al., 2007).

Although measures of nutrition literacy were not performed, correlation between literacy levels and parental level of education may be useful to provide a stronger correlation to health outcomes in rural populations.

In regions characterized by ethnic and racial minority communities, ethnographic research has described nutrition literacy in terms of symbolism used at meal times rather than actual food content (Jones, 2007). Food is more than an expression of identity in ethnic, regional, and religious affiliation; it is also a means to convey messages through culinary behavior that requires examination of preparation, service, and consumption (Jones, 2007). A limitation to the review was that overall health and weight status outcomes of the populations discussed with relationship to food symbolism were not evaluated as part of the dialogue (Jones, 2007).

### ***Sources of Nutrition Knowledge***

Nutrition literacy is used to interpret many sources of dietary information. Skills necessary to understand dietary content can increase an individual's knowledge about diet and nutrient content thereby supporting their ability to implement disease prevention, management, or treatment. The ability to understand and use information about nutrition gathered from sources such as newspapers, magazines, and the internet is commonly referred to as media health literacy (MHL) or eHealth literacy (Levin-Zamir, Lemish, & Gofin, 2011). The Internet and other forms of print media have become more readily accessible to a broad range of populations and are increasingly utilized by adults and adolescents for health information (O'Keeffe & Clarke-

Pearson, 2011). Adolescents, rather than adults, are typically early adopters of new technology (e.g., the Internet); however, teens of parents with low education levels are either ‘as likely as’ or ‘even more likely than’ teens of high education parents to seek online health information (Shanyang, 2009; Skinner, Biscope, Poland, & Goldberg, 2003).

Despite the widespread and increasing use of media for dietary information, adolescents reported that parents and health care providers are key sources of diet-related information (Ackard & Neumark-Sztainer, 2001). Adolescents also responded that struggling to understand general health information and belief that little could be done to affect their future health, decreased the likelihood for interest in and desire to follow what they were taught about health (Brown, Teufel, & Birch, 2007). Age and gender differences also determined where adolescents typically seek sources of dietary and health information. Girls were more likely to turn to school, parents, and medical personnel for health information whereas older students (13-17 years of age) were more likely to turn to school and the Internet (Brown et al., 2007; Eysenbach, 2008). Also identified from adolescent studies was that health information provided by parents, school, television, and friends were more trusted than Internet material (Eysenbach, 2008; Ghaddar, Valerio, Garcia, & Hansen, 2012). Only 17 percent of adolescents reported trusting Internet-based health information ‘a lot,’ whereas 85 percent said they trusted physicians, 68 percent said they trusted parents, 30 percent said they trusted TV related media, and 18 percent said they trusted friends ‘a lot,’ with regard to health information (Eysenbach, 2008).

Urban and rural adolescents have similar reasons for seeking sources of health information which include concerns about illegal drug use, smoking marijuana, smoking cigarettes, HIV/AIDS, drinking liquor, becoming a young parent, being hurt in a fight, cancer, diabetes, and having a bad heart (Lariscy, Reber, & Paek, 2011). Although adolescents are

concerned about health outcomes from specific behaviors or environmental exposures, their level of nutrition knowledge and skills has seldom been evaluated as a factor for understanding dietary information. Likewise, parental influence on nutrition knowledge in adolescents and the relationship one has to the other, has yet to be examined.

### ***Health Costs and Service Use***

Nutrition literacy is a multidimensional concept that can indirectly affect an adolescent's health outcomes. Although greater access to health care services can improve health outcomes, a relationship between health care service coverage and an individual's level of nutrition literacy has yet to be explored within the adolescent population and the parent-adolescent dyad. An early study (n = 2,659) that surveyed health literacy, level of education, overall health, and use of healthcare services in adults over a 3 month period, suggested that individuals with inadequate functional health literacy were more likely to rate their health as poor compared to individual's with adequate literacy (Baker, Parker, Williams, Clark, & Nurss, 1997). Also, the number of years of school completed was less strongly associated with self-reported health. Nutrition literacy was not related to a regular source of preventive care or health provider visits; however, individuals with insufficient health literacy levels were more likely than person's with sufficient literacy to report a hospitalization in the previous year (Baker et al., 1997). Since health literacy is positively associated with higher nutrition literacy skills (Silk et al., 2008), it is a key factor for supporting dietary behavior interventions for the treatment of diet-related conditions such as diabetes, cancer, metabolic syndrome, and cardiovascular disease (Macabasco-O'Connell et al., 2011). Yet, mixed results for the relationship of literacy to the use of health care services in the adolescent population exists. In a systematic review exploring the effect of general parental

literacy levels on child health outcomes, children with low literacy generally had poorer health behaviors and knowledge of preventive care (DeWalt & Hink, 2009).

Parents with low literacy levels had less health knowledge and engaged in behaviors that were less beneficial for their children's health compared to parents with higher literacy levels. Children with parents that had low literacy levels often had worse health outcomes (DeWalt & Hink, 2009). A link between parent and child health services use with regard to dietary knowledge and nutrition literacy could be useful for guiding interventions aimed at prevention of conditions leading to chronic disease.

### ***Health and Weight Status***

Parental health and weight status has been inconsistently related to children's health and weight outcomes (Agras, Hammer, McNicholas, & Kraemer, 2004; Bang & B., 2007). Elevated BMI in maternal weight status and low household income have been identified as contributing factors to increased BMI in children, but the role of increased BMI in paternal weight has not emerged as a strong predictor (Lin, Huang, & French, 2004; Siegel, 2007). A study conducted over a 7 year period (n = 346) compared the effects of overweight and lean families to SES. In the study, children with lean parents demonstrated no SES difference in BMI rank from age 4 to 11; however, in children with obese parents, the increase in BMI rank was significantly greater in lower SES families (Semmler, Ashcroft, van Jaarsveld, Carnell, & Wardle, 2009). In many cases, there is an incongruence between parents' perceptions of children's overweight or obesity contributing to decreased health status since it is usually not perceived in parents who are overweight or obese themselves (Doolen, Alpert, & Miller, 2009). Prospective studies suggest that child feeding behavior and parental BMI, rather than parenting style, has greater correlation

to children's BMI in the family food environment (Hennessy, Hughes, Goldberg, Hyatt, & Economos, 2010). Traditionally, associations in family trends towards obesity and decreased health status have primarily been gauged through environmental and psychosocial aspects of the family food environment (O'Neil et al., 2010). Further examination of family trends towards children's weight status that focus on access to nutritious foods and the ability of parents to understand the complex language of dietary and nutritional elements, would provide vital insights into adolescent's weight status outcomes.

### ***Framework***

Guiding the model of nutrition literacy for this study is the Framework for Adolescent Health Literacy proposed by Manganello (2007). Within the context of nutrition literacy, the Framework for Adolescent Health Literacy is supported by the Institute of Medicine's findings on adult health literacy that have extended to parent-child dyads (Neilson-Bohlman, 2004). The Framework for Adolescent Health Literacy also includes constructs derived from the Ecological Model (EM) that imply different levels of internal and external factors can influence an individual's development and health behaviors (Bronfenbrenner, 1975,1986; Elder et al., 2007).

The Framework for Adolescent Health Literacy (Figure 1) emphasizes the influence of individual traits, health outcomes, and environmental factors on the level of health literacy an adolescent is able to achieve. The bidirectional arrows and feedback loops within the framework suggest that health literacy can affect an individual's health outcomes while exerting influence over indirect factors, such as individual traits and environmental stimuli (Manganello, 2011). Similar constructs are useful to address nutrition literacy and how changes in an individual's knowledge, skill, and behaviors, towards dietary knowledge can improve health outcomes.



Adolescent levels of health literacy are important to address from a public health standpoint since understanding health and nutrition education aimed at early intervention and prevention of chronic disease can greatly improve health outcomes.

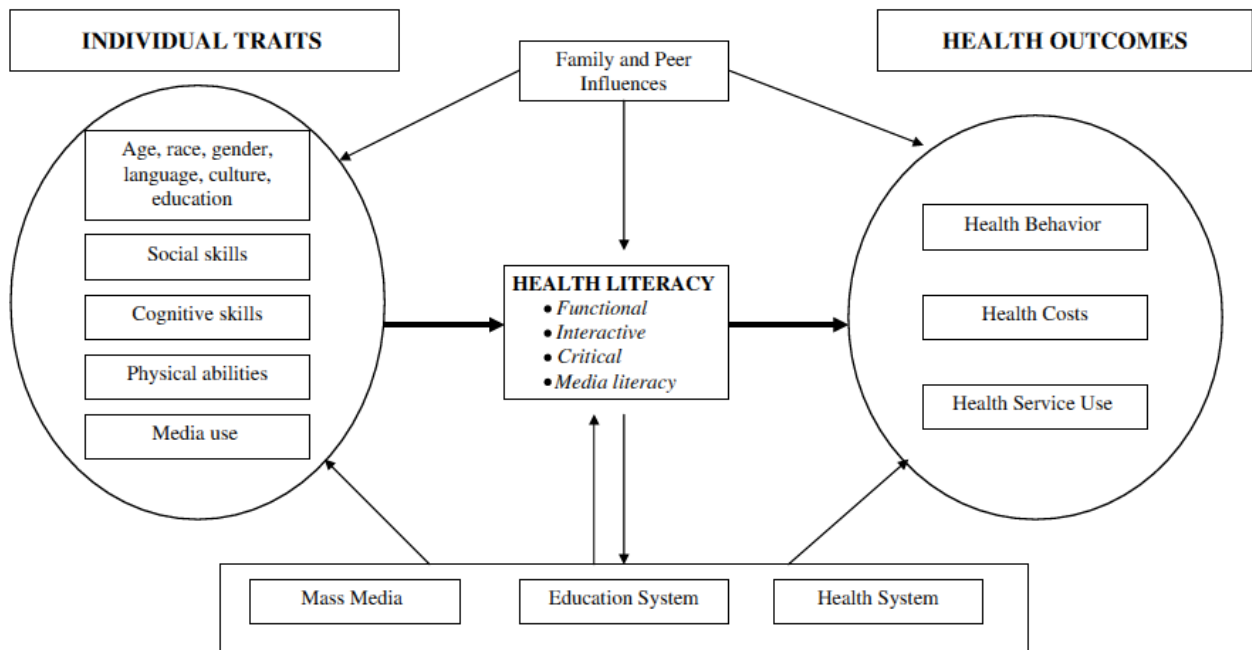


Figure 1. Framework for Adolescent Health Literacy

The ability of an individual to retain the skills for obtaining, understanding, and implementing basic health information and services necessary for making informed health decisions is the foundation of health literacy models (Manganello, 2008). The Principal Investigator (PI) has used the Framework for Adolescent Health Literacy to develop a framework to guide the development of this study—Model for Client-Centered Nutrition Literacy in Adolescents (Figure 2). This model begins with individual traits that represent specific attributes of the individual, such as age, gender, ethnicity/race, cognitive and physical

abilities, and social inclinations. These attributes influence nutrition literacy and affect health outcomes in adolescent populations (Manganello, 2008; Manganello, 2011). Environmental factors form a portion of the Model for Client-Centered Nutrition Literacy since adolescents are frequent users of various types of mass media and increased media use has been associated with both positive and negative health development and behaviors (O'Keeffe & Clarke-Pearson, 2011).

The central focus of the framework encompasses the progression of developmental skills in nutrition literacy within the concept of nutrition literacy as 1) knowledge (ability to understand and coordinate healthful dietary habits into daily food choices), 2) skills (the basic ability of reading food labels and numeracy associated with dietary intake), and 3) behavior (self-efficacy and attitude to change dietary environment).

An individual's nutrition literacy capabilities are included in the center of the framework around a triangle symbolizing the ability to change based on interactions with outside factors related to an individual's traits, family and peers, the environment, and an individual's health status. Lastly, the model concludes with the adolescent's level of nutrition literacy as an outcome of the layers of the surrounding influences and capacities necessary for making dietary choices and decisions.

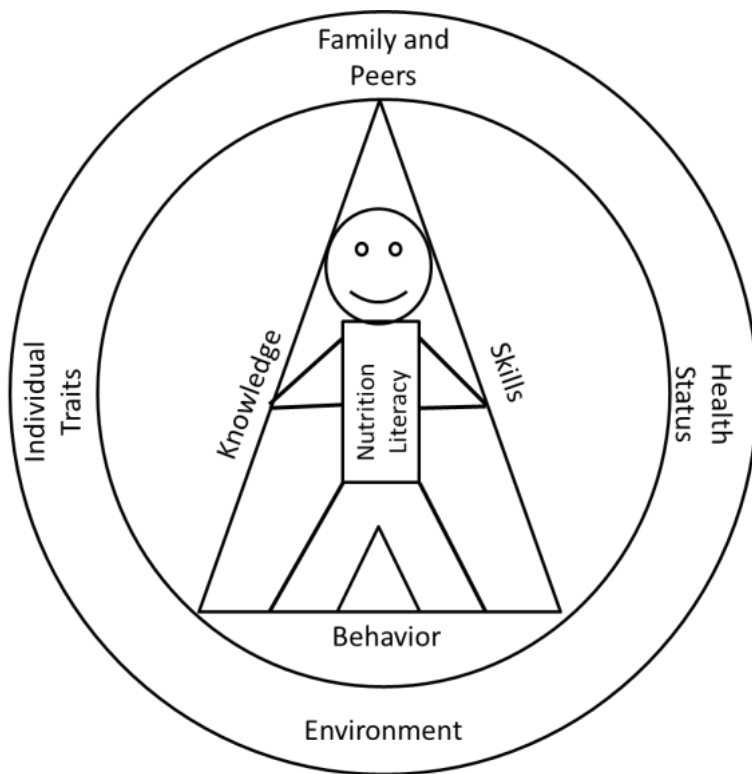


Figure 2. Model for Client-Centered Nutrition Literacy in Adolescents (D’Amato-Kubiet)

For this study, nutrition literacy will be explored within the context of adolescent health literacy and the assessment of nutrition literacy as a contributing factor to health outcomes measured as adolescent BMI. It is beyond the scope and purpose of this study to determine the influential effects of other types of health literacy, such as functional, interactive, or media literacy, on the selected health outcome of adolescent BMI. To date, most of the current research has focused on nutrition literacy and outcomes in adult populations; however, a relationship in similar patterns among adolescents has yet to be determined.

Nutrition literacy and several potential modifying factors identified as elements of the Model for Client-Centered Nutrition Literacy are consistent with variables that contribute to an individual’s level of nutrition literacy within the parent-child dyad. Variables to be explored in this study that are congruent with categories reflected in the Model for Client-Centered Nutrition

Literacy include: 1) self-identified individual traits of adults and adolescents as quantified by demographic variables of age, race, gender, ethnicity, and education; additionally, parents will report household income; 2) nutrition knowledge as quantified by the NVS; 3) nutrition skills as quantified by the NLS; and 4) access to health services and costs as quantified by a modified version of the Behavioral Risk Factor Surveillance System Questionnaire (BRFSS, 2011) Section 3: Health Care Access.

As illustrated by the study framework, nutrition literacy in adolescents can be influenced by multiple factors that can affect health outcomes. Although the degree of influence exerted by modifying factors can vary from person to person, this study will attempt to identify which variables best predict the probability of higher levels of health outcomes in adolescent children. Figure 3 depicts the framework for the study along with the variables to be assessed.

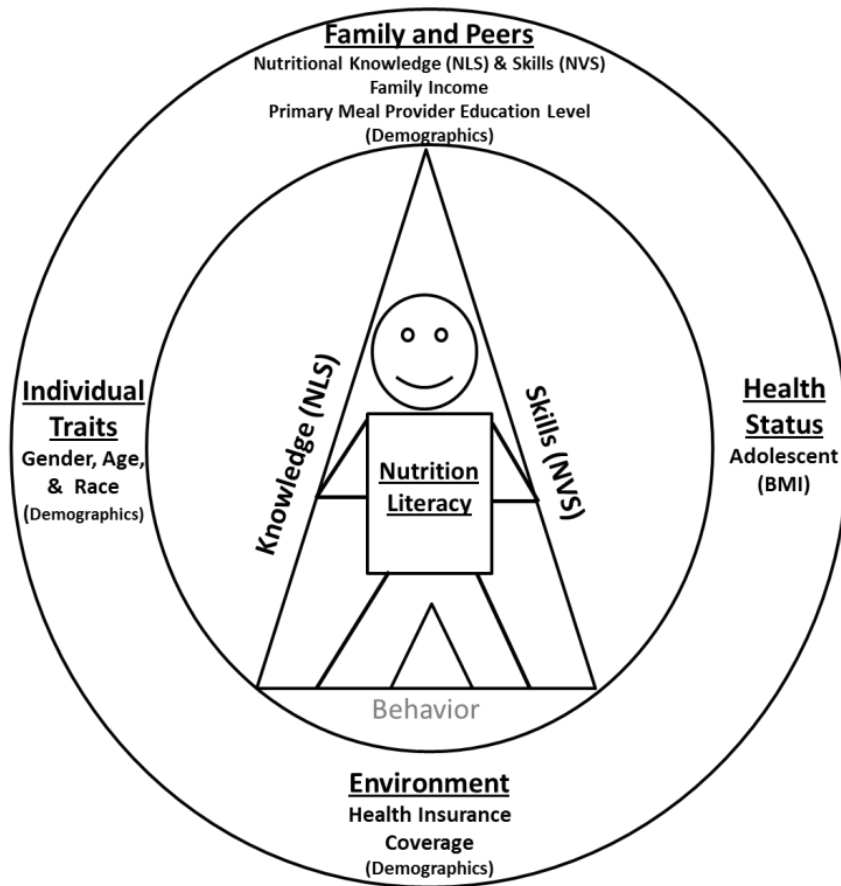


Figure 3. Model for Client-Centered Nutrition Literacy in Adolescents (D'Amato-Kubiet)

In summary, literature supports the need to assess nutrition literacy in adolescents. Many factors can influence nutrition literacy in the adolescent population, as noted in the adapted model. These issues were studied in this dissertation. Chapter 3 describes the study methods.

## **CHAPTER 3: METHODS**

The study examined parent nutrition literacy levels, adolescent nutrition literacy levels, household income, parent level of education, and select demographic variables, and tested their effects on weight status in adolescent children that live in a Florida county. Findings were used to explore the implications for weight status outcomes within parent-adolescent dyads to public health initiatives aimed at adult and adolescent populations, as predicted by the Model for Client-Centered Nutrition Literacy in Adolescents.

### ***Research Design***

A descriptive, correlational design was chosen for this study to collect data at a single point in time using a voluntary convenience sample.

### ***Sample and Setting***

Parent-adolescent dyads (n=110) who met inclusion criteria were recruited for participation in the study. Data obtained from the demographic survey (Appendix A) were used to describe the sample and assure that selected participants met the study inclusion criteria.

### ***Eligibility/Exclusion Criteria***

The following inclusion criteria for both parent-adolescent dyads were used for recruitment: (1) must speak, read, and write in English; and (2) must live in Flagler County, FL. Children and their parents were not discounted as possible study participants due to their appearance, level of fitness, or disability.

### ***Parental Inclusion Criteria***

(1) The focal parent was one, self-identified, legal guardian that was 18 years of age or older, and was a self-identified primary care giver of the focal child, that resides in the same household as the child. (2) If two parents were present when approached to participate in the study, the parent that self-identified as making the most meal purchasing and planning decisions for the family was asked to complete the study materials. (3) Attendance with adolescent at public health screening event.

### ***Adolescent Inclusion Criteria***

Adolescent participation was based on the following: (1) Males and females between the ages of thirteen and seventeen. (2) Current registration in a local school district in the identified county. (3) attendance at a public health screening event.

### ***Exclusion Criteria***

Exclusion criteria included children that had not reached 13 years of age or those 18 years and older. Parents or adolescents that could not speak, read, or write in English, or that lived in a county outside of Flagler County. The rationale for excluding younger children was that the parent or parents influence the majority of decisions concerning the child's health behaviors and food choices, albeit with some displays of preferential input from the child. Children younger than the intended study population would have very little input on meal or snack planning and lack the developmental autonomy to exert authority over parental bias or understanding of nutritional value.

### *Power Analysis*

The sample size of 110 dyads was based on a proposed alpha level of 0.05, six predictor variables, and an observed  $R^2$  of 0.15. Effect size was set at as medium since the literature did not support a consistent estimate (Cohen, 1999). An observed power level of 0.80 yielded an estimated sample size of 97 as the total number of valid cases necessary for analysis. Sample size estimates using power analysis are supported by recommendations for a ratio of participants to independent variables of at least 15 to 1 (Mertler, 2010). Request to recruit up to 110 parent-adolescent dyads was made to account for possible attrition and incomplete data.

### *Setting*

Participants were recruited from a Florida county in North Central Florida. Currently, there is no consistent definition for persons residing in low SES communities. Portions of some Florida counties contain large, rural areas but are not classified as low SES. Many of the counties bordering on the Atlantic and Gulf have populations concentrated near the coast, but have thinly populated interiors. To take these less populated areas into account, the statutory Rural Health Networks include them in their service areas (Florida Department of Health, 2010). The constituents of the proposed county for this study, Flagler County, Florida, do not have access to a health care facility of greater than 100 acute care beds. The county hospital is lacking health care providers and in-patient resources to manage acute care pediatric clients. There are no pediatric specialist services represented in the county. The facility does not have the resources for acute adult or pediatric conditions that require time sensitive interventions, such as treatment of acute myocardial infarction that needs interventional cardiac procedures.



Flagler County has the highest rate of unemployment in the state of Florida at 13.8%, compared to the state average of 10.3% (Florida Department of Health, 2010). The school nurse-to-student ratio for Flagler County is 1:4,367, which is considerably less than the state average of Florida which is 1:2,536 (Health, 2010). The median income for Flagler County is \$48,090, which is consistent with similar counties that have large areas designated as farmland and more densely populated coastal areas. Currently, 80% of Flagler County is designated as state subsidized farmland (Florida Department of Health, 2010). Flagler County has two middle schools (seventh and eighth grades), two public high schools (ninth through twelfth grades), and one “at-risk” high school (ninth through twelfth grade) (Florida Department of Health, 2010). Each school has between 900-1500 students, thereby providing a large potential pool of participants.

### ***Ethical Considerations***

#### ***Protection of Human Participants***

Protection of study participants was undertaken by following the ethical and legal guidelines set forth by the policies for protection of human subjects mandated by the University of Central Florida and the U.S. Federal Guidelines for conducting research with human subjects (Services, 2009). The study was approved by the University of Central Florida Institutional Review Board (Appendix G).

#### ***Informing Participants***

A cover letter/consent form was provided to participants, both parent and the adolescent, identifying the name of the principal investigator, doctoral studies faculty sponsor, the organization affiliation, the purpose of the research, the number of parent-adolescent dyads

necessary for participation, the risks and benefits of participation in the study, and the understanding that response data will remain private (Appendix H). Participants were informed that partaking in the study was entirely voluntary and they retained the option to refuse or discontinue their involvement without experiencing any form of censure or consequence.

### ***Protecting Respondents***

Individual responses to the study instruments were anonymous; no personal identifying factors, such as name or address, were gathered. Privacy was maintained by assigning random numbers between 1 and 200 to each parent- adolescent dyad which eliminated the discovery of any personal information. The randomly assigned numbers were not connected to any form of personal identification data and were used in all study data. Only the researcher and the supervising research faculty were granted access to the data, which was password protected after being downloaded to a personal computing device.

### ***Risks and Benefits to Participants***

There were no anticipated risks involved with participation in this study; however, the participant could have experienced minor psychological discomfort when disclosing both personal health and nutrition knowledge, and when height and weight were measured. There was no direct benefit to the participants in this study except for assisting health care providers to increase knowledge about factors that contribute to an individual's health status within the family environment. No monetary or other type of incentive was offered to adult or adolescent study participants.

## *Procedures*

### *Sampling Procedure*

One parent and one adolescent child per family were recruited for participation. Parent was defined as an adult over the age of 18 that is in residence with the focal adolescent child of the study that self-identifies as the primary care giver and a legal guardian of the adolescent child, but is not necessarily a biological parent. Because parents tend to agree on the dietary and nutrition behaviors of their children, only one parent was recruited for this study. Enrollment of one parent was more practical for recruitment efforts in today's society to balance the divorce rate and complement of blended families.

The adolescent child consisted of one child between the ages of thirteen and seventeen that had not reached 18 years of age. If a family had more than one adolescent in this age range, the child with a birth date closest to the date of data collection was selected to participate.

### *Recruitment*

The first recruitment effort for participants took place at a free health physical screening offered by volunteer health care providers from a local hospital in the identified county. The expected and average participation for the free physicals was approximately 400 to 600 adolescents. A second recruitment effort was planned if the sample size was not achieved with the first data collection. It would have targeted public and private school systems, county health departments, churches, after-school activities, and community functions. Participants were recruited based on their willingness to speak with the researcher on-site. Potential participants were approached and asked if they would like to participate in a brief survey about nutrition and dietary habits.

Parents were asked if they would like to participate in the study and for permission to allow their adolescent child that met the study criteria to participate if the adolescent agreed to the described research process. Informed consent was obtained from the parent for themselves and their adolescent child prior to data collection. The PI, or trained research assistant, described the research process and answered any questions. An IRB-approved consent form and parental permission form was given to eligible parent participants to read and sign. The form contained parental consent for the adolescent child's participation. Participation in the study was voluntary. Parent and adolescent participants were informed they did not have to answer any questions they did not wish to and no names or forms of personal identification were collected on the study questionnaires. Parent and adolescent participants were informed they could discontinue participation at any time.

### ***Data Collection Process***

Data collection was conducted by the PI, or trained research assistant, that had direct contact with study participants and was not a local provider of health care. All data were collected during initial contact with each parent- adolescent dyad in a single session estimated to be 20 minutes in total length. Parents and adolescents were asked to complete all the study instruments as administered by the PI using a pencil and paper format.

In the presence of the parent, the adolescent child was measured for height and weight, and BMI was calculated. Adolescent measurements were conducted with the child standing beside the PI or site provided table in the presence of the parent. Locations that allowed for the greatest amount of privacy at the determined site were pre-arranged by the PI.

The written instruments were simultaneously administered to both the parent and the adolescent, directly following the collection of height and weight. The demographic questionnaire was completed first. Then, participants were presented the remainder of the instruments in the following order: NLS (Diamond, 2007) and the NVS (Weiss, Mays, Martz, Castro, DeWalt, Pignone, Mockbee, Hale, et al., 2005). The parent and the adolescent completed the study instruments at individual tables with chairs provided by the PI at the research site. They were asked to respond without assistance from the other.

All instruments were examined for missing items prior to the participant parent-adolescent dyads leaving the study encounter. No monetary or other type of incentive was offered to the parent or adolescent child that completed the study requirements.

### ***Inter-rater Reliability of Research Assistants***

Five individuals volunteered as research assistants (RA) to assist the PI at the event site. The RA's were trained by the PI on site to transcribe adolescent height (cm) and weight (kg) measurements from the scale and stadiometer to the study instrument in the allotted space. The RA's were also taught to examine the study surveys for completeness prior to collection. After collection of the study instruments, the RA's placed the completed surveys in a collection envelope secured by the PI. The PI assessed the competency for completion of the study materials by observing each RA perform adolescent measurements for a minimum of two participants and by observing each RA check the parent/child dyad's study instruments for completeness.

### ***Data Analysis Procedures***

All data obtained were extracted from the study instruments and entered by the PI into a Microsoft Excel spreadsheet. Data were imported from Excel into the Statistical Package for the Social Sciences (SPSS) Grad Pack for Windows version 20.0 (IBM, 2010) for statistical analysis. To lessen the potential for error in data entry, 10% of data entered will be scrutinized for accuracy by an individual other than the person who entered the data.

### ***Data Storage***

Access to data obtained for the study in all forms was limited to the principal investigator and the research faculty supervisor. After the data were downloaded to the PI's password protected laptop, all information were backed up to a dedicated external hard drive device and stored in a locked file cabinet in the PI's home office, along with paper copies of instrumentation completed by the participants. At the end of a five year time frame from completion of the data collection, the external hard drive device, paper copies, and any other research materials will be destroyed.

### ***Pilot Study***

Following IRB approval, a pilot study was conducted with 5 subjects (parent-child dyads) recruited from the population of interest. The pilot study sample size is 5% of the calculated sample and data were not included in the main study sample. The purpose for conducting a pilot sample included: 1) Examining the practicality of the study instruments, 2) evaluation of interruptions during completion of the study materials, and 3) estimating the length of time required to complete the study materials and anthropometric measurements. The pilot study

noted that it took between 20 to 25 minutes to complete the tools. No further adjustments were made to the instruments or procedures for data collection based on the pilot study.

### *Instruments*

Two social-behavioral instruments, selected demographic information, and physiologic measurements were completed. In addition to demographic information, participants selected for the study completed the following data collection instruments: The NLS and The NVS. Each of these instruments has demonstrated validity and reliability either within literacy data collection or as a means of collecting information about nutrition knowledge data for both adult and adolescent populations. Refer to Table 2 for instrument scoring.

### *Demographic Data*

Demographic data (Appendix A) included age, race/ethnicity, gender, household income, level of education of the person responsible for meal planning and preparation, and health care use/access. Actual age of parent and adolescent was recorded (scale level data). Nominal and ordinal level categories were used to obtain the rest of the demographic data.

While no formal evaluation instrument exists to measure health care use, access, or health seeking behaviors, several components of the BRFSS (CDC, 2011) have been used and validated as reliable measures when evaluating population dynamics for health care services and when seeking health care information (Ghaddar et al., 2012; Levin-Zamir et al., 2011). This tool is necessary to describe the scope of health services access available to the sample population. Modifications to the current survey questions in BRFSS were incorporated into the demographic data collection tool.

### ***Nutrition Literacy Survey***

The NLS (Appendix B) is a 28-item instrument constructed in sentence format that is used to assess the participant's ability to comprehend nutritional information (Diamond, 2007). A modified "Cloze procedure" is used for questioning in which one or more words are removed from the sentence (e.g., "Losing \_\_\_\_\_ can be a challenge." A) weight, B) calories, C) fiber, D) vitamins). Respondents are asked to choose the best option to complete the sentence from a list of four options in multiple-choice, written format. Items in each content area are prearranged from easiest to more difficult. The scale includes indicators directed at healthy eating, saturated fats, and portion sizes. The NLS also consists of content areas related to organic foods, calcium, fiber and sugar. The estimated time for completing the NLS is ten minutes.

### ***Validity***

The readability statistics for the NLS calculated by Microsoft Word for English-speaking participants in preliminary reviews of the instruments is estimated at 69.7% which is within the recommended range for reading ease. The NLS received a grade level score of 6.7, indicating participants with very low literacy levels may have difficulty reading the items. The instrument developer expressly states the NLS is for research and is not intended as a clinical diagnostic tool (Diamond, 2007).

The concurrent validity of the NLS was established by administering it with the Short Test of Functional Literacy in Adults (S-TOFHLA) for comparison. The scores from the two measures were moderately correlated ( $r=0.69$ ) when used in clients with diabetes and hypertension.



### ***Reliability***

The internal consistency reliability of the 28 item NLS and the S-TOFHLA was obtained by administering it to 341 adults from a family practice setting on four different instances from 2004-2006. Cronbach's alpha coefficient was 0.84 and the Pearson correlation between the NLS and the S-TOFHLA scores was 0.61 for all groups combined (Diamond, 2007). Presently, there is no data about test-retest reliability. No factor analysis for the NLS was found. There is currently no approved Spanish version of the NLS, and testing in adolescent populations could not be found.

### ***Scoring***

The NLS asks respondents to choose the best option to complete the sentence from a list of four options in multiple-choice format. A total number right score is used for analysis and expressed as a percentage correct. Higher percentages correct indicate higher levels of nutrition literacy. Conversely, lower percentages correct indicate less low levels of nutrition literacy.

### ***The Newest Vital Sign***

The NVS (Appendix C) is a nutrition literacy screening tool that uses a dietary label to measure nutrition readability and numeracy. It is accompanied by six questions that ask participants to interpret dietary information on a nutrition label and to calculate energy information. The NVS requires approximately three minutes for administration. Researchers identified that health literacy screening tools used in primary care settings were either too long for routine use or were not available in print for multilingual populations (Weiss, Mays, Martz, Castro, DeWalt, Pignone, Mockbee, & Hale, 2005). The NVS was developed to evaluate health literacy in a multilingual population in an expeditious time frame. Since the NVS uses a

nutrition label as an assessment of literacy level for reading and numeracy of dietary information, it is of value for addressing nutrition skills in parent-adolescent dyads.

### ***Validity and Reliability***

In prior studies, the NVS and the TOFHLA were administered to English- and Spanish speaking adult subjects in a primary care setting. A Cronbach's alpha  $>0.76$  in English and  $0.69$  in Spanish proved internal consistency, reliability, and findings correlated with the TOFHLA. Using TOFLHA scores  $<75$  to define limited literacy, plotted receiver-operating characteristics (ROC) curves and calculated likelihood ratios for cutoff scores on the NVS showed the area under the ROC curve was  $0.88$  for English and  $0.72$  for Spanish versions (Weiss, Mays, Martz, Castro, DeWalt, Pignone, Mockbee, & Hale, 2005). Researchers concluded that subjects with more than 4 correct responses were unlikely to have low literacy, whereas fewer than 4 correct answers indicates the possibility of limited literacy (Weiss, Mays, Martz, Castro, DeWalt, Pignone, Mockbee, & Hale, 2005).

Data evaluating psychometric evaluation of the NVS in adolescent populations is currently unavailable, but preliminary studies anticipate correlation values similar to adult populations (Jordan, Osborne, & Buchbinder, 2011).

### ***Scoring***

The NVS asks respondents to read a food label and answer 6 questions about nutrition literacy and numeracy related to the contents of the label. For this study, categorical scores of 0-1 suggests a greater likelihood ( $>50\%$ ) of limited nutrition skills, 2-3 correct indicates the possibility of limited nutrition skills, and 4-6 correct indicates adequate nutrition skills. Actual

correct (scale) scores represent lower scores (closer to 1) as lower levels of nutrition skills and higher levels of scores (closer to 6) represent greater levels of nutrition skills.

### ***Body Mass Index***

Adolescent weight status was operationalized as Body Mass Index (BMI). Physiologic measurements for the study included anthropometric measurement of the focal adolescent child's height and weight without shoes on. Height and weight are measured in the metric system by centimeters and kilograms, respectively, for more precise measurement than the English system of inches and pounds. BMI scores were calculated according to the Center for Disease Control guidelines for childhood BMI using the indices of height in centimeters and weight in kilograms. In addition to actual value, BMI was categorized as low/normal and overweight/obese for logistic regression analysis. Body Mass Index (BMI) for age is the appropriate method for identifying overweight in children (Freedman & Sherry, 2009). Several studies have conducted extensive research to identify the best measure of body fat in children (Freedman & Sherry, 2009; Rao, 2008). Although measures of waist-hip-circumference (WHC) were better able to measure disease risk associated trends in obese children, reliability for the measure of WHC was inaccurate due to a vast amount of intra-rater reliability differences (Freedman & Sherry, 2009; McCarthy, 2006; Rao, 2008).

The Center for Disease Control (CDC, 2010), produces BMI-for-age charts that are age and gender specific. Each chart indicates percentile levels ranging from zero to one hundred. The percentiles were developed to chart expected growth in children and are divided into four categories: Underweight, healthy weight, overweight, and obese. Underweight is defined as below the 5<sup>th</sup> percentile, healthy weight ranges between the 5<sup>th</sup> and 85<sup>th</sup> percentiles, overweight is

measured between the 85<sup>th</sup> percentile and the 95<sup>th</sup> percentile, and obese is measured at greater than the 95<sup>th</sup> percentile.

The correlation between the BMI number and body fatness is fairly strong; however the correlation varies by sex, race, and age (Division of Nutrition, 2011). These variations include the following examples: 1) women tend to have more body fat than men, 2) older adults, on average, tend to have more body fat than younger adults, and 3) athletes in training may have a high BMI because of increased muscularity as opposed to increased body fatness (Division of Nutrition, 2011). BMI is only one factor related to disease risk from increased weight status and it is not a direct measure of body fatness because it is calculated from an individual's weight which includes both muscle and fat (Division of Nutrition, 2011). In a small percentage of the population, some individuals can have a high BMI based on height and weight calculations, but do not actually have a high percentage of body fat.

Height and weight for adolescents was measured in street clothes (with shoes removed) using a Health-O-Meter © digital scale (HDR900-01) and portable stadiometer, consistently by the same investigator according to the NHANES III protocol (Prevention, 2007). The participant was asked to stand upright with his/her weight equally distributed on both legs, and with the heels of each foot touching the back portion of the stadiometer where it meets the floor. The feet should point slightly out at a 60<sup>0</sup> angle while in this position (Prevention, 2007). The horizontal bar of the stadiometer was lowered to the crown of the head with sufficient pressure to compress the hair (Prevention, 2007). The participant's height was measured to the nearest 0.1 cm (Prevention, 2007). Next the participant was asked to stand upright on a digital scale with their weight equally distributed between both legs and their feet. Weight was measured to the nearest 0.01kg (Prevention, 2007).

Health-O-Meter digital floor scales use electro-mechanical transducers called load cells, which translate force or weight into voltage (Sunbeam Products, 2012). For accuracy and reliability each load cell is individually tested and calibrated according to factory standards. Each cell is proof tested to its full rated capacity, and in most instances, to more than its rated capacity (Sunbeam Products, 2012). The scale is set to automatically zero at the beginning of each use.

BMI was recorded as the actual value, and was also categorized as to weight status. The CDC chart standards for BMI for children up to age 20 as follows:

- 1) Underweight = less than the 5<sup>th</sup> percentile
- 2) Healthy weight= 5<sup>th</sup> percentile to less than the 85<sup>th</sup> percentile
- 3) Overweight = 85<sup>th</sup> to less than the 95<sup>th</sup> percentile
- 4) Obese = Equal to or greater than the 95<sup>th</sup> percentile

Table 2. Description, Administration, and Scoring of Study Instruments

Order	Instrument	Variable	Time (Minutes)	Scoring
1	Socio-Demographic Survey (adapted from BRFSS, 2009)	Socio-demographic variables	5	Race, ethnicity, family income, parent level of education
2	NLS	Nutrition literacy	10	<p>The <i>NLS</i> is 28 items, uses a total number right score. Score per item = 1 (correct) or 0 (incorrect).</p> <p><i>Scale Scoring:</i> Actual number correct.</p> <p><i>Categorical Scoring:</i>                      0-14 implies inadequate nutrition literacy                      15-21 implies marginal nutritional literacy                      22-28 implies adequate nutrition literacy</p>
3	NVS	Nutrition literacy and numeracy	3	<p>The <i>NVS</i> consists of 6 items, uses a total number right score, understanding nutrition labels. Score per item = 1 (correct) or 0 (incorrect).</p> <p><i>Scale Scoring:</i> Actual number correct.</p> <p><i>Categorical Scoring:</i>                      0-1 suggests a high likelihood (&gt;50%) limited literacy                      2-3 correct indicates the possibility of limited literacy                      4-6 correct always indicates adequate literacy</p>
4	Body Mass Index (BMI)	Physiologic measure	2	<p><b>Adolescent BMI=</b></p> <p><i>Scale Scoring:</i> Actual Adolescent BMI percentile.</p> <p><i>Categorical Scoring:</i>                      1) Underweight/Healthy weight = Equal to or Less than the 85<sup>th</sup> percentile                      2) Overweight/Obese = Greater than the 85<sup>th</sup> percentile</p>

### *Data Analysis*

Data were analyzed using Statistical Package for the Social Sciences (SPSS; version 20.0). Frequencies (categorical data) and descriptive (scale data) statistics were calculated on all variables to characterize the sample and to provide summary data. Each variable was examined for missing data and plans for addressing missing data were discussed in the proposal. For this study, no missing values were realized from the data. Data were examined for normal distribution. All of the continuous variables demonstrated a normal distribution of data.

#### *Question 1. What is the nutrition knowledge level of parent-adolescent dyads?*

Paired *t*-tests were used to compare responses to the NLS survey in parent-child dyads. Higher total correct scores indicated higher levels of nutrition knowledge, whereas lower total correct scores indicated lower nutrition knowledge. A Q-Q plot examined the variables for normal distribution and descriptive statistics were used to evaluate mean scores on the NLS. Lastly, a paired correlation score was evaluated between the two variables of actual parent NLS scores and adolescent NLS scores. A 2-tailed *t*-test with significance less than .05 would indicate a significant difference in NLS scores between the parent-child dyads and a significance greater than .05 would indicate no significant difference between parent-adolescent dyads.

#### *Question 2. What are the nutrition skill levels of parent-adolescent dyads?*

Paired *t*-tests were used to compare responses to the NVS survey in parent-adolescent dyads. Higher total correct scores indicated higher levels of nutrition skills, whereas lower total correct scores indicated lower levels of nutrition skills. A Q-Q plot that examined the variables for normal distribution and descriptive statistics was used to evaluate mean scores on the NVS. Lastly, a paired correlation score was evaluated between the two variables of actual parent NVS

scores and adolescent NVS scores. A 2-tailed *t*-test with significance less than .05 would indicate a significant difference in NVS scores between the parent-adolescent dyads and a significance greater than .05 would indicate no significant difference between parent-adolescent dyads.

*Question 3. Is there a relationship between nutrition knowledge and nutrition skills in parent-adolescent dyads?*

Bivariate correlation analyses using the Pearson *r* correlation coefficient was calculated using actual values for the NLS and the NVS to determine if a correlation existed between nutrition knowledge and nutrition skills in parent-adolescent dyads. The relationship between nutrition knowledge and nutrition skills in parent-adolescent dyads is of value to determine if parental nutrition literacy extends to adolescent nutrition literacy or to identify if they are independent from each other's influences.

*Question 4. Which model of the six predictor variables- parent nutrition literacy level, adolescent nutrition literacy, parent nutrition knowledge, adolescent nutrition knowledge, family income, or parent level of education, predicts adolescent weight status measured in body mass index (BMI)?*

First, a standard multiple regression analysis was conducted using the regression method to determine the correlation between parent/adolescent level of nutrition knowledge and parent/adolescent level of nutrition skills to children's weight status (BMI). Multivariate normality and homoscedasticity were examined through the generation of histograms and the generation of a residual plot. An ANOVA table was generated to evaluate if the overall model of the IV's significantly predicts adolescents weight status. A model summary to determine the accuracy of the IV's to predict adolescent weight status (DV) was calculated using the regressed



IV's that achieve linearity and/or natural log transformation was performed as necessary.

Analysis of the model summary and ANOVA table for the IV's was used to create a coefficients table to review tolerance statistics between IV's and for analysis of the IV's that significantly contribute to the model. If the tolerance testing is  $< .1$ , then the regression analysis would have been conducted again without the violating variables. All data was explored for goodness-of-fit and multicollinearity to address the potential for incongruences and casual relationships.

Next, logistic regression analysis was conducted to determine if a correlation between parent/adolescent level of nutrition knowledge, parent/adolescent level of nutrition skills, and demographic characteristics, to adolescent's BMI could be predicted. The dependent variable was adolescent BMI, and was coded as a dichotomous variable between underweight/normal weight adolescents and overweight/obese adolescents. The independent variables were the actual numbers of correct answers from the NLS and NVS for parents and adolescents.

Variables related to household income and level of education of the parent responsible for food purchase remained as ordinal level data for the analysis. A model summary to determine the accuracy of the IV's to predict adolescent weight status (DV) were calculated using the regressed IV's that achieve linearity and/or natural log transformation was performed as necessary.

Lastly, the same procedure for logistic regression was conducted with all IV data represented and coded as categorical data rather than actual values. The DV was adolescent BMI and was coded as a dichotomous variable between underweight/normal weight adolescents and overweight/obese adolescents. A model summary to determine the accuracy of the IV's to predict adolescent weight status (DV) was calculated using the regressed IV's that achieved linearity and/or natural log transformation were performed as necessary.

Statistical significance for inclusion as a predictor for all models were set at  $P < 0.05$ . A

comparison between the results for the three models was evaluated for accuracy and the best predictors of adolescent BMI.

### *Summary*

Chapter 3 has described the instruments and methods for conducting this study. Findings are presented in Chapter 4.

## CHAPTER 4: RESULTS

The purpose of this study was to examine demographic variables, nutrition literacy levels of parent-adolescent dyads, parent income and parent education levels, and test their correlation to adolescent BMI based on the Framework for Adolescent Health Literacy (Manganello, 2008).

The purpose was achieved through the examination of four research questions and the testing of 2 hypotheses. As delineated by the selected hypotheses, demographic variables and parent/adolescent nutrition knowledge and skills were considered independent variables. The adolescent participants' BMI was considered the dependent variable.

Data were collected over a 6 hour time period in a single day designated for free physical exams hosted by volunteers from a local healthcare facility. Combining data from all instruments resulted in a total of 74 scale items and 15 demographic variables. Data were analyzed using SPSS 20.0 for Windows.

### *Description of the Sample*

Of the 120 individuals approached, a total of 110 (92%) consented to participate and verbalized permission for their child to participate. None of the parents approached refused to participate in the study; however 10 adolescents did not meet study inclusion criteria prior to consent being signed. In total, 110 parent-adolescent dyads met final study inclusion criteria and were used in data analyses. Demographic characteristics are shown in Table 3. The sample (N =110) of adult participants was represented by males (n = 30, 27%) and females (n =80, 73%) ranging in age from 34 to 55 years (M= 41.9, SD= 4.77) with 62% (n = 68) < 42 year of age and 38% (n = 42) ≥ 42 years of age. The sample of (N=110) adolescent participants was represented

by males (n = 61, 55%) and females (n = 49, 45%) ranging in age from 13 to 17 years (M = 15.1, SD = 1.43) with 52% (n= 57)  $\leq$  15 years of age and 48% (n = 53)  $>$  15 years of age.

The typical adult participant was a 41 year old, non-Hispanic, white female that was the primary meal planner for the adolescent participant, was a high-school graduate, and had a family household income between \$25,000 - \$49,999 a year. The adult participant was typically employed full-time outside the home and had some type of private or employer-sponsored health insurance.

The typical adolescent participant in the study was a full-time student in the public school system with 53% of adolescents in 10<sup>th</sup> grade or lower grades (n= 58) and 47% in either 11<sup>th</sup> or 12<sup>th</sup> grade. The majority of adolescent participants had healthcare insurance (n= 105, 95%) consisting of either private or government sponsored plans. Additional demographic information for the parent-adolescent dyads is presented in Table 3.

Because the numbers were small in the high and low categories of income and education, these variables were recoded into two categories for later analysis in the regression equations.

Table 3. Demographic Characteristics of the Sample

<b>Variable</b>	<b>n</b>	<b>Frequency %</b>	<b>Mean</b>	<b>SD</b>	<b>Range</b>
<b>Age</b>					
Parent	110		42	4.76	34-55
Adolescent	110		15	1.40	13-17
<b>Gender - Parent</b>					
Male	30	27			
Female	80	73			
<b>Gender - Adolescent</b>					
Male	61	55			
Female	49	45			
<b>Race - Parent/Adolescent</b>					
White	65/65	59.1			

Variable	n	Frequency %	Mean	SD	Range
Black or African American	32/32	29.1			
Hispanic	13/13	11.8			
Other	0	0			
<b>Highest level of Education - Parent</b>					
Grades 9-12, or some high school	1	.9			
High school graduate or GED	51	46.4			
College 1-3 years or technical school	55	50.0			
College 4 years or more (college graduate)	3	2.7			
<b>Highest Level of Education/Parent - Dichotomous</b>					
Grades 9-12, or some high school, high school graduate or GED	52	47.3			
College 1-3 years or technical school College 4 years or more (college graduate)	58	52.7			
<b>Employment Status - Parent</b>					
Employee or self-employed, full-time	67	60.9			
Employed or self-employed, part-time	9	17.3			
Out of work	19	8.2			
Homemaker	15	13.6			
<b>Annual Reported Household Income</b>					
Less than \$25,000/year	7	6.4			
Between \$25,000 and \$49,999/year	83	75.5			
Between \$50,000 and \$89,999/year	19	17.2			
\$90,000 or higher/year	1	.9			
<b>Annual Reported Household Income - Dichotomous</b>					
< \$49,999/year	90	81.9			
≥ \$50,000	20	18.1			
<b>Primary Insurance - Parent</b>					
Private or employer-sponsored health insurance	79	71.8			
Medicare/Medicaid	3	2.7			
Health maintenance organization (HMO)/Pre-paid plan	5	4.5			
None	23	20.9			
<b>Primary Insurance-Adolescent</b>					
Private or employer-sponsored health insurance	79	71.8			
Medicare/Medicaid	21	19.1			
HMO/Pre-paid plan	5	4.5			
None	5	4.5			

### ***BMI Demographics of Sample***

A composite BMI score (underweight/normal weight, overweight/obese) was used to determine BMI classification of adolescent participants. Of the total adolescent population (N= 110), 51.8% (n= 57) were classified as underweight/normal weight, with 48.2% (n=51) identified as overweight/obese. Of the participants identified as underweight/normal weight (n=57, 51.8%), 32.8% (n=20) were males and 75.5% (n=37) were females. Overweight/Obese participant adolescents were predominately represented as being 15 years of age and male (n= 8, 88.9%) or 16 years of age and female (n= 7, 36.8%) age group. Underweight/normal weight participants were typically represented as 17 year old males and females, 41.7% (n=5) and 75% (n=6) respectively. Table 4 represents BMI demographics of the sample.

Table 4. BMI Demographics of the Sample

<b>Variable</b>	<b>n</b>	<b>Frequency %</b>	<b>Mean</b>	<b>SD</b>	<b>Range</b>
<b>BMI - Adolescent (actual)</b>					
Male	61		27.3459	3.48011	20.9- 35.5
Female	49		24.3469	2.90345	20.4-33.1
<b>BMI - Adolescent (percentile)</b>					
Male	61		91.0984	9.0105	58-99
Female	49		79.6531	12.55413	48-98
<b>BMI - Adolescent (category)</b>					
Male (underweight/normal weight)	20	32.8			
Male (overweight/obese)	41	67.2			
Female (underweight/normal weight)	37	75.5			
Female (overweight/obese)	12	24.5			

### ***Scores on BMI Measures***

Descriptive statistics were obtained prior to hypothesis testing to describe and summarize data for BMI measures. Measures for central tendency (discussed in hypothesis testing), outliers,

and characteristics of sample distribution were examined for continuous independent variable scores.

### *Outliers*

Histograms and boxplots were visually reviewed for identification of outlying cases. A few outliers were identified in the NLS for the adolescent (2), with no outliers noted to be severe, extending 3 box lengths beyond the plot. Other variables did not have any identifiable outliers noted in the analysis. All outlying cases were considered to be minimal in frequency and valid components of the sample for both adult and adolescent populations, and were included in the analysis.

### *Tests of Normality of Distribution*

Normality of distribution for continuous independent variable values/scores (parent/adolescent nutrition knowledge level and parent/adolescent nutrition skill level) was calculated with measures of skewness and kurtosis. Skewness was between -1 and 1, indicating acceptable distribution. Kurtosis exceeded -1 for parent NLS and adolescent NVS. Table 5 summarizes the results.

Table 5. Normality of Distribution for Continuous Independent Variables

<b>Instrument</b>	<b>Skewness</b>	<b>Kurtosis</b>
NLS Parent	.069	1.192
NVS Parent	.599	.708
NLS Adolescent	.766	.398
NVS Adolescent	.206	1.041

### *Estimation of Internal Consistency*

Given that the target sample size was attained, reliability of each of the scales was estimated by means of Cronbach's alpha ( $\alpha$ ). The NLS for both parents and adolescents achieved an acceptable alpha value greater than .70. Parent NLS alpha values ( $n=110, \alpha = .79$ ) and adolescent NLS alpha values ( $n=110, \alpha = .76$ ) compared favorably to alpha values reported by earlier researchers for adult participants: NLS alpha values,  $\alpha = .84$  (Diamond, 2007). Past research has no reported alpha values for adolescent populations, although alpha values for adolescent populations are projected to be similar to adult alpha values for the NLS (Diamond, 2007).

The NVS fell short of acceptable alpha values for both the parent NVS scores and the adolescent NVS scores with alpha values less than .70. Parent NVS alpha values ( $n= 110, \alpha = .56$ ) and adolescent NVS alpha values ( $n= 110, \alpha = .23$ ) were considerably less than the reported research previously found to be reliable ( $\alpha = 0.76$ ) (Weiss et al., 2005). The alpha values for both the adult and adolescent participants can be explained by the low number of items for the instrument and the other limitations of the tool discussed in Chapter 5. Table 6 summarizes the results.

Table 6. Estimates of Internal Consistency

<b>Instrument</b>	<b>N of items</b>	<b>Cronbach's Alpha</b>
NLS Parent	27	.79
NVS Parent	6	.56
NLS Child	27	.76
NVS Child	6	.23



### ***Hypothesis Testing***

Two hypotheses were posed based on the Model for Client-Centered Nutrition Literacy in Adolescents as adapted by D'Amato-Kubiet (See Figure 3). Standard descriptive summary statistics were used to characterize responses. Associations among variables were evaluated using the Kruskal-Wallis test (continuous variables) or the  $\chi^2$  test (categorical variables) as appropriate. All tests were 2-sided with an a priori significance level set at 0.05. In hypothesis 3, a paired-samples *t*-test was used to examine for differences between parent and adolescent nutrition knowledge and skills. Due to the non-monotonic, linear relationship of the dependent variable when expressed as both continuous and categorical values in hypothesis 4, the relationships between the independent variables and the dependent variable were examined using the Pearson's correlation coefficient and the Spearman's *rho* (*r*) coefficient respectively. The independent samples *t*-test was used to examine data for mean differences in independent variable scores between weight group classification and demographic groups (age, gender, parent income level, parent level of education). In the final multivariate analysis, independent variables that suggested a substantial relationship to adolescent BMI and adolescent weight group classification were used for exploration.

### ***Correlations among Categorical Demographic Variables***

A two-tailed Spearman's *rho* coefficient was calculated for the relationship between categorical demographic variables of gender (parent), race (parent/child), education level of parent meal planner, employment status, household income level and insurance (parent/child). A significant correlation between adolescent gender and BMI was noted ( $r = -.425$ ). Table 7 summarizes correlation statistics for all categorical demographic variables.

Table 7. Correlation of Demographic Variables with Adolescent BMI

<b>Demographic Variable</b>	<b>n</b>	<b>r</b>	<b>p (two-tailed)</b>
Gender (parent)	110	-.060	.533
Race (parent)	110	.021	.828
Education level (parent)	110	.002	.984
Employment Status (parent)	110	-.010	.916
Household income	110	.017	.859
Insurance (parent)	110	-.013	.889
Insurance (child)	110	.019	.842
Race (Child)	110	.021	.828
Gender (Child)	110	-.425	.000

***Questions 1 and 2***

*Question 1: What is the nutrition knowledge level of parent-adolescent dyads? No stated hypothesis.*

Measures of central tendency for the NLS were calculated and analyzed. Overall, parent study participants demonstrated a weak aptitude for nutrition knowledge. Adolescent nutrition knowledge was marginally scored for adequate nutrition knowledge. The mean Nutrition Literacy Scale score (M=19) for parent (adult) study participants indicated low overall levels of general nutrition knowledge whereas the mean Nutrition Literacy Scale score (M=21.7) for adolescent study participants demonstrated slightly greater aptitude for general nutrition knowledge than parental scores. Table 8 summarizes nutrition knowledge for parents and adolescents.

Table 8. Nutrition Knowledge of Parents and Adolescents

<b>Independent Variable</b>	<b>N</b>	<b>M</b>	<b>SD</b>	<b>Range</b>
NLS Total Parent	110	19.03	4.84	9-27
NLS Total Child	110	21.74	3.95	11-27

*Question 2: What are the nutrition skill levels of parent-adolescent dyads? No stated hypothesis.*

Measures of central tendency for the NVS were calculated and analyzed. The mean Newest Vital Sign score (M=4.1) for parents suggests adequate levels of nutrition skills. Likewise, the mean Newest Vital Sign score (M= 4.1) for adolescents suggests adequate levels of nutrition skills, similar to scores attained in the adult population. Table 9 summarizes data for nutrition skills for parents and adolescents.

Table 9. Nutrition Skills of Parents and Adolescents

<b>Independent Variable</b>	<b>N</b>	<b>M</b>	<b>SD</b>	<b>Range</b>
NVS Total Parent	110	4.11	1.42	1-6
NVS Total Child	110	4.16	1.10	1-6

### ***Question 3***

*Question 3: Is there a relationship between nutrition knowledge and nutrition skills in parent-adolescent dyads?*

*Hypothesis 3: There will be a significant relationship between adolescent nutrition knowledge and skills and parent nutrition knowledge and skills.*

Nutrition knowledge scores and nutrition skills scores were compared for parent and adolescents using a two-tailed Pearson’s correlation coefficient. A strong, positive correlation was found ( $r = .622, p = .001$ ) between parent nutrition knowledge and parent nutrition skills. A weak, positive correlation ( $r = .263, p = .005$ ) existed between adolescent nutrition knowledge and adolescent nutrition skills. A positive correlation between parent nutrition knowledge and

adolescent nutrition knowledge ( $r = .229, p = .016$ ) was also noted. Table 10 summarizes correlation statistics for parent and adolescent nutrition knowledge and nutrition skills.

Table 10. Correlation for Parent and Adolescent Nutrition Knowledge and Nutrition Skills

	<b>NLS Parent</b>	<b>NVS Parent</b>	<b>NLS Child</b>
NVS Parent	$r = .662$ $p = .000$		
NLS Child	$r = .229$ $p = .016$	$r = .225$ $p = .018$	
NVS Child	$r = .181$ $p = .059$	$r = .104$ $p = .279$	$r = .263$ $p = .005$

An additional two-tailed, paired-samples  $t$ - test was calculated to compare the mean parent nutrition knowledge scores to the mean adolescent nutrition knowledge scores. The mean for parent knowledge scores was 19.03 (SD = 4.84) and the mean for adolescent knowledge scores was 21.74 (SD = 3.95). Adolescents scored significantly higher than their parents in nutrition knowledge ( $t(109) = -5.15, p < .005$ ).

Likewise, a paired-samples  $t$ -test was calculated to compare the mean parent nutrition skills scores to the mean adolescent skills scores. The mean for the parent skills scores was 4.11 (SD = 1.42) and the mean for adolescent skills scores was 4.16 (SD = 1.10). No significant difference between parent nutrition skills scores to adolescent nutrition skills scores was found ( $t(109) = -.279, p < .05$ ). Table 11 summarizes mean differences in parent and adolescent nutrition knowledge and skills scores.

Table 11. Mean Differences in Parent/Adolescent Nutrition Knowledge and Skills Scores

	<b>M</b>	<b>SD</b>	<b>Lower (95% confidence interval)</b>	<b>Upper (95% confidence interval)</b>	<b>t(df)</b>	<b>p*</b>
NLS Total Parent- NLS Total Adolescent	-2.70	5.50 9	-3.75	-1.66	-.157 (109)	.001

\* $p < .05$

Next, the nutrition knowledge and nutrition skills as categorical data were compared between parents and adolescents using a bivariate correlational model. Two-tailed Spearman's rank order ( $r_s$ ) correlations were calculated to determine the association between the level of nutrition knowledge and skills in parent-adolescent dyads. There was a positive correlation between parents' nutrition knowledge and adolescents nutrition knowledge, ( $r_s = .224$ ,  $p = .019$ ) and parents nutrition knowledge and skills ( $r_s = .596$ ,  $p < .001$ ). Positive correlations were also noted between adolescents' nutrition knowledge and parents' nutrition skills ( $r_s = .257$ ,  $p = .007$ ) and adolescents' nutrition knowledge and nutrition skills ( $r_s = .260$ ,  $p = .006$ ). No relationship was found between parents' nutrition knowledge and adolescents' nutrition skills ( $r_s = .152$ ,  $p = .112$ ).

Table 12. Relationships (rho) between Nutrition Knowledge and Skills by Categorical Classifications as High/Low in Parents and Adolescents

		<b>NLS Parent Category</b>	<b>NLS Child Category</b>	<b>NVS Parent Category</b>
NLS Child Category	$r_s$	0.224*		
	$p$ (2-tailed)	0.019		
NVS Parent Category	$r_s$	0.596***	0.257**	
	$p$ (2-tailed)	0.000	0.007	
NVS Child Category	$r_s$	0.152	0.260**	0.139
	$p$ (2-tailed)	0.112	0.006	0.147

\*Correlation is significant at the 0.05 level (2-tailed).

\*\*Correlation is significant at the 0.01 level (2-tailed).

#### ***Question 4***

Which model of the six predictor variables- parent/adolescent nutrition knowledge, parent/adolescent nutrition skills, family income, or parent level of education, is most influential in predicting adolescent weight status measured in BMI? *Hypothesis 4:* One or more of the predictor values will significantly predict adolescent weight status in all models of adolescent weight status expressed in BMI.

To answer the primary research question, three models for predicting BMI in adolescents were inspected. The first model used standard multiple regression with all continuous variables (including BMI) entered into the analysis as scale data or actual scores. The second model used standard logistic regression with independent variables entered into the analysis as categorical or scale data (actual scores) and the dependent variable of BMI represented as a dichotomous variable based on percentage cut points for underweight/normal weight BMI (coded as 0) and

overweight/obese BMI (coded as 1) for adolescents. The third model used standard logistic regression with all variables expressed as categorical data. Predictor variables demonstrating a significant relationship to BMI in adolescents (NLS parent/adolescent, NVS parent/adolescent, household income, and level of parent education) were entered into the final regression analysis for all models being explored. Adolescent gender was entered into the third model for analysis since the mean BMI for males was higher than females.

Prior to analysis, data were explored for missing values and outliers. Preliminary multiple regression analyses were conducted to calculate Mahalanobis distance and to evaluate the data for multicollinearity. The results for the table of regression coefficients indicated multicollinearity was not violated as tolerance statistics were greater than .1 for all supporting independent variables. Data were explored to determine which cases exceeded Mahalanobis distance critical value of  $\chi^2(5) = 20.515$  at  $p = .001$ . None of the subjects' data exceeded this value; therefore all subjects were included in the analysis.

Table 13. Collinearity Statistics

Variable	Collinearity Statistics	
	Tolerance	VIF
Parent NLS (NLS-P)	.326	3.020
Parent NVS (NVS-P)	.547	1.815
Adolescent NLS (NLS-C)	.848	1.176
Adolescent NVS (NVS-C)	.890	1.116

\*The results indicated that multicollinearity was not violated and the tolerance statistics were greater than 0.1.

The first model used standard multiple regression to determine the accuracy of the independent variables; parent nutrition literacy knowledge (NLS-P), parent nutrition skills

(NVS-P), adolescent nutrition literacy knowledge (NLS-C), or adolescent nutrition skills (NVS-C), in predicting adolescent BMI. Regression results indicate that the overall model does not significantly predict adolescent BMI,  $R^2 = .013$ ,  $R^2_{adj} = -.025$ ,  $F(4,109) = .348$ ,  $p < .845$ . The model correctly accounted for only 1.3% of variance in adolescent BMI. A summary of regression coefficients is presented in Table 14 and indicates that none of the 4 independent variables significantly contributed to the model.

Table 14. Model 1 Summary of Regression

<b>Model</b>	<b>B</b>	<b><math>\beta</math></b>	<b>t</b>	<b>p</b>
Constant	26.088		11.553	.000
NLS Parent (NLS-P)	-.035	-.048	-.363	.717
NVS Parent (NVS-P)	.349	.140	1.076	.284
NLS Adolescent (NLS-C)	-.035	-.039	-.383	.703
NVS Adolescent (NVS-C)	.020	-.006	.060	.952

The second model used binary logistic regression to determine which independent variables; parent level of education (categorical edu-P), household income (categorical inc-P), parent nutrition literacy knowledge (NLS-P), parent nutrition skills (NVS-P), adolescent nutrition literacy knowledge (NLS-C), or adolescent nutrition skills (NVS-C), characterized as actual values, were predictors of adolescent BMI when the dependent variable of BMI was represented as a dichotomous variable based on percentage cut points for underweight/normal weight BMI and overweight/obese BMI for adolescents. Regression results indicated that none of the predictor variables was statistically reliable in distinguishing between underweight/normal weight and overweight/obese adolescent participants ( $\chi^2(6) = 3.31$ ,  $p = .769$ ; -2 Log Likelihood



149.036;  $R^2$  .03; Hosmer and Lemeshow Goodness-of-Fit  $\chi^2$  (8) = 12.36,  $p$  = .136). Regression coefficients are presented in Table 15.

Table 15. Logistic Regression with Categorical and Continuous Predictors of Overweight/Obesity

	<b>B</b>	<b>Wald</b>	<b>df</b>	<b><i>p</i></b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>	
						<b>Lower</b>	<b>Upper</b>
Parent Education	.345	.336	1	.562	1.413	.439	4.547
Parent Income	-.207	.115	1	.693	.813	.291	2.274
NLS_total_P	-.005	.005	1	.944	.995	.867	1.142
NVS_Total_P	.248	1.761	1	.185	1.281	.889	1.847
NLS_Total_C	-.048	.808	1	.369	.953	.858	1.058
NVS_Total_C	.183	.951	1	.329	1.201	.831	1.735

The third and final model used binary logistic regression to determine the accuracy of the independent variables-parent level of education (edu-P), household income (inc-p), adolescent gender, parent nutrition literacy knowledge (NLS-P), parent nutrition skills (NVS-P), adolescent nutrition literacy knowledge (NLS-C), or adolescent nutrition skills (NVS-C), expressed as categorical data, in predicting adolescent BMI when the dependent variable of BMI was represented as a dichotomous variable based on percentage cut points for underweight/normal weight BMI and overweight/obese BMI for adolescents. Regression results indicate that the overall model does not significantly predict adolescent BMI ( $\chi^2$  (11) = 14.506,  $p$  = .206; -2 Log Likelihood 137.841;  $R^2$  .124; Hosmer and Lemeshow Goodness-of-Fit  $\chi^2$  (8) = 10.864,  $p$  = .210. Analysis of regression coefficients indicates none of the variables demonstrated significance.

An additional two-tailed, independent samples t-test was calculated to compare the mean between genders and adolescent BMI. Means were significant for overweight/obese in male adolescents ( $t(108) = 4.83, p < .001$ ).

Table 16. Independent Sample t-test for Gender as a Comparison with BMI

Variable	t	df	p (2-tailed)	S.E.	95% Confidence Interval of the Difference	
					Lower	Upper
Adolescent BMI (Overweight/Obese)	4.830	108	.001	.62089	1.76826	4.22967

### *Summary*

The results of this study did not demonstrate significant predictors of adolescent BMI that could be explained by parent education level, total household income level, parent and adolescent NLS scores, and parent and adolescent NVS scores, in any of the three models examined. However, the BMI of the adolescent participants suggests adolescent boys have higher BMI's than adolescent girls, with both genders reflecting overall BMI's averaging in the overweight/obese category. NLS and NVS scores were low to normal for both parents and adolescent participants.

## CHAPTER 5: DISCUSSION

In the last decade, the importance of nutrition and healthful dietary behaviors and their impact on weight status has warranted a great amount of research. Although general knowledge of nutrition principles has grown rapidly, little is known regarding proficiencies in nutrition literacy and their impact on adolescent BMI in the family meal environment. The primary purpose of this study was to examine the effects of parent/adolescent nutrition knowledge, parent/adolescent nutrition skills, and demographic variables as predictors of weight status in adolescents based upon the framework for adolescent health literacy as adapted by D'Amato-Kubiet (2013). The secondary purpose of this study was to examine the implications for nutrition literacy levels within parent/adolescent dyads to identify public health initiatives aimed at adult and adolescent populations. This chapter explores and compares the study results with previous research findings. Implications for nursing practice and public health initiatives as well as recommendations for future research are discussed.

### *Sample*

The demographic characteristics of the sample of parents and adolescents within the study should not be generalized to the entire population. Participants were comprised of a convenience sample of potential male and female adolescents and their parents, attending a health screening event for free sports physicals. The adolescent and their parent were asked to take part in the study while waiting to receive a physical exam. Age group distributions represented populations defined in similar adolescent studies (13-17 years of age) (Bronfenbrenner, 1986; DeWalt & Hink, 2009; Steinberg, 2005). Gender differences in the adolescent participants favored males (55%) to females (45%) which was expected because the

sample represented potential athletic participation in organized sports (Freedman & Sherry, 2009). Compared to Flagler County statistics, this sample had fewer whites 59.1% (versus 78% county) and more African Americans 29.1% (versus 10% county) and Hispanics 12% (versus 7% county). This follows the trend that a greater number of African Americans and minority adolescents typically compete in organized sports to gain athletic scholarships (Hodge, 2008). Although Asian and 'other' race categories were underrepresented in the sample, similar findings were reflected in the county population with less than 3% described as Asian or 'other.' The race of the parent respondent for the study was the same as the adolescent participant; however, the gender of the parent completing the study materials greatly favored females (73%) to males (27%). This is consistent with prior ecological studies that indicate women are the primary caregivers responsible for the welfare and health of children in the family environment (Belfort, Zupancic, Riera, Turner, & Prosser, 2011; Bronfenbrenner, 1986).

Demographic characteristics of the study participants were compared with county statistics. This sample had a greater amount of households with incomes that were less than \$50,000 81.9% (versus 49.9% county), and more participants with a high school education (or less) 47% (versus 44% county). Contributing factors to the lower incomes and education levels of the participants can be attributed to lifespan level for rearing and caring for children, and entry level, lower paying jobs of the income providers. The majority of adult respondents (70%) were employed or self-employed full-time and had private or employer sponsored health insurance for themselves and their children (71.8%). The second most reported health insurance for adolescents was Medicaid (19%).

### *Adolescent BMI*

BMI is considered a practical measure for determining overweight and obesity in adolescence and is based on weight in relation to height for weight status. BMI is the most widely accepted method used to screen for overweight and obesity in persons under the age of 20 because it is easy to obtain anthropometric measurements to calculate BMI, measures are non-invasive, and BMI has proven a strong correlation to body fatness. It is also consistent with international terminology. Adolescent BMI for this study demonstrated an average BMI for all genders of 26, which is greater than the BMI cut point of 25 that signifies overweight and obesity. Male adolescents averaged consistently higher BMI levels ( $M=27$ ) than female adolescents ( $M=24$ ), and males also had a greater BMI percentile (91%) than females (80%). Similar results were demonstrated for BMI categories with 67.2 % of male adolescents represented in the overweight/obese category compared with 24.5% of female adolescents. The CDC guidelines for child overweight or obesity are calculated according to body mass index (BMI)- for-age percentiles. Children considered 'at risk' for overweight/obesity consistently show trends towards being in the greater than 85th percentile for height and weight categories (Flegal, Tabak, & Ogden, 2006). As the child grows, the percentile curve accounts for age and sex specific changes that the child, who remains in the 85th or greater percentile, will eventually exceed if they stay on the same plotted course (Flegal et al., 2006). Obese children are 70% more likely to become obese as adults (Freedman & Sherry, 2009).

Parent income and education level did not show a significant relationship with adolescent BMI for this study. These findings are consistent with previous studies in which parent income and education level of the parent that is the primary meal planner has only demonstrated a weak correlation to children's BMI (Barros, Victora, Scherpbier, & Gwatkin, 2008; Berge, Wall, Loth,

& Neumark-Sztainer, 2010; Cassady, Jetter, & Culp, 2007; Chang, Nitzke, Brown, & Baumann, 2011; Dammann & Smith, 2009; Gray et al., 2007; Storey, Forshee, Weaver, & Sansalone, 2003). One possible explanation for the lack of a significant correlation between parent education level and household income and adolescent BMI is that weight status is often dependent on influences guiding nutrition intake by teenagers outside the family meal environment. These include peer pressure, media and social networking, access to convenience foods, and greater independence in personal decision-making regarding food choices (Gray et al., 2007; O'Keeffe & Clarke-Pearson, 2011).

### *Nutrition Literacy*

#### *Nutrition Knowledge*

The parent-adolescent NLS was tested as a predictor for adolescent BMI. The NLS was calculated as a score of 0 to 28, and then categorized into three subsections: 0 to 14 (lower 50%) implying inadequate nutrition knowledge, 15-21 (50% to 75%) implying marginal nutritional knowledge, and 22-28 (upper 25%) implying adequate nutrition knowledge. Analysis in all models failed to support a significant correlation between parent and adolescent nutrition knowledge and adolescent BMI although parent nutrition knowledge was a slightly better predictor of adolescent BMI than adolescent nutrition knowledge. This finding is consistent with research that suggests the impact of parental nutrition literacy on child overweight and obesity is only as powerful as the behaviors that support its underlying constructs (Haire-Joshu & Nanney, 2002). Addressing multiple factors that contribute to the development of eating patterns in children and adolescents involves the ability of parents to use multiple paths of influence, including nutrition knowledge, to encourage the development of positive food preferences and

intake (Campbell et al., 2007; Haire-Joshu & Nanney, 2002). The NLS total score for parents (M = 19) implied marginal nutrition knowledge while adolescents (M = 21) were at the top of the cut point in the marginal range for nutrition knowledge. Comparatively, adolescents possessed more nutrition knowledge than their parents. Recent research suggests that adolescents may have greater access to health and nutrition information than their parents due to increased exposure to outside sources, such as the Internet, awareness programs at school, and social media advertising (Fulkerson et al., 2011; Shanyang, 2009; Wakefield, Loken, & Hornik, 2010). Additionally, beginning in the 2009-2010 school year, the State of Florida law mandated that all middle school students (grades 6-8) must have one semester each year of physical education/personal fitness and high school students must satisfy one semester (0.5 credits) of personal fitness to graduate (“Physical education fact sheet”, 2010). Personal fitness courses taught in the public education system typically include information about exercise, nutrition, and sexual health issues.

Although results from the study failed to support a significant correlation between parent and adolescent nutrition knowledge with adolescent BMI, additional study findings may be of clinical significance to healthcare providers. The adolescent participants completing the NLS scored higher than their parents, suggesting they are receiving nutrition information beyond the scope of their parent’s knowledge. As the study suggests, overall nutrition knowledge in parents and adolescents indicates the need for further education and improvement based on marginal nutrition knowledge scores for both groups.

### ***Nutrition Skills***

The NVS was used as a proxy for nutrition. The NVS is a six item total score based on the participant’s ability to read a nutrition label. A total score from 0 to 6 is used to screen for

adequate nutrition skills. A categorical score of 0 to 1 suggests a high likelihood (>50%) limited nutrition skill, 2-3 correct indicates the possibility of limited nutrition skill, and 4-6 correct always indicates adequate nutrition skills. Results for this study indicate that parents (M = 4.11) and adolescents (M = 4.16) have similar nutrition skills that were deemed adequate. The NVS did not predict adolescent BMI. Similar to the NLS that implies level of nutrition knowledge, the NVS, which implies nutrition skills, has not been widely used in the adolescent population (Diamond, 2007; Weiss et al., 2005). Results from the adolescents on the NVS mirrored findings reported in adult subjects using the same tool. This suggests that the NVS is a useful tool for evaluating the adolescent population particularly in public health and primary care settings (Weiss et al., 2005).

The NVS may not have been a significant predictor of adolescent BMI in this study for several reasons. To begin with, NVS scores demonstrated adequate nutrition literacy for parents and adolescents despite underweight/normal weight or overweight/obese BMI in the adolescent. This suggests that even if parents or adolescents read labels, the contents of the label may not influence the decision or behavior to consume the food or not. In other words, taste or general preference for a food may be the deciding factor when making unhealthy dietary decisions. Another factor may be that parents and adolescents read food labels, but choose to bargain calories against total daily calories or against daily exercise; therefore, foods that are less nutrient dense may become a large part of the diet. The use of sports drinks, high-fat energy bars, or high protein nutritional supplements that increase muscle bulk, particularly by males, may have been a factor in this study since the majority of the sample was male and athletic. The study instruments did not include questions related to dietary recall, supplement use, or how often nutrition labels were used to evaluate the dietary content of foods.



### ***Implications***

Findings reported in the study have several important strengths that add to the body of knowledge concerning parental and adolescent nutrition literacy and its impact on adolescent BMI, by focusing on specific characteristics of a county population. Results from the study have implications for nursing practice, education, and public health policy, yet the greatest implications exist within the realm of nursing practice in the community.

### ***Nursing Practice***

The International Obesity Task Force (IOTF) concluded that the prevention of weight gain is easier, less costly, and more effective at preventing chronic disease, than treating obesity after it has fully developed (Basdevant, Boute, & Borys, 1999; Cole, Bellizzi, Flegal, & Dietz, 2000). The IOTF has taken the position that public health prevention, based on improved education and behavioral changes aimed at promoting a less energy dense diet and physical activity, is an effective intervention strategy for overweight in adults and children (Ihmels, Welk, Eisenmann, & Nusser, 2009). Results of this study demonstrate low overall nutrition knowledge in both parents and adolescents, emphasizing the need for further education concerning general nutrition information. The NVS demonstrated nutrition skills for reading a food label were adequate for both parents and adolescents; however, adolescent BMI continues to be a concern, particularly for adolescent males. Prior studies regarding behaviors about reading food labels demonstrate differences in food label reading between genders (Cluskey & Grobe, 2009; Levi, Chan, & Pence, 2006). For example, in studies of adult, college-age participants, more women than men read nutrition labels (Misra, 2007). Likewise, women were more often exposed to nutrition education at a younger age than their male counterparts with a positive correlation

found between early exposure to nutrition education and label reading (Misra, 2007). Frequency of reading labels on food products was not asked as part of this study, which is a limitation.

Lastly, attitudes towards food as a cultural phenomenon, which included label reading, was stereotypical to gender roles; men consider label reading a more “feminine” activity (Kolodinsky, Green, Michahelles, & Harvey-Berino, 2008; Levi et al., 2006; Misra, 2007).

Nurses and advanced practice nurses are perfectly positioned to discuss nutrition label reading during patient encounters in various practice settings. Use of the NVS would be greatly beneficial to examine individual’s nutrition skills and numeracy in a simple and efficient manner during an encounter.

Dietitians also play an important role in nutrition education; however, the general public has limited access to dietary professionals compared to professional nursing encounters (i.e. health fairs, public schools, and adult and children's office visits/clinics). Increasing nutrition knowledge and skills through improved nutrition literacy is an interdisciplinary concern for the reduction of BMI in children and as a preventive measure for reducing overweight and obesity in adulthood. The results of this study do not hold parent and adolescent nutrition literacy levels accountable for predictions of BMI in adolescents; however, they did demonstrate that low levels of parental nutrition literacy are in contrast with adequate levels of adolescent nutrition literacy. This suggests that adolescents may acquire nutrition knowledge from sources outside of parental influence. Education about nutrition and its impact on health offered by professional nurses and other public sources may be beneficial towards bridging the gap between parent and adolescent nutrition knowledge.

### ***Nursing Education***

Results reported in the study may encourage both entry-level and advanced practice nursing education programs to incorporate nutrition literacy as a fundamental component of family education. Nurses are well respected and valued for their holistic approach to healthcare issues. Ongoing support and care provided over the lifespan about nutrition and dietary impact on BMI should be periodically assessed using tools such as the NVS. Nurses should be taught to use specific educational interventions aimed at weight status in overweight and obese individuals, specifically those with poor nutrition knowledge and skills. Increasing dietary awareness through nursing education programs aimed at nutrition literacy can emphasize the importance of maintaining a healthy weight status throughout the lifespan.

### ***Public Health Policy***

Health policies at the federal level need to focus on food labels and packaging that accurately describes the contents of food in a manner that can be understood in more general terminology, as well as in the complex language related to recommended dietary allowance (RDA) percentages for nutrients required by law (Borra, 2006). In 1990, nutrition labeling became mandatory in the United States with the passage of the Nutrition Labeling and Education Act (NLEA) for packaged food (Marietta, Welshimer, & Anderson, 1999). The NLEA was enacted as a national education effort to increase consumer awareness about the nutritional content of food.

The 2004 Shopping for Health Survey showed 83% of consumers read the nutrition facts panel when purchasing foods for the first time, 48% used label-reading to buy healthful foods, and 23% used label reading to assist with weight loss (Borra, 2006). Consumer interest in label

reading has been demonstrated through the use of label reading; however, it is unknown how much of the label is understood about nutritional content due to the complexity of nutrition science (Blitstein & Evans, 2006). This study emphasizes that parental nutrition skills, or the ability to read a food label, are only marginally adequate.

Additional federal legislation is needed on food packaging and on menus for all meals eaten outside the home that raises awareness of food contents and its potential to cause obesity, in language that is understandable to a maximum of third grade reading levels (Boyle, 2005). Tobacco products also have complex ingredients and the ability to cause long term, chronic disease, yet outcomes related to their use are stated in warning boxes that are bold and clearly readable by the general public (Klein & Dietz, 2010). It is an individual's choice to use tobacco products or to abstain, but all persons must choose some form of energy intake on a daily basis to survive. Nurses can identify family food preferences based on nutrition knowledge and advocate for informed choices that are likely to shape future behaviors that reduce healthcare costs. Nurses are an excellent source of information for athletes who have higher BMI's. They can monitor the effects of food and supplement choices and assist the adolescent client with making healthier dietary choices when training and during plateau (off-season) periods. Good dietary habits are important to stress during formative, active years so in later life, when adults may not be as active or participating in organized sports, a healthy weight can be maintained. Similarly, females should be observed for unhealthy dietary behaviors related to eating disorders, such as bulimia and anorexia. Adolescent females are prone to the behavioral effects of peer pressure and societal expectations to be thin, regardless of negative health outcomes and nutrition knowledge. This study did not examine any behavioral aspects of either males or females weight status that might influence dietary choices or be related to nutrition knowledge and skills.

### ***Recommendations for Future Research***

There is a wide range of opportunities for future research in parent and adolescent nutrition literacy and its relationship to weight status. Research that examines the theoretical constructs of nutrition knowledge and skills can further objectives of improving weight status outcomes and health promotion for those affected by overweight and obesity. A compelling area of research involves developing and testing new screening tools to assess the constructs of nutrition literacy. This also includes further validation of tools already published in the use of known surveys for nutrition literacy in a wider range of populations.

Areas of research that evaluate gender differences in BMI and dietary knowledge would also be beneficial in preventing overweight and obesity, specifically in children and adolescents. By purposefully and consistently defining gender groups and elevated BMI, appropriate interventions can be specifically targeted during education efforts aimed at improving dietary knowledge and its effect on weight status. Understanding long-term effects of weight status throughout the lifespan would be of significant value in improving health outcomes and decreasing healthcare costs from chronic disease. Longitudinal research that investigates interventions aimed at nutrition literacy and comparative demographic data in association with BMI would be of value when trying to improve long-term, health status, outcomes.

### ***Study Limitations***

Although the strengths of this study include an appropriate theoretical base, reliable scale instruments, precision data collection methods, and an adequate sample size, several limitations of this study were evident and are discussed separately.

Limitations related to the sample of this study include the use of a convenience sample collected at single point in time from a participant pool of potential student athletes waiting to receive free sports physicals offered by local health care facility. Adolescents that do not participate in organized sports may have been unintentionally excluded from the pool of study participants as well as adolescents that did not have a method of transportation to the site of the free physicals. For parent and adolescent participants that completed the surveys, it is the assumption that each participant completed the survey to the best of their knowledge in an effort to attain the highest score, although this is most likely a minimal limitation in the selected sample due to the competitive makeup of the potential sample pool. Likewise, parent/adolescent dyads were not screened or evaluated for basic reading level. None of the parent/adolescent participants asked for assistance completing the study instruments, therefore the assumption was that all participants possessed at least a basic reading level for completing the study surveys.

BMI-for-age has limitations universal to all anthropometric measures related to inter-rater reliability and units of measurement used in specific settings. Also, BMI is an indirect measure of adiposity that is used for screening and surveillance purposes only, not as a diagnostic tool (Ogden, Carroll, Curtin, Lamb, & Flegal, 2010). Children with a BMI over the cut-points for healthy weight do not necessarily have clinical manifestations, complications, or health risks related to over fatness (Flegal et al., 2006; Freedman & Sherry, 2009). BMI does not represent adolescents with higher muscle to fat ratio, which can be present in an athletic population from which the bulk of the sample in the study was obtained. A limitation of this study was that many of the participants were engaged in some type of sports activity and may be more fit than others. Within the context of this study, the current design limits the assessment of BMI to one point in

time with only a few constructs identified in the literature that could influence weight status outcomes.

The NLS is a relatively new measurement tool designed to quantify the level of nutrition literacy in adults (Diamond, 2007). It remains to be tested and applied as a serviceable tool for the measurement of the constructs of nutrition literacy. To date, there are no studies that have tested the NLS in specific populations, particularly the adolescent population, although a Spanish version of the NLS has recently been examined (Diamond, 2007). Lastly, the guidelines for the NLS expressly state that the tool is primarily for use in research and is not intended as a clinical diagnostic tool (Diamond, 2007).

The NVS contained low alpha values for both the adult and adolescent participants which can be explained by several contributing factors. The NVS uses multidimensional, non-likert type, test items that include mathematical computation, fill-in-the-blank, and dichotomous answers (yes or no), to measure nutrition knowledge and skill. It also contains a low number of questions that have greater value when computed as a total number correct score rather than as independent, homogenous, items (Tavakol, 2011). These factors resulted in a low internal consistency for the tool.

Bias can also occur with the NLS and NVS since it is assumed that data collected from parent/adolescent dyads would be completed independently of one another and that one participant would not influence the responses of the other during the data collection procedures.

Lastly, statistical analysis using regression techniques can lead to casual conclusions that do not determine association and prediction or relationships between similar concepts (Polit, 2008).

### *Summary and Conclusion*

The purpose of this study was to examine parent/adolescent nutrition knowledge, parent/adolescent nutrition skills, family income, and parent level of education, as predictors of weight status in adolescents. A convenience sample of 110 parent/adolescent dyads provided the data for this study. The results of the study added to the current body of knowledge in the area of nutrition literacy and its effect on adolescent BMI. The results from this study determined parent and adolescent capacity to understand basic dietary information that has been associated with education efforts aimed at childhood obesity prevention. Also, the value of nutrition information found on food labels can be easily confused or misinterpreted in persons with low health literacy levels. Due to the large amount of available health information, parents must be able to advocate for themselves and their children as they are increasingly seen as active consumers rather than passive recipients of healthcare. The nursing profession is ideally poised to assess communication strategies that enhance access to health information needed for personal, family, and community empowerment. In addition, gender differences in adolescent BMI found in the study strongly support the need for further research aimed at adolescent males and dietary behaviors. A viable method of decreasing healthcare costs to a community is by asking people to care for themselves and their families. To do this, parents and their children must truly understand nutrition and dietary information as a strategy for obesity prevention.



## **APPENDIX A: PARENT DEMOGRAPHIC SURVEY**

Survey of Parent and Adolescent Nutrition (SPAN)  
PARENT FORM

General Information Survey

**DO NOT WRITE YOUR NAME ON THIS QUESTIONNAIRE**

Please answer all the questions to the best of your ability. You do not have to answer any questions that make you feel uncomfortable or that you do not understand. There is no right or wrong answers. All answers will be kept completely confidential. The information you provide will be used for this research study only.

1. Birthdate: \_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_

Month                      Date                      Year

2. Gender:

Male

Female

3. Are you the person primarily responsible for meal planning, grocery shopping, and cooking?

Yes

No

4. Race and Ethnicity. Please check the box next to the choice that best describes **you**.

White

Black or African-American

Hispanic

Asian

Some other race (describe) \_\_\_\_\_

5. Education: Check the highest level of education completed for the person responsible for food and dietary choices.

- Never attended school or only attended kindergarten
- Grades 1 thru 8
- Grades 9-12 or some high school
- High School Graduate or GED
- College 1 year to 3 years or technical school
- College 4 years or more (graduate)
- Graduate School or higher (completed)

6. Employment: Check which category best describes your current status.

- Employed or Self-Employed
- Out of work
- Unable to work
- A homemaker
- Retired

7. Family Income: Check the combined total income earned by all working members of your family.

- Less than \$25,000 (<25,000)
- Less than \$50,000 (25,000-50,000)
- Less than \$90,000 (50,000-90,000)
- Greater than \$90,000 (>90,000)

8. What type of health care coverage do you have?

- Private or Employer Sponsored Health insurance
- Medicare (with or without co-plans)
- Medicaid
- Health Maintenance Organization (HMO)/pre-paid plan
- Military health care
- None
- Other \_\_\_\_\_

**About Your Child in the Study:**

9. What type of health care coverage does your child have?

- Private or Employer Health insurance
- Medicare (with or without co-plans)
- Medicaid
- Health Maintenance Organization (HMO)/pre-paid plan
- Military health care
- None
- Other \_\_\_\_\_

## **APPENDIX B: ADOLESCENT DEMOGRAPHIC SURVEY**

## Adolescent Survey

### General Information Survey

#### **DO NOT WRITE YOUR NAME ON THIS QUESTIONNAIRE**

Please answer all the questions to the best of your ability. You do not have to answer any questions that make you feel uncomfortable or that you do not understand. There is no right or wrong answers. All your answers will be kept completely anonymous. The information you provide will be used for this research study only.

1. How old are you? \_\_\_\_\_

2. What is your birthdate? \_\_\_\_\_Month/ \_\_\_\_\_Day/ \_\_\_\_\_Year

3. Gender: Male  Female

4. Race and ethnicity. Please check the box next to the choice that best describes **you**.

Non-Hispanic White

Black or African-American

Hispanic

Asian

Some other race (describe) \_\_\_\_\_

5. What is your current grade level?

6<sup>th</sup> grade

7<sup>th</sup> grade

8<sup>th</sup> grade

9<sup>th</sup> grade

10<sup>th</sup> grade

11<sup>th</sup> grade

12<sup>th</sup> grade

Ht. \_\_\_\_\_ cm    Wt. \_\_\_\_\_ kg    BMI \_\_\_\_\_

## **APPENDIX C: THE NUTRITION LITERACY SURVEY (NLS)**



## Nutrition Literacy Survey

We all hear a lot about nutrition and diet. On the next few pages is information you might see. Each piece of information is a sentence with some of the words missing. Look at the words listed below the blank line and pick the one that makes the most sense to you. Write the letter of that word on the blank line. Keep going until you finish. Thank you.

1. Healthy eating is really supposed to \_\_\_\_\_ our heart.
  - a. grow
  - b. age
  - c. help**
  - d. bypass
  
2. However, no single food can supply all the nutrients in the \_\_\_\_\_ we need.
  - a. meals
  - b. amount**
  - c. fiber
  - d. portions
  
3. Eating a \_\_\_\_\_ of foods ensures you get all the nutrients needed for good health.
  - a. lot
  - b. many
  - c. variety**
  - d. pound
  
4. Grains, fruits and vegetables are food groups that form the basis of a(an) \_\_\_\_\_ diet.
  - a. energy
  - b. fat-free
  - c. protein
  - d. healthy**
  
5. For a healthy diet, we are advised to eat five \_\_\_\_\_ of fruits and vegetables each \_\_\_\_\_.
  - a. cups
  - b. fibers
  - c. grams
  - d. servings**
  - a. day**
  - b. morning
  - c. meal
  - d. year

6. Foods like butter have lots of \_\_\_\_\_ fat which can increase cholesterol.
- a. calorie-free
  - b. bacon
  - c. saturated**
  - d. diet
7. We also know that cholesterol can be affected by foods high in trans fatty \_\_\_\_\_.
- a. oils
  - b. acids**
  - c. fiber
  - d. diet
8. Experts often say to \_\_\_\_\_ these foods, because they are \_\_\_\_\_.
- |                 |                     |
|-----------------|---------------------|
| <b>a. avoid</b> | a. delicious        |
| b. use          | b. healthy          |
| c. drink        | <b>c. fattening</b> |
| d. eat          | d. calories         |
9. Fiber is the part of plant-based foods that your \_\_\_\_\_ does not digest and absorb.
- a. body**
  - b. portion
  - c. weight
  - d. eating
10. Whole grains provide more \_\_\_\_\_ than processed grains.
- a. weight
  - b. good
  - c. fiber**
  - d. nutritious
11. A good diet should contain approximately 25 to 30 \_\_\_\_\_ of fiber a day.
- a. grams**
  - b. ounces
  - c. portions
  - d. calories
12. Calcium is \_\_\_\_\_ for bone health.
- a. essential**
  - b. osteoporosis
  - c. expensive
  - d. prescription

13. As you age, your bones may get thinner as minerals are \_\_\_\_\_.
- a. **lost**
  - b. weakened
  - c. skinny
  - d. tall
14. Even in older people, Vitamin D is \_\_\_\_\_ to keep bones healthy.
- a. wants
  - b. sunny
  - c. mineral
  - d. **needed**
15. Foods with added sugars are sometimes called foods with empty \_\_\_\_\_.
- a. pounds
  - b. fat
  - c. **calories**
  - d. vitamins
16. To prevent \_\_\_\_\_ from bacteria, keep eggs in the \_\_\_\_\_
- a. omelets
  - b. groceries
  - c. pain
  - d. **illness**
  - a. pantry
  - b. **refrigerator.**
  - c. frying pan
  - d. chicken
17. Farmers who grow organic foods don't use \_\_\_\_\_ methods to control weeds.
- a. **conventional**
  - b. expensive
  - c. compost
  - d. herbal
18. They control \_\_\_\_\_ by techniques such as crop rotation, rather than pesticides.
- a. nutrients
  - b. **weeds**
  - c. markets
  - d. it
19. For this, as well as other reasons, organic food \_\_\_\_\_ than conventional food.
- a. **costs more**
  - b. tastes better
  - c. cooks faster
  - d. has more fiber

20. A 180 calorie \_\_\_\_\_ with 10 grams of fat has 50% of its calories from fat.
- a. vitamin
  - b. fiber
  - c. serving**
  - d. exercise
21. A 140-pound woman needs about 51 \_\_\_\_\_ of protein a day.
- a. servings
  - b. grams**
  - c. portions
  - d. ounces
22. Using fat-free \_\_\_\_\_ on a sandwich can really cut down on the grams of fat.
- a. sugars
  - b. mayonnaise**
  - c. vitamins
  - d. salads
23. My doctor told me that "fat-free" is not the same as \_\_\_\_\_.
- a. vitamin-free
  - b. snack-free
  - c. weight-free
  - d. calorie-free**
24. She also told me to make the size of my \_\_\_\_\_ smaller to help control
- a. waistline
  - b. portions**
  - c. glass
  - d. calories
- my \_\_\_\_\_.
- a. fattening
  - b. vitamins
  - c. meals
  - d. weight**

Thank you!  
© 2004 Thomas Jefferson University

## **APPENDIX D: THE NEWEST VITAL SIGN (NVS)**

This information is on the back of a container of a pint of ice cream.

<b>Nutrition Facts</b>	
Serving Size	1/2 cup
Servings per container	4
Amount per serving	
Calories 250	Fat Cal 120
	%DV
<b>Total Fat</b> 13g	20%
Sat Fat 9g	40%
<b>Cholesterol</b> 28mg	12%
<b>Sodium</b> 55mg	2%
<b>Total Carbohydrate</b> 30g	12%
Dietary Fiber 2g	
Sugars 23g	
<b>Protein</b> 4g	8%
* Percent Daily Values (DV) are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.	
<b>Ingredients:</b> Cream, Skim Milk, Liquid Sugar, Water, Egg Yolks, Brown Sugar, Milkfat, Peanut Oil, Sugar, Butter, Salt, Carrageenan, Vanilla Extract.	

Please answer the following questions to the best of your ability:

1. If you eat the entire container, how many calories will you eat? \_\_\_\_\_ Calories

2. If you are allowed to eat 60 g of carbohydrates as a snack, how much ice cream could you have?

\_\_\_\_\_

3. Your health care provider advises you to reduce the amount of saturated fat in your diet. You usually have 42 g of saturated fat each day, which includes 1 serving of ice cream. If you stop eating ice cream, how many grams of saturated fat would you be consuming each day?

\_\_\_\_\_

4. If you usually eat 2500 calories in a day, what percentage of your daily value of your calories will you be eating in one serving?

\_\_\_\_\_

Pretend that you are allergic to the following substances: Penicillin, peanuts, latex gloves, and bee stings.

5. Is it safe for you to eat this ice cream? Circle one: Yes No

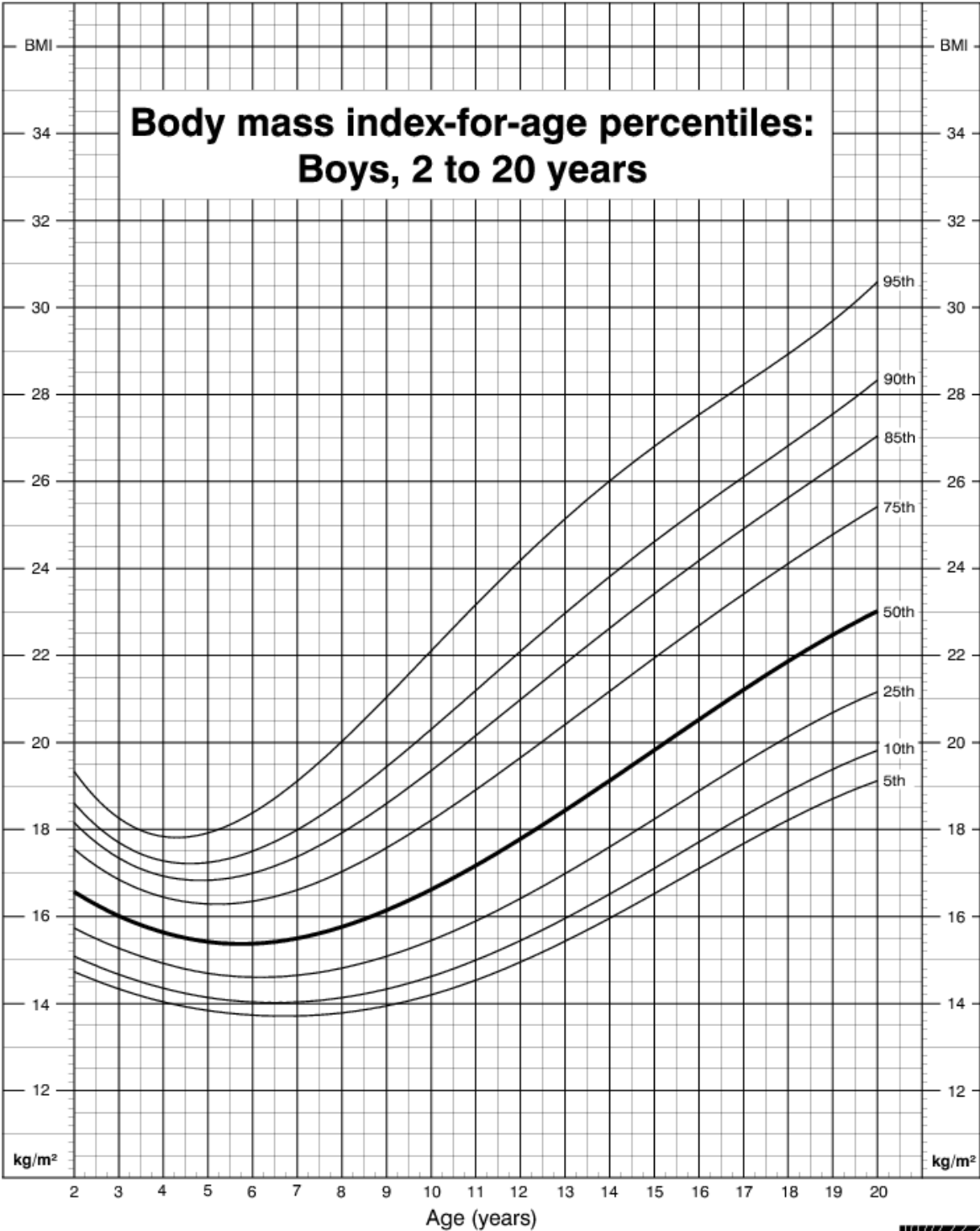
6. Why or why not?

\_\_\_\_\_

**APPENDIX E: GROWTH CHARTS – BMI BOYS, AGE 2 TO 20**



# CDC Growth Charts: United States

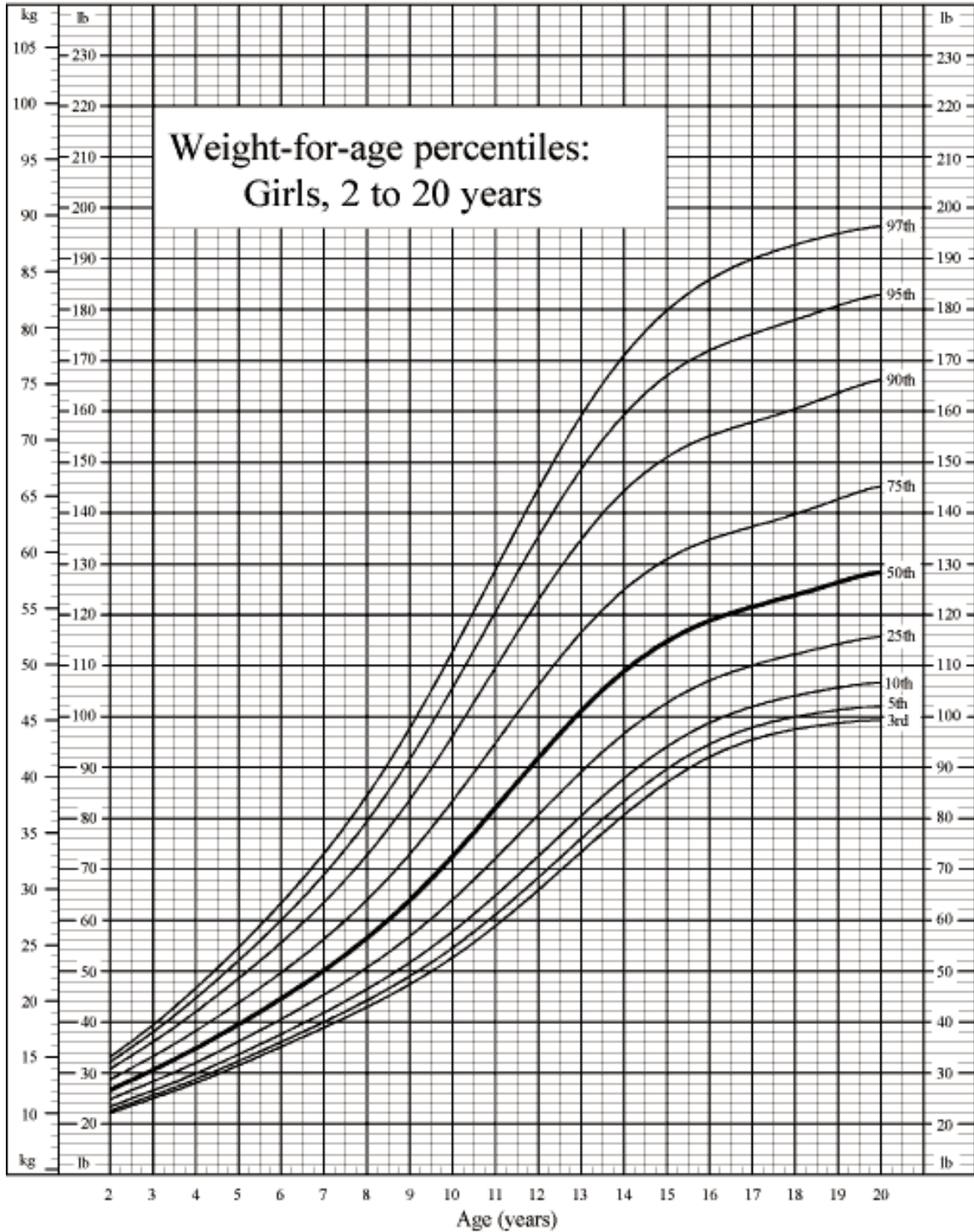


Published May 30, 2000.  
 SOURCE: Developed by the National Center for Health Statistics in collaboration with  
 the National Center for Chronic Disease Prevention and Health Promotion (2000).



**APPENDIX F: GROWTH CHARTS – BMI GIRLS, AGE 2-20**

# CDC Growth Charts: United States



SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).



**APPENDIX G: IRB APPROVAL LETTER**



University of Central Florida Institutional Review Board  
Office of Research & Commercialization 12201 Research  
Parkway, Suite 501 Orlando, Florida 32826-3246  
Telephone: 407-823-2901 or 407-882-2276  
[www.research.ucf.edu/compliance/irb.html](http://www.research.ucf.edu/compliance/irb.html)

**Approval of Human Research**

From: **UCF Institutional Review Board #1  
FWA00000351, IRB00001138**  
To: **Leslie Ann Damato-Kubiet**  
Date: **May 18, 2012**

Dear Researcher:

On 5/18/2013, the IRB approved the following human participant research until 5/17/2013 inclusive:

Type of Review: UCF Initial Review Submission Form  
Project Title: Nutrition Literacy and Weight Status in Adolescents Lay Title for Forms: Survey of  
Parent and Adolescent Nutrition (SPAN)  
Investigator: Leslie Ann Damato-Kubiet  
IRB Number: SBE-12-08468  
Funding Agency:  
Grant Title:  
Research ID: N/A

The Continuing Review Application must be submitted 30days prior to the expiration date for studies that were previously expedited, and 60 days prior to the expiration date for research that was previously reviewed at a convened meeting. Do not make changes to the study (i.e., protocol, methodology, consent form, personnel, site, etc.) before obtaining IRB approval. A Modification Form **cannot** be used to extend the approval period of a study. All forms may be completed and submitted online at <https://iris.research.ucf.edu>.

If continuing review approval is not granted before the expiration date of 5/17/2013, approval of this research expires on that date. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

Use of the approved, stamped consent document(s) is required. The new form supersedes all previous versions, which are now invalid for further use. Only approved investigators (or other approved key study personnel) may solicit consent for research participation. Participants or their representatives must receive a copy of the consent form(s).

In the conduct of this research, you are responsible to follow the requirements of the Investigator Manual. On behalf of Sophia Dziegielewski, Ph.D., L.C.S.W., CF IRB Chair, this letter is signed by: Signature applied by Joanne Muratori on 05/18/2012 01:44:00 PM EDT

IRB Coordinator

## **APPENDIX H: CONSENT FOR RESEARCH**

## **Research Participation Consent Form (Parent Form) Survey of Parent and Adolescent Nutrition (SPAN)**

Primary Investigator: Leslee D'Amato-Kubiet, MSN, ARNP  
Doctoral Candidate

University of Central Florida College of Nursing

Researchers at the University of Central Florida (UCF) study many topics. To do this we need the help of people who agree to take part in a research study. You and your adolescent child are being invited to take part in a research study which will include about 110 pairs of parents and their adolescent children between 13 and 17 years of age. You can ask questions about the research at any time.

The person doing this research is Leslee D'Amato-Kubiet, who is a doctoral student at the University of Central Florida (UCF) in the College of Nursing. Because the researcher is a graduate student, she is being guided by Mary Lou Sole, RN, PhD, a UCF faculty supervisor in the College of Nursing. There are no other UCF students conducting this research.

### **What you should know about a research study:**

- Someone will explain this research study to you.
- A research study is something you volunteer for.
- Whether or not you take part is up to you.
- You should take part in this study only because you want to.
- You can choose not to take part in the research study.
- You can agree to take part now and later change your mind.
- Whatever you decide it will not be held against you.
- Feel free to ask all the questions you want before you decide.

**Study title:** Survey of Parent and Adolescent Nutrition (SPAN)

**Purpose of the research study:** The purpose of this study is to study nutrition knowledge of parents and their adolescent children. The child's height and weight will also be examined.

**What you and your child will be asked to do in the study:** You and your child will complete three written surveys. One survey tells us briefly about yourself and your child. The other two surveys tell us what you and your child know about nutrition. Your child will also be asked to remove his/her shoes and asked to stand on a scale like those at a health care provider's office for us to measure his/her height and weight, and body mass index or BMI. This information will be written on a study form.

**Voluntary participation:** You and your child should take part in this study only because you both want to. There is no penalty for not taking part and you and your child will not lose any benefits. You and your child have the right to stop at any time. Just tell the researcher or a member of the research team that you want to stop. You and your child will be told if any new information is learned which may affect your willingness to continue taking part in this study.

**Location:** The research will be conducted at the free health physical screening at Florida Hospital Flagler.

**Time required:** The time required for adult and adolescent child participation in the study is estimated at less than 20 minutes. The study requires one contact session for completion.

**Risks:** There are no expected risks for taking part in this study. You and your child do not have to answer every question and there will not be lost benefits if questions are skipped. You and your child do not have to answer any questions that make you feel uncomfortable. No names will be recorded on any of the forms. To maintain confidentiality, completed surveys will be kept in a locked file cabinet. Only the researcher will have the key for the cabinet. When the study is done and the data have been analyzed, the documents will be destroyed per Florida State laws. Your child's height and weight will be measured at a station arranged the same way as the other stations for this portion of the physical exam to attract the least amount of attention. Measurements will be taken discretely and written on a form.

**Benefits:** There are no expected benefits to you and your child for taking part in this study. As research participants you will not benefit directly from this research, besides learning more about how research is conducted.

**Compensation or payment:** No compensation or payment is offered for this study.

**Confidentiality:** We will limit your personal data collected in this study to people who have a need to review this information. We cannot promise complete secrecy.

**Study contact for questions about the study or to report a problem:** If you have questions, concerns, or complaints, or think the research has hurt you, talk to Leslee Kubiet, Graduate Student at the College of Nursing, (386) 506-4067 or Dr. Mary Lou Sole, Faculty Supervisor, College of Nursing at (407) 823-5133, or by email at [lkubiet@knights.ucf.edu](mailto:lkubiet@knights.ucf.edu) or [Mary.Sole@ucf.edu](mailto:Mary.Sole@ucf.edu).

**IRB contact about your rights in the study or to report a complaint:** Research at the University of Central Florida involving human participants is carried out under the oversight of the Institutional Review Board (UCF IRB). This research has been reviewed and approved by the IRB. For information about the rights of people who take part in research, please contact: Institutional Review Board, University of Central Florida, Office of Research & Commercialization, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246 or by telephone at (407) 823-2901. You may also talk to them for any of the following:

- Your questions, concerns, or complaints are not being answered by the research team.
- You cannot reach the research team.
- You want to talk to someone besides the research team.
- You want to get information or provide input about this research.



*Child Assent Script for children 13 to 17 years of age*

**Survey of Parent and Adolescent Nutrition (SPAN)**

My name is Leslee Kubiet. I am doing a research project about your knowledge of nutrition. I am interested in learning if what you know affects how much you weigh and how tall you are. I am a nurse working on a PhD. This research is part of my studies at the University of Central Florida.

As a way to study this, I will measure your weight and height, without your shoes on, using a scale like the one at your doctor's office. After this is done, there are two short surveys about nutrition for you to complete. You may sit next to your parent and complete this part of the study, while they fill out their forms. At the end of the activity, I will ask you what you thought about the activity and what you would change if you had the chance.

Only Dr. Sole, my professor at UCF, and I will see the notes. I will destroy the research notes at the end of the study. No names will be used so that nobody will know that you took part in my study.

This will not affect your grade if you decide you don't want to do this. You can stop at any time and you do not have to answer a question if you do not want to. If you do not want to take part in this study, tell your parent or guardian. You will not be paid for doing this and you will not get extra credit for doing this.

Would you like to take part in this research project?

\_\_\_\_\_ This script was read to the child and they assent to taking part in Mrs. Kubiet's research project.

## LIST OF REFERENCES

- Ackard, D.M., & Neumark-Sztainer, D. (2001). Health care information sources for adolescents: age and gender differences on use, concerns, and needs. *Journal of Adolescent Health, 29*(3), 170-176.
- Agras, W.S., Hammer, L.D., McNicholas, F., & Kraemer, H.C. (2004). Risk factors for childhood overweight: a prospective study from birth to 9.5 years. *The Journal of Pediatrics, 145*(1), 20-25.
- Alaimo, K., Olson, C.M., & Frongillo, E.A., Jr. (2001). Low family income and food insufficiency in relation to overweight in U.S. children: is there a paradox? *Archives of Pediatrics & Adolescent Medicine, 155*(10), 1161-1167.
- Baker, D.W. (2006). The meaning and the measure of health literacy. *Journal of General Internal Medicine, 21*(8), 878-883.
- Baker, D. W., Parker, R. M., Williams, M. V., Clark, W. S., & Nurss, J. (1997). The relationship of patient reading ability to self-reported health and use of health services. *American Journal of Public Health, 87*(6), 1027-1030.
- Baker, D.W., Williams, M.V., Parker, R. M., Gazmararian, J.A., & Nurss, J. (1999). Development of a brief test to measure functional health literacy. *Patient Education and Counseling, 38*(1), 33-42.
- Baker, D.W., Williams, M.V., Parker, R.M., Gazmararian, J.A., Nurss, J., Campbell, M.J., Weatherby, N. (2007). Short Test of Functional Health Literacy in Adults: Developing a parsimonious model for predicting completion of advance directives. *Patient Education and Counseling, 39*(2), 165-171.

- Baltrus, P.T., Lynch, J.W., Everson-Rose, S., Raghunathan, T.E., & Kaplan, G.A. (2005). Race/ethnicity, life-course socioeconomic position, and body weight trajectories over 34 years: the Alameda County Study. *American Journal of Public Health, 95*(9), 1595-1601.
- Bang, D.S., & B. (2007). *Understanding childhood and parental body mass index (BMI) relationships: An ex post facto, correlational, nonexperimental study*. ProQuest Information & Learning, U.S.. Retrieved from <http://ezproxy.lib.ucf.edu/login?URL=http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=2007-99200-412&site=ehost-live>
- Barros, F.C., Victora, C.G., Scherpbier, R., & Gwatkin, D. (2008). Socioeconomic inequities in the health and nutrition of children in low/middle income countries. *Revista De Saude Publica, 44*(1), 1-16.
- Basdevant, A., Boute, D., & Borys, J.M. (1999). Who should be educated? Education strategies: could children educate their parents? *International Journal of Obesity and Related Metabolic Disorders, 23 Suppl 4*, S10.
- Belfort, M., Zupancic, J., Riera, K., Turner, J., & Prosser, L. (2011). Health state preferences associated with weight status in children and adolescents. *BMC Pediatrics, 11*(1), 12.
- Berge, J.M., Wall, M., Loth, K., & Neumark-Sztainer, D. (2010). Parenting style as a predictor of adolescent weight and weight-related behaviors. *The Journal of Adolescent Health, 46*(4), 331-338.
- Birch, L.L., & Davison, K.K. (2001). Family environmental factors influencing the developing behavioral controls of food intake and childhood overweight. *Pediatric Clinics of North America, 48*(4), 893-907.

- Blitstein, J.L., & Evans, W.D. (2006). Use of nutrition facts panels among adults who make household food purchasing decisions. *Journal of Nutrition Education and Behavior*, 38(6), 360-364.
- Borra, S. (2006). Consumer perspectives on food labels. *American Journal of Clinical Nutrition*, 83(suppl), 1235s.
- Bronfenbrenner, U. (1975). *The Ecology of Human Development in Retrospect and Prospect*. Cambridge, Mass: Harvard University Press.
- Bronfenbrenner, U. (1986). Ecology of the family as a context for human development: research perspectives. *Developmental Psychology*, 22(6), 723-742.
- Brown, N., Muhlenkamp, A., Fox, L., Osborn, M., Brown, N., Muhlenkamp, A., Osborn, M. (1983). Personal Lifestyle Activities Questionnaire: The relationship among health beliefs, health values, and health promotion activity. *Western Journal of Nursing Research*, 5(2), 155-163.
- Brown, S.L., Teufel, J.A., & Birch, D.A. (2007). Early adolescents perceptions of health and health literacy. *Journal of School Health*, 77(1), 7-15.
- Campbell, K.J., Crawford, D.A., Salmon, J., Carver, A., Garnett, S.P., & Baur, L.A. (2007). Associations between the home food environment and obesity-promoting eating behaviors in adolescence. *Obesity (Silver Spring, Md.)*, 15(3), 719-730.
- Carbone, E.T., & Zoellner, J.M. (2012). Nutrition and health literacy: A systematic review to inform nutrition research and practice. *Journal of the Academy of Nutrition & Dietetics*, 112(2), 254-265.

- Cassady, D., Jetter, K.M., & Culp, J. (2007). Is price a barrier to eating more fruits and vegetables for low-income families? *Journal of the American Dietetic Association*, 107(11), 1909-1915.
- Castro, C.M., King, A.C., Housemann, R., Bacak, S.J., McMullen, K.M., & Brownson, R.C. (2007). Rural family caregivers and health behaviors: results from an epidemiologic survey. *Journal of Aging & Health*, 19(1), 87-105.
- Center for Disease Control and Prevention (2007). Anthropometric Procedures Manual. *National Health and Nutrition Examination Survey*, 1-102.
- Centers for Disease Control and Prevention (2011). *Behavioral Risk Factor Surveillance System Survey Questionnaire*. Atlanta, Georgia: U.S. Department of Health and Human Services Retrieved from <http://www.cdc.gov/brfss/suggestedcitation.htm>.
- Centers for Disease Control and Prevention (2011). *Healthy Weight - it's not a diet, it's a lifestyle!*: About BMI for Adults. Atlanta, Georgia: U.S. Department of Health and Human Services, retrieved from [http://www.cdc.gov/healthyweight/assessing/bmi/adult\\_bmi/index.html](http://www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/index.html).
- Centers for Disease Control and Prevention (2013). Overweight and Obesity. Center for Disease Control and Prevention. Retrieved from <http://www.cdc.gov/obesity/index.html>.
- Chang, M.W., Nitzke, S., Brown, R., & Baumann, L. (2011). Predictors of low-income, obese mothers' use of healthful weight management behaviors. *Journal Of Nutrition Education And Behavior*, 43(2), 87-95.
- Cherry, D.C., Huggins, B., & Gilmore, K. (2007). Children's health in the rural environment. *Pediatric Clinics Of North America*, 54(1), 121-133.

- Chisolm, D.J., & Buchanan, L. (2007). Measuring adolescent functional health literacy: A pilot validation of the test of functional health literacy in adults. *Journal of Adolescent Health, 41*(3), 312-314.
- Cluskey, M., & Grobe, D. (2009). College weight gain and behavior transitions: male and female differences. *Journal Of The American Dietetic Association, 109*(2), 325-329.
- Cohen, J. (1999). A Power Primer. *Psychological Bulletin, 112*(1), 155-159.
- Cole, T.J., Bellizzi, M.C., Flegal, K.M., & Dietz, W.H. (2000). Establishing a standard definition for child overweight and obesity worldwide: international survey. *BMJ, 320*(7244), 1240. doi: 10.1136/bmj.320.7244.1240
- Coveney, J. (2005). A qualitative study exploring socio-economic differences in parental lay knowledge of food and health: implications for public health nutrition. *Public Health Nutrition, 8*(3), 290-297.
- Crossman, A., Anne Sullivan, D., & Benin, M. (2006). The family environment and American adolescents' risk of obesity as young adults. *Social Science & Medicine (1982), 63*(9), 2255-2267.
- Dammann, K.W., & Smith, C. (2009). Factors affecting low-income women's food choices and the perceived impact of dietary intake and socioeconomic status on their health and weight. *Journal Of Nutrition Education And Behavior, 41*(4), 242-253.
- DeVoe, J.E., Krois, L., & Stenger, R. (2009). Do children in rural areas still have different access to health care? Results from a statewide survey of Oregon's food stamp population. *The Journal of Rural Health, 25*(1), 1-7.
- DeWalt, D.A., & Hink, A. (2009). Health literacy and child health outcomes: A systematic review of the literature. *Pediatrics, 124*(5, Suppl 3), S265-S274.

- Diamond, J.J. (2007). Development of a reliable and construct valid measure of nutritional literacy in adults. *Nutrition Journal*, 6, 5-15.
- Division of Nutrition, Physical Activity and Obesity, National Center for Chronic Disease Prevention and Health Promotion, National Center for Chronic Disease Prevention and Health Promotion (Producer). March 31, 2011. About BMI for Adults. Retrieved from [http://www.cdc.gov/healthyweight/assessing/bmi/adult\\_bmi/index.html](http://www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/index.html)
- Doolen, J., Alpert, P.T., & Miller, S.K. (2009). Parental disconnect between perceived and actual weight status of children: a metasynthesis of the current research. *Journal of the American Academy of Nurse Practitioners*, 21(3), 160-166.
- Dunn, R.A., Sharkey, J.R., Lotade-Manje, J., Bouhlal, Y., & Nayga, R.M., Jr. (2011). Socio-economic status, racial composition and the affordability of fresh fruits and vegetables in neighborhoods of a large rural region in Texas. *Nutrition Journal*, 10, 6-6.
- Elder, J.P., Lytle, L., Sallis, J.F., Young, D.R., Steckler, A., Simons-Morton, D., Ribisl, K. (2007). A description of the social-ecological framework used in the trial of activity for adolescent girls (TAAG). *Health Education Research*, 22(2), 155-165.
- NAEP Data Explorer (2007). *National Center for Education Statistics*.: Retrieved from <http://nces.ed.gov/nationsreportcard/naepdata>.
- Eysenbach, G. (2008). *Credibility of Health Information and Digital Media: New Perspectives and Implications for Youth. Digital Media, Youth, and Credibility*. Edited by Miriam J. Metzger and Andrew J. Flanagin. The John D. and Catherine T. MacArthur Foundation Series on Digital Media and Learning. Cambridge, MA: The MIT Press, 2008. 123–154.
- Fitzgerald, N.S. (2009). Barriers to a Healthy Lifestyle: From Individuals to Public Policy—An Ecological Perspective. *Journal of Extension*, 47(1).

- Flegal, K.M., Tabak, C.J., & Ogden, C.L. (2006). Overweight in children: definitions and interpretation. *Health Education Research, 21*(6), 755-760.
- Freedman, D. S., Khan, L. K., Serdula, M. K., Ogden, C. L., & Dietz, W. H. (2006). Racial and ethnic differences in secular trends for childhood BMI, weight, and height. *Obesity, 14*(2), 301-308.
- Freedman, D.S., & Sherry, B. (2009). The validity of BMI as an indicator of body fatness and risk among children. *Pediatrics, 124 Suppl 1*, S23-S34.
- Fulkerson, J.A., Farbakhsh, K., Lytle, L., Hearst, M. O., Dengel, D.R., Pasch, K.E., & Kubik, M. Y. (2011). Away-from-home family dinner sources and associations with weight status, body composition, and related biomarkers of chronic disease among adolescents and their parents. *Journal of the American Dietetic Association, 111*(12), 1892-1897.
- Gazmararian, J.A., Williams, M.V., Peel, J., & Baker, D.W. (2003). Health literacy and knowledge of chronic disease. *Patient Education and Counseling, 51*(3), 267-275.
- Ghaddar, S.F., Valerio, M.A., Garcia, C.M., & Hansen, L. (2012). Adolescent health literacy: the importance of credible sources for online health information. *Journal of School Health, 82*(1), 28-36.
- Gray, V.B., Byrd, S.H., Cossman, J.S., Chromiak, J., Cheek, W.K., & Jackson, G.B. (2007). Family characteristics have limited ability to predict weight status of young children. *Journal of the American Dietetic Association, 107*(7), 1204-1209.
- Harris, D.M., & Sharon, G. (1979). Health-protective behavior: An exploratory study. *Journal of Health and Social Behavior, 20*(1), 17-29.



- Florida Department of Health (2010). What is rural health in Florida: Current Rural Health Issues in Florida. Retrieved from <http://www.doh.state.fl.us/workforce/ruralhealth/ruralhlthissues.htm>
- Haire-Joshu, D., & Nanney, M. S. (2002). Prevention of overweight and obesity in children: influences on the food environment. *The Diabetes Educator*, 28(3), 415-423.
- Hennessy, E., Hughes, S.O., Goldberg, J.P., Hyatt, R.R., & Economos, C. D. (2010). Parent behavior and child weight status among a diverse group of underserved rural families. *Appetite*, 54(2), 369-377.
- Hodge, S.R., Burden, J.W., Robinson, L.E., & Bennett R.A. (2008). Theorizing on the stereotyping of black male student athletes. *Journal for the Study of Sports and Athletes in Education*, 2(2), 203-226.
- Ihmels, M.A., Welk, G.J., Eisenmann, J.C., & Nusser, S.M. (2009). Development and preliminary validation of a Family Nutrition and Physical Activity (FNPA) screening tool. *The International Journal of Behavioral Nutrition and Physical Activity*, 6, 14-14.
- Joffe, M. (2007). Health, livelihoods, and nutrition in low-income rural systems. *Food And Nutrition Bulletin*, 28(2 Suppl), S227-S236.
- Jones, M.O. (2007). Food Choice, Symbolism, and Identity: Bread-and-Butter Issues for Folkloristics and Nutrition Studies (American Folklore Society Presidential Address, October 2005). *Journal of American Folklore*, 120(476), 129-177.
- Jordan, J.E., Osborne, R.H., & Buchbinder, R. (2011). Critical appraisal of health literacy indices revealed variable underlying constructs, narrow content and psychometric weaknesses. *Journal of clinical epidemiology*, 64(4), 366-379.

- Kaati, G., Bygren, L. O., Pembrey, M., & Sjastram, M. (2007). Transgenerational response to nutrition, early life circumstances and longevity. *European Journal of Human Genetics*, *15*(7), 784-790.
- Kidshealth, N. F. (2012). KidsPoll: Children chime in about health literacy and where they go for answers. Retrieved from [http://www.kidshealth.org/kid/stay\\_healthy/body/poll\\_health\\_literacy.htm](http://www.kidshealth.org/kid/stay_healthy/body/poll_health_literacy.htm).
- Klein, J.D., & Dietz, W. (2010). Childhood obesity: the new tobacco. [Research Support, Non-U.S. Gov't]. *Health affairs (Project Hope)*, *29*(3), 388-392.
- Kolodinsky, J., Green, J., Michahelles, M., & Harvey-Berino, J.R. (2008). The use of nutritional labels by college students in a food-court setting. *Journal of American College Health*, *57*(3), 297-302.
- Krahnstoever Davison, K., Francis, L.A., & Birch, L.L. (2005). Reexamining obesigenic families: parents' obesity-related behaviors predict girls' change in BMI. *Obesity Research*, *13*(11), 1980-1990.
- Kumanyika, S.K. (2008). Environmental influences on childhood obesity: ethnic and cultural influences in context. *Physiology & Behavior*, *94*(1), 61-70.
- Lariscy, R., Reber, B., & Paek, H.J. (2011). Exploration of health concerns and the role of social media information among rural and urban adolescents: a preliminary study. *International Electronic Journal of Health Education*, *14*, 21p.
- Levi, A., Chan, K.K., & Pence, D. (2006). Real men do not read labels: the effects of masculinity and involvement on college students' food decisions. *Journal Of American College Health*, *55*(2), 91-98.

- Levin-Zamir, D., Lemish, D., & Gofin, R. (2011). Media Health Literacy (MHL): Development and measurement of the concept among adolescents. *Health Education Research, 26*(2), 323-335.
- Li, L., Law, C., Lo Conte, R., & Power, C. (2009). Intergenerational influences on childhood body mass index: the effect of parental body mass index trajectories. *American Journal of Clinical Nutrition, 89*(2), 551-557.
- Lin, B.H., Huang, C.L., & French, S.A. (2004). Factors associated with women's and children's body mass indices by income status. *International Journal of Obesity and Related Metabolic Disorders, 28*(4), 536-542.
- Lindhorst, K., Corby, L., Roberts, S., & Zeiler, S. (2007). Rural consumers' attitudes towards nutrition labelling. *Canadian Journal of Dietetic Practice and Research, 68*(3), 146-149.
- Macabasco-O'Connell, A., DeWalt, D.A., Broucksou, K.A., Hawk, V., Baker, D.W., Schillinger, D., Pignone, M. (2011). Relationship between literacy, knowledge, self-care behaviors, and heart failure-related quality of life among patients with heart failure. *Journal of General Internal Medicine, 26*(9), 979-986.
- Mahon, N.E., Yarcheski, A., & Yarcheski, T.J. (2002). Psychometric evaluation of the personal lifestyle questionnaire for adolescents. *Research in Nursing & Health, 25*(1), 68-75.
- Mahon, N.E., Yarcheski, T.J., Yarcheski, A. (2003). The Revised Personal Lifestyle Questionnaire for Early Adolescents. *Western Journal of Nursing Research, 25*(5), 533-547.
- Manganello, J.A. (2008). Health literacy and adolescents: a framework and agenda for future research. *Health Education Research, 23*(5), 840-847.

- Manganello, J.A. (2011). The association of understanding of medical statistics with health information seeking and health provider interaction in a national sample of young adults. *Journal of Health Communication, 16 Suppl 3*, 163-176.
- Marietta, A.B., Welshimer, K.J., & Anderson, S.L. (1999). Knowledge, attitudes, and behaviors of college students regarding the 1990 Nutrition Labeling Education Act food labels. *Journal of the American Dietetic Association, 99*(4), 445-449.
- McCarthy, H.D. (2006). Body fat measurements in children as predictors for the metabolic syndrome: focus on waist circumference. *The Proceedings of the Nutrition Society, 65*(4), 385-392.
- Mertler, C.A., Vanatta, R.A. (2010). *Advanced and multivariate statistical methods* (3rd ed.). Los Angeles: Pyrczak Publishing.
- Misra, R. (2007). Knowledge, attitudes, and label use among college students. *Journal of the American Dietetic Association, 107*(12), 2130-2134.
- Moestue, H., & Huttly, S. (2008). Adult education and child nutrition: the role of family and community. *Journal of Epidemiology and Community Health, 62*(2), 153-159.
- Montori, V.M. (2005). Understanding Health Literacy: Implications for Medicine and Public Health. *Mayo Clinic Proceedings, 80*(6), 829-829.
- Muhlenkamp, A.F. & Brown, N.J. (1983). Personal Lifestyle Questionnaire. *The development of an instrument to measure health practices*. Paper presented at the American Nurses Association Council of Nurse Researchers Conference, Minneapolis, MN.
- Muhlenkamp, A.F., Brown, N.J., Yarcheski, A., Mahon, N.E., & Yarcheski, T.J. (1997). Personal Lifestyle Questionnaire: Alternate models of positive health practices in adolescents. *Nursing Research, 46*(2), 85-92.

- Muhlenkamp, A.F., Brown, N.J., Yarcheski, A., Mahon, N.E., Yarcheski, T.J., & Cannella, B.L. (2004). Personal Lifestyle Questionnaire: A Meta-analysis of predictors of positive health practices. *Journal of Nursing Scholarship, 36*(2), 102-108.
- Neilson-Bohlman, L., Panzer, A.M., & Kindig, D.A., eds. (2004). *Health literacy: A prescription to end confusion*. Washington, D.C.: National Academies Press.
- Nutbeam, D. (2000). Health literacy as a public health goal: a challenge for contemporary health education and communication strategies into the 21st century. *Health Promotion International, 15*, 259-267.
- O'Keeffe, G.S., & Clarke-Pearson, K. (2011). The impact of social media on children, adolescents, and families. *Pediatrics, 127*(4), 800-804.
- O'Neil, M.E., Shewokis, P.A., Falkenstein, K.K., DeLago, C.W., Smith, S.A., Vaughn, N.A., & Costigan, T. E. (2010). Psychosocial factors and health perceptions in parents and children who are overweight or obese. *Obesity, 18*(8), 1558-1565.
- Ogden, C.L., Carroll, M.D., Curtin, L.R., Lamb, M.M., & Flegal, K.M. (2010). Prevalence of high body mass index in U.S. children and adolescents, 2007-2008. *The Journal of the American Medical Association, 303*(3), 242-249.
- Parker, R., & Ratzan, S.C. (2010). Health Literacy: A second decade of distinction for Americans. *Journal of Health Communication, 15*(sup2), 20-33.
- Parker, R.M., Baker, D.W., Williams, M.V., & Nurss, J.R. (1995). The test of functional health literacy in adults: a new instrument for measuring patients' literacy skills. *Journal of General Internal Medicine, 10*(10), 537-541.
- “Physical Education fact sheet, 2010-2011”(2010). Florida House of Representatives. Retrieved June 11, 2013, 2013, from

[http://www.myfloridahouse.gov/FileStores/Web/HouseContent/Approved/Web%20Site/education\\_fact\\_sheets/2011/documents/2010-11%20Physical%20Education.3.pdf](http://www.myfloridahouse.gov/FileStores/Web/HouseContent/Approved/Web%20Site/education_fact_sheets/2011/documents/2010-11%20Physical%20Education.3.pdf)

Polit, D. F., Beck, C.T. (2008). *Nursing Research: Generating and assessing evidence for nursing practice* (8th ed.). Philadelphia: Lippincott, Williams, and Wilkins.

Office of Disease Prevention and Health Promotion (2008). *America's Health Literacy: Why We Need Accessible Health Information*. (An Issue Brief From the U.S. Department of Health and Human Services.). Retrieved February 6, 2012

<http://www.health.gov/communication/literacy/issuebrief/#top>

Rao, G. (2008). Childhood obesity: Highlights of AMA expert committee recommendations. *American Family Physician*, 78(1), 56-63.

Ratzan, S.C. (2001). Health literacy: communication for the public good. *Health Promotion International*, 16(2), 207-214.

Sanders, L.M., Guez, G., Baur, C., Rudd, R., & Shaw, J.S. (2009). Health literacy and child health promotion: Implications for research, clinical care, and public policy. *Pediatrics*, 124(5, Suppl 3), S306-S314.

Sanders, L.M., Shaw, J.S., Guez, G., Baur, C., & Rudd, R. (2009). Health literacy and child health promotion: implications for research, clinical care, and public policy. *Pediatrics*, 124, S306-314.

Savage, J.S., Fisher, J.O., & Birch, L.L. (2007). Parental influence on eating behavior: conception to adolescence. *The Journal of Law, Medicine & Ethics*, 35(1), 22-34.

Seligman, H.K., Laraia, B.A., & Kushel, M.B. (2010). Food insecurity is associated with chronic disease among low-income NHANES participants. *The Journal of Nutrition*, 140(2), 304-310.

- Semmler, C., Ashcroft, J., van Jaarsveld, C.H., Carnell, S., & Wardle, J. (2009). Development of overweight in children in relation to parental weight and socioeconomic status. *Obesity (Silver Spring, Md.)*, 17(4), 814-820.
- U.S. Department of Health and Human Services (2009). *Basic HHS Policy for Protection of Human Research Subjects* Retrieved from <http://www.hhs.gov/ohrp/humansubjects/guidance/45cfr46.html>.
- Shanyang, Z. (2009). Parental education and children's online health information seeking: Beyond the digital divide debate. *Social Science & Medicine*, 69(10), 1501-1505.
- Shavers, V.L. (2007). Measurement of socioeconomic status in health disparities research. . *Journal of the National Medical Association*, 99(9), 1013-1020.
- Siegel, J.H. (2007). *Predictors of overweight in children in grades six through eight*. (Ph.D.), University of Miami. Retrieved from <http://ezproxy.lib.ucf.edu/login?URL=http://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=2009982571&site=ehost-live>
- Silk, K.J., Sherry, J., Winn, B., Keesecker, N., Horodyski, M.A., & Sayir, A. (2008). Increasing nutrition literacy: testing the effectiveness of print, web site, and game modalities. *Journal of Nutrition Education and Behavior*, 40(1), 3-10.
- Skinner, H., Biscope, S., Poland, B., & Goldberg, E. (2003). How adolescents use technology for health information: implications for health professionals from focus group studies. *Journal of Medical Internet Research*, 5(4), e32-e32.
- Steinberg, L. (2005). *Adolescence*. New York: McGraw-Hill.

- Storey, M.L., Forshee, R.A., Weaver, A.R., & Sansalone, W.R. (2003). Demographic and lifestyle factors associated with body mass index among children and adolescents. *International Journal of Food Sciences and Nutrition*, 54(6), 491-503.
- Sunbeam Products, I. (2012). Health-O-meter digital floor scales. Retrieved from <http://www.healthometer.com/Products.aspx?cid=1086>
- Tavakol, M.D. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education*, 2, 53-55.
- Townsend, M.S., Ontai, L., Young, T., Ritchie, L.D., & Williams, S.T. (2009). Guiding family-based obesity prevention efforts in low-income children in the United States. Part 2: what behaviors do we measure? *International Journal of Child & Adolescent Health*, 2(1), 31-47.
- Wakefield, M.A., Loken, B., & Hornik, R.C. (2010). Use of mass media campaigns to change health behaviour. *Lancet*, 376(9748), 1261-1271.
- Wang, Y., & Zhang, Q. (2006). Are American children and adolescents of low socioeconomic status at increased risk of obesity? Changes in the association between overweight and family income between 1971 and 2002. *The American Journal of Clinical Nutrition*, 84(4), 707-716.
- Wardle, J., Guthrie, C., Sanderson, S., Birch, L., & Plomin, R. (2001). Food and activity preferences in children of lean and obese parents. *International Journal Of Obesity And Related Metabolic Disorders: Journal of the International Association for the Study of Obesity*, 25(7), 971-977.



- Webber, C.B., Sobal, J., & Dollahite, J.S. (2010). Shopping for fruits and vegetables. Food and retail qualities of importance to low-income households at the grocery store. *Appetite*, 54(2), 297-303.
- Weiss, B.D., Mays, M.Z., Martz, W., Castro, K.M., DeWalt, D.A., Pignone, M.P., Hale, F.A. (2005). Quick assessment of literacy in primary care: the newest vital sign. *Annals of Family Medicine*, 3(6), 514-522.
- Wilson, F.L. (1995). Measuring patients' ability to read and comprehend: a first step in patient education. *Nursing Connections*, 8(4), 17-25.
- Wilson, F.L. (2000). Are patient information materials too difficult to read? *Home Healthcare Nurse*, 18(2), 107-115.
- Xie, B., Gilliland, F.D., Li, Y., & Rockett, H.R. (2003). Effects of ethnicity, family income, and education on dietary intake among adolescents. *Preventive Medicine*, 36(1), 30-40.
- Yin, H.S., Johnson, M., Mendelsohn, A.L., Abrams, M.A., Sanders, L.M., & Dreyer, B.P. (2009). The health literacy of parents in the United States: a nationally representative study. *Pediatrics*, 124 Suppl 3, S289-S298.