

Associations Among Measures of Weight Status, Energy Balance Related Behaviors, and
Psychosocial Mediators in Urban Upper Elementary School Children

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ABSTRACT

Associations Among Measures of Weight Status, Energy Balance Related Behaviors, And Psychosocial Mediators in Urban Upper Elementary School Children

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Childhood obesity is a serious public health concern, yet evidence linking childhood obesity and related modifiable behaviors is lacking. This study examines cross-sectional associations among two measures of weight status, energy balance related behaviors (EBRB), and psychosocial mediators.

Participants included children (N=1382) who participated in baseline assessments for the *Food, Health & Choices* childhood obesity study during Spring and Fall 2012. Participants were mostly low-income Hispanic and Black children, ages 9-13, from New York City public elementary schools in upper Manhattan and the Bronx.

Body mass index percentile for age (BMI) and percent body fat (%BF) were calculated using a Tanita body composition analyzer and stadiometer. The *Food, Health & Choices* Questionnaire (FHC-Q), administered in participating classrooms, measured self-reported EBRB, such as sweetened beverage intake and physical activity frequency, as well as psychosocial mediators, such as outcome expectations and autonomy. Statistical analyses included Pearson correlations, regression analyses, one-way ANOVA, ANCOVA, and descriptive statistics.

Despite a high correlation between BMI and %BF, a wide range of %BF was observed for each category of weight status determined by BMI: underweight, normal weight, overweight, and obese. Unexpectedly, slight but significant inverse correlations were observed between BMI/%BF and processed packaged snack and sweetened beverage intake. Overweight and obese children reported healthier EBRB than normal weight children.

Mediator analyses identified habit strength as a predictive variable for most EBRB. Means for mediator scales indicated healthier levels of autonomous motivation, competence, goal setting skills, behavioral intentions, and outcome expectations among overweight and obese children compared to normal weight children.

Results suggest more healthful behaviors and mediators may already be in place in overweight/obese children compared to normal weight children. However, EBRB for all children was far removed from current dietary and activity recommendations indicating room for improvement in this population. Further investigation of associations among childhood obesity, EBRB, and psychosocial mediators is warranted, as is the development of %BF standards for children.

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Dedication

This dissertation is dedicated to all of the children who participated in the *Food, Health & Choices* project.

Chapter I

INTRODUCTION

Childhood obesity is an epidemic in the United States, yet interventions to prevent and reduce it have shown inconsistent results (Waters et al., 2012). A major problem related to the effectiveness of these interventions is the lack of clear evidence for specific modifiable behaviors associated with childhood obesity and mediators of these behaviors (Baranowski, Cerin, & Baranowski, 2009).

Modifiable behaviors are the target of many childhood obesity interventions because energy balance – calories consumed versus calories expended – is thought to be one of the main causes of obesity. Energy balance is influenced by numerous behavioral, genetic, and environmental factors, which are complex and interacting (Barlow, 2007; Ogden, Carroll, Curtin, Lamb, & Flegal, 2010). Thus, it is difficult for researchers to pinpoint specific causal relationships with obesity.

Food and activity behaviors thought to be associated with obesity are often referred to as energy balance related behaviors (EBRB); common examples include limiting sweetened beverage intake and increasing daily physical activity. Interventions targeting EBRB often address theory-based psychosocial mediators as a path towards behavior modification and physiological outcomes. Psychosocial mediators typically include attitudes and beliefs towards behaviors and behavior change and are based on common psychological theories, such as Social Cognitive Theory.

Further understanding of the associations among obesity, EBRB, and psychosocial mediators, as well as the measurement of these variables, can greatly contribute to childhood obesity prevention. Specifically, it can help identify modifiable behaviors and mediators for effective interventions. It is imperative to move this research forward in order to mitigate the childhood obesity epidemic through effective interventions and policies.

Background

The most up-to-date statistics on childhood obesity indicate that 18.0% of children ages 6-11 are obese, with an additional 17.5% overweight in the United States (Ogden et al., 2010). In New York City public K-8 schools, the target population of this study, obesity affects 20.7% of children (CDC, 2010).

Overall, significant increases in childhood obesity prevalence were seen in nationally representative samples of children and adolescents starting in the 1980s and lasting over three decades. Recent research suggests that trends may be leveling off. Between 1999-2000 and 2007-2008, significant increases were seen only at the highest BMI cut point (\geq 97th percentile) and only in 6- through 19-year-old males (Ogden Carroll, Kit, & Flegal, 2012). Similarly, slight decreases were observed in the prevalence of obesity in New York City public K-8 schools between 2006 and 2010 (21.9% in 2006-07 to 20.7% in 2010-11). The decrease was smaller among Black and Hispanic children than among Asian/Pacific Islander and White children.

Although this is promising, interventions are still critically needed to further reduce the prevalence of obesity. Interventions also need to address disparities among schoolchildren in

New York City and across the nation as low-income minorities such as Blacks and Hispanics are disproportionately affected by overweight and obesity (CDC, 2010).

Obesity in childhood raises concerns for the current and future health status of children. Negative health consequences associated with childhood obesity include, but are not limited to, high blood pressure, insulin resistance, asthma, and depression. In a nationally representative sample of 5-17 year olds, 70% of obese youth had at least one existing risk factor for cardiovascular disease (Ogden, Lamb, Carroll, & Flegal, 2010). Additionally, childhood obesity increases the potential for adulthood obesity, which can lead to even greater health risk and the earlier onset of diseases such as heart disease, stroke, several types of cancer, type 2 diabetes, and osteoarthritis (Singh, Mulder, Twisk, Van Mechelen, & Chinapaw, 2008).

The Surgeon General and the Institute of Medicine have both released urgent calls to action on this issue (Institute of Medicine, 2007; Office of the Surgeon General, 2001). In addition, the White House Report calls for reversing childhood obesity in one generation (White House Task Force on Childhood Obesity, 2010). Thus, prevention and reduction of childhood obesity and its persistence into adulthood are common themes in current research. Despite the plethora of research already done, obesity prevention interventions in children have failed to produce consistent positive behavioral changes as well as positive physiological outcomes such as decreasing body mass index percentile for age (Waters et al., 2011).

A considerable amount of research has been dedicated to interventions aimed at the prevention of childhood obesity by modifying EBRB. Results of short and long term interventions focused on EBRB also yield inconsistent results. This is partly due to differences in selected target behaviors, psychosocial mediators, outcome measures, and theoretical

framework in addition to traditional research and intervention design variability considerations (Khambalia, Dickinson, Hardy, Gill, & Bauer, 2012). Improvements are needed in the selection of relevant EBRB, theory, mediators, and measurement instruments in order to improve the effectiveness of interventions to reduce childhood obesity rates.

The selection of a few specific modifiable behaviors to target is critical to the success of an intervention. This selection is extremely difficult considering the complex nature of individual food and activity behavior and the associations of these with obesity. Furthermore, once relevant behaviors are selected, mediators of the behaviors need to be identified and addressed in order to effectively change behavior (Baranowski et al., 2009).

The Expert Committee of the American Academy of Pediatrics has identified several behaviors that may help prevent excessive weight gain in children on the basis of current knowledge: limiting consumption of sugar-sweetened beverages, encouraging consumption of diets with recommended quantities of fruits and vegetables, limiting television and other screen time, limiting eating out at restaurants (particularly fast food restaurants), limiting portion size, limiting consumption of energy-dense foods, promoting moderate to vigorous physical activity for at least 60 minutes each day, eating breakfast daily, and encouraging family meals in which parents and children eat together (Barlow, 2007).

In addition, the United States Department of Agriculture continually develops evidence-based Dietary Guidelines for Americans intended to allow individuals to maintain a healthy weight and promote optimal health. Specific guidelines for children include consuming about 4 cups a day of fruits and vegetables and limiting consumption of empty calories – items with high levels of added sugars and solid fats (Dietary Guidelines for Americans Advisory

Committee, 2010). For physical activity recommendations, the United States Department of Health and Human Services sets Physical Activity Guidelines for Americans (US Department of Health and Human Services, 2008) recommends that children achieve at least 60 minutes of moderate to vigorous physical activity daily.

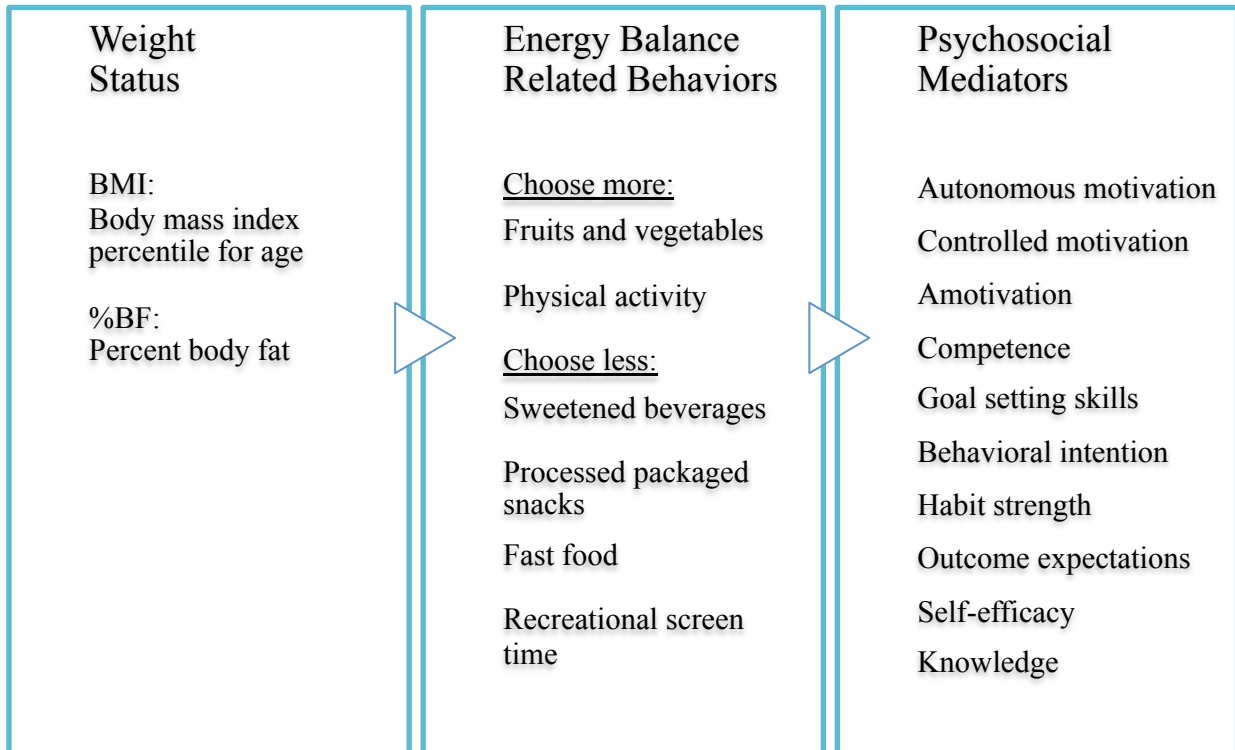
Overall, research supporting the behaviors listed above reveals promising, but inconsistent associations with weight status. A first step in advancement of the literature would be to institute a more rigorous process for identifying modifiable behaviors associated with obesity in children before spending precious prevention dollars on ineffective interventions (Baranowski et al., 2009).

Of interest to this study are the individual and combined behaviors that show evidence of association with weight status in children. Evidence for the selection of behaviors is presented in Chapter II. Behaviors are categorized into “choose more” and “choose less” groups. “Choose more” behaviors include healthful food and activity behaviors: fruit and vegetable intake and physical activity. The “choose less” group includes less healthful food and activity behaviors: recreational screen time, and intake of sweetened beverages, processed package snacks, and fast food.

Psychosocial mediators of the selected behaviors were identified based on two important health behavior theories, Social Cognitive Theory and Self-Determination Theory, both discussed further in Chapter II. These psychosocial mediators include outcome expectations, self-efficacy, behavioral intention, habit strength, autonomy, competence, and health behavior knowledge. All of these have been found to be predictive of either dietary or physical activity behaviors (Van Stralen, Yildirim, te Velde, Brug, Van Mechelen, & Chinapaw,

2011). All variables of interest to this study are listed in Figure 1.1, which provides a basic conceptual framework for the study.

Figure 1.1: Overview of Main Study Variables



It is important to link measures of weight status to EBRB and psychosocial mediators to EBRB to improve understanding of these relationships and to move childhood obesity prevention further. Drawing links among behaviors, mediators, and weight status, though, is only as useful as the validity and reliability of the measurements.

EBRB can be difficult to measure, especially in research with children using conventional methods such as 24-hour food and activity recalls and food frequency questionnaires. These most often rely on self-reported data and the accuracy of responses can be difficult to determine. They are also limited in the depth of questions and the amount of items that can be measured at one time. In large samples, available methods can also be extremely cost-prohibitive (Burrows et al., 2012). As technology continues progress and become readily available, the integration of technology and survey data collection is made possible. Computerized systems for individual and group EBRB data collection are in the process of being developed. Data on psychosocial mediators related to EBRB and appropriate measurement of these variables is promising, though limited and further development of valid and reliable instruments is warranted (van Stralen et al., 2011).

Researchers also rely on quick and easy methods of measuring weight status, such as calculating body mass index from measures of height and weight. Weight status in children is often categorized by body mass index percentile for age (BMI) as underweight, normal weight, overweight, and obese (CDC, 2000). Current CDC BMI cutoffs for children define the following weight status categories by percentile range based on reference curves: <5th percentile=underweight, 5-84.9th percentile=normal weight, 85-94.9th percentile=overweight, and >95th percentile=obese. Reference curves for these percentiles are based on data from the 1970's as this is the best data before the marked shift upwards in childhood obesity in the United States (Kuczmarski et al., 2002).

BMI is intended to be representative of percent body fat and is the most commonly used measurement of weight status. It has been criticized for its limitations, which include lack of

assessment of true body composition because it cannot distinguish between fat mass and fat free mass such as muscle and bone, which vary in individuals of the same weight for height (Burkhauser, & Cawley, 2008).

Bioelectrical impedance analysis (BIA) is a method of measuring body composition including fat mass and fat free mass, from which percent body fat (%BF) can be calculated (Deurenberg & Deurenberg-Yap, 2003). The use of %BF as another tool for assessing the presence and degree of adiposity and potential health risk – as compared to the typical and widespread use of BMI – has been recommended. BIA is adequately comparable to high-quality laboratory measures of body fat such as dual-energy x-ray absorptiometry (DXA) and acceptable for use in large epidemiological studies (Burkhauser, & Cawley, 2008; Hosking, Metcalf, Jeffery, Voss, & Wilkin, 2006).

Calls to action have been made to include the use of body fat as a measure of weight status, to identify modifiable behaviors related to obesity, and to determine modifiable mediators of those behaviors (Baranowski et al., 2009; Burkhauser, & Cawley, 2008; van Stralen et al., 2011). The selection of variables – weight status, EBRB, and psychosocial mediators – as well as methods of measurement are of the utmost importance to the study of childhood obesity.

Rationale

This is one of the first studies to examine the relationships between BMI and %BF in a large sample of Hispanic and Black children. This is also one of the first studies that will be able to describe such a wide range of EBRB and psychosocial mediators in urban upper elementary children and to analyze the relationships among these along with weight status.

Study Purpose

This study aims to examine the many relationships among two measures of weight status in children (BMI and %BF), EBRB, and psychosocial mediators of those behaviors in urban Hispanic and Black upper elementary school children in New York City. Understanding these associations will shed light on behaviors important to the study of childhood obesity.

Research Questions

1. What is the association between body mass index percentile for age (BMI) and percent body fat (%BF)?
 - 1a. What is the correlation between BMI and %BF?
 - 1b. What is the range of %BF for each weight category as defined by BMI: underweight, normal weight, overweight, and obese (CDC, 2000)?
2. What are the associations among energy balance related behaviors (EBRB), BMI, and %BF?
 - 2a. To what extent are EBRB associated with BMI and %BF?
 - 2b. How do EBRB differ with BMI and %BF?
 - 2c. To what extent are EBRB associated with each other?
3. What are the associations among psychosocial mediators, EBRB, BMI, and %BF?
 - 3a. Which psychosocial mediators are most predictive of EBRB?
 - 3b. How do psychosocial mediators differ with BMI and %BF?

Significance

Understanding associations among difference measures of weight status, EBRB, and psychosocial mediators will help researchers and practitioners move research forward in identifying specific modifiable behaviors to target in interventions aiming to prevent and reduce childhood obesity. The addition of %BF as a measure of weight status, compared to the conventionally used BMI, strengthens the analysis of variables associated with weight status. It also provides a closer look at the relationship between BMI and %BF in this population and allows us to explore how the differences in how the two measures may classify obesity. It is possible that %BF may be a better indicator of obesity or health risk, or may be more sensitive to changes in EBRB than BMI.

This research has applications to reproducible, real-world measurements of EBRB and weight status in children since this study utilizes non-conventional, though validated and justifiable, measurements of these variables including %BF and an ARS-administered EBRB and psychosocial mediator survey. The availability of a data set with the amount of variables from this study in a large sample of urban children allows for an important assessment of these factors and their relationships with childhood obesity.

Scope and Delimitations

This study is limited to a cross sectional analysis of a primarily Hispanic and Black urban upper elementary school population.

Definition of Key Terms

Term	Definition
Activity	Refers to both physical activity and sedentary activity
Calorie	Colloquial term for the scientific term of kilocalories
Energy balance	State of equilibrium or disequilibrium based on calories taken in via food and drink versus calories expended by an individual's body
Energy balance related behaviors (EBRB)	Food and activity actions that affect the intake or use of calories in the human body
Fast food	Foods from quick service, counter style restaurants such as burgers, fries, fried chicken, pizza, tacos, burritos, and take-out Chinese food
Processed packaged snack	Food items packaged in individual serving containers and made up of several ingredients typically including added fats and sugars; examples are chips and candy
Psychosocial mediators	Concepts thought to be intermediaries in the process of behavior change; typically derived from psychological theories
Sweetened beverage	Drink with added sugar such as soda, sweetened iced teas and sweetened, flavored drinks
Recreational screen time	Time spent in sedentary game play or computer use for non-educational purposes
Weight status	Refers to the classification of excess adiposity as body mass index or percent body fat

List of Acronyms

Acronym	Term
ARS	Audience response system
%BF	Percent body fat
BMI	Body mass index percentile for age
EBRB	Energy balance related behaviors
FHC-Q	<i>Food, Health & Choices</i> questionnaire
SCT	Social Cognitive Theory
SDT	Self-Determination Theory

Chapter II

REVIEW OF THE LITERATURE

This chapter provides an overview of childhood obesity including prevalence, related health concerns, methodological issues of measurement and classification, and causes of childhood obesity. This is followed by a review of the evidence for energy balance related behaviors (EBRB) thought to be associated with childhood obesity and other negative health consequences. A summary of the theory-based psychosocial mediators thought to influence EBRB is then presented and followed by a review of EBRB and psychosocial mediator measurements in children.

Childhood Obesity And Relevant Concerns

Childhood obesity is an epidemic in the United States (Ogden, et al. 2010). Multiple calls to action have been made by the Surgeon General, the Institute of Medicine, the White House, and the Centers for Disease Control (Institute of Medicine, 2007; Office of the Surgeon General, 2001; CDC, 2010). The CDC's Healthy People 2020 calls for a 10% reduction in childhood obesity between 2010 and 2020 while the White House Report calls for reversing childhood obesity in one generation (White House Task Force on Obesity, 2010).

Prevalence

Significant increases were seen in childhood obesity prevalence during the 1980s and 1990s and 2000s in the United States. Recent research suggests that trends may be leveling off (Ogden et al., 2012). That said, the fact remains that over one third of children in the United

States are overweight or obese (18.0% obese) (Ogden et al., 2010). In New York City public K-8 schools 20.7% of children are obese (CDC 2010). A more detailed description of obesity in New York City public elementary schools reported at least 20% obesity in each grade, including kindergarten, with Hispanic children having significantly higher levels (31%) than Black (23%), White (16%) or Asian children (14.4%) (Thorpe, List, Marx, May, Helgerson, & Frieden, 2004).

Negative Health Outcomes

Obesity in childhood raises concern for children's current and future health status. Negative health consequences associated with childhood obesity include, but are not limited to, high blood pressure, Type 2 diabetes, and asthma (CDC, 2010; Ogden et al., 2010). Psychological consequences of obesity include depression, poor school performance, and increased risk-behaviors including alcohol use, tobacco use, premature sexual behavior, inappropriate dieting practices, and physical inactivity. Overweight children are more likely to become obese as adults, putting them at long-term higher risk for chronic conditions such as stroke, cancers (breast, colon, kidney), musculoskeletal disorders, and gall bladder disease (Daniels, Jacobson, McCrindle, Eckel, & Sanner, 2009).

A review by Singh and colleagues (2008) of 25 studies examining the relationship between child and adult weight status found that all studies consistently reported that overweight and obesity persists from childhood into adulthood. The risk of being obese in adulthood is progressively larger with severity of obesity in childhood. One of the highest quality studies from this review reported as odds ratio of 28.3 for obesity in adulthood, based

on obesity between the ages of 10 and 14 in children (95% confidence interval 15.0-53.5, N=61) (Whitaker, Wright, Pepe, Seidel, & Dietz, 1997).

In adults, BMI has clear associations with morbidity and mortality. Diseases associated with obesity in adulthood are increasingly common in children. About half of the National Health and Nutrition Examination Survey (NHANES) participants measured in a study by Johnson and colleagues (2009), aged 12-19 years, had at least one metabolic syndrome disorder: high waist circumference for age, high blood pressure, high fasting triglycerides, low high-density lipoprotein serum cholesterol, or glucose intolerance, and overall metabolic syndrome prevalence, three or more of the disorders listed above, was 8.6% (95% confidence interval, 6.5%-10.6%). Prevalence was higher in males, Hispanic individuals and white individuals than in Black individuals, though there was a high prevalence of a large waist circumference (23.3%) in Black females. Large waist circumference, high fasting triglyceride, and low high-density lipoprotein concentrations were the major disorders identified in Hispanic and white individuals. Additionally, another study found obesity, glucose intolerance, and hypertension in childhood are strongly associated with increased rates of premature death (Franks, Hanson, Knowler, Sievers, Bennett, & Looker, 2010).

As mentioned above, one of the greatest concerns with childhood obesity is that obese children often become obese adults. Obese children also have a greater risk overall of the following conditions later in life, and they get these conditions earlier than their non-obese counterparts: high blood pressure, glucose intolerance, Type 2 diabetes mellitus, high triglycerides, high cholesterol, and fatty liver (Nieto, Szklo, & Comstock, 1992; Maffeis & Tato, 2004). Additionally, cardiovascular disease often has its origin in childhood via the

development of fatty streaks in the arteries, which eventually progress to raised lesions of atherosclerosis (Kavey, Daniels, Lauer, Atkins, Hayman, & Taubert, 2003).

In addition to physiological consequences, obesity in children has been associated with many negative psychological outcomes. Lower health-related quality of life, psychological disorders (such as depression), and health risk behaviors have been consistently associated with childhood obesity (Pinhas-Hamiel, Singer, Pilpel, Fradkin, Modan, & Reichman, 2005; Pulgarón, 2013; Daniels et al., 2009).

Direct costs of childhood obesity are extremely high. These include prescription drug costs, emergency room visits, and outpatient care, totalling \$14.1 billion, as well as inpatient costs of \$237.6 million (Trasande, & Chatterjee, 2009; Trasande, Liu, Fryer, & Weitzman, 2009). Taking into consideration that many obese children become obese adults, childhood obesity can increase the already staggering annual cost of treating obesity in adulthood which is currently around \$147 billion (direct cost), not to mention indirect costs such as increased job absenteeism and lower employee productivity (Finkelstein, Trogon, Cohen, & Dietz, 2009; Cawley, Rizzo, & Haas, 2007; Gates, Succop, Brehm, Gillespie, & Sommers, 2008).

Obesity and Related Health Disparities

Childhood obesity affects boys and girls, all racial and ethnic groups, all socioeconomic groups, and all localities, yet in disproportionate ways (Kumanyika & Grier, 2006; Ogden et al., 2010; Singh, Kogan, & van Dyck, 2010; Wang & Zhang, 2006). Higher rates of overweight and obesity are seen in African-American and Mexican-American girls between the ages of 12 and 19 (Ogden et al., 2012). Youths, ages 2 to 17, who reside in economically distressed urban neighborhoods, have the highest rates of obesity (Ogden et al., 2010; Singh et al., 2010; Story,

Evans, Fabsitz, Clay, Rock, & Broussard, 1999). Lower socioeconomic status individuals as well as Black and Hispanic individuals are disproportionately affected by obesity at all ages (Wang & Beydoun, 2007; CDC, 2010).

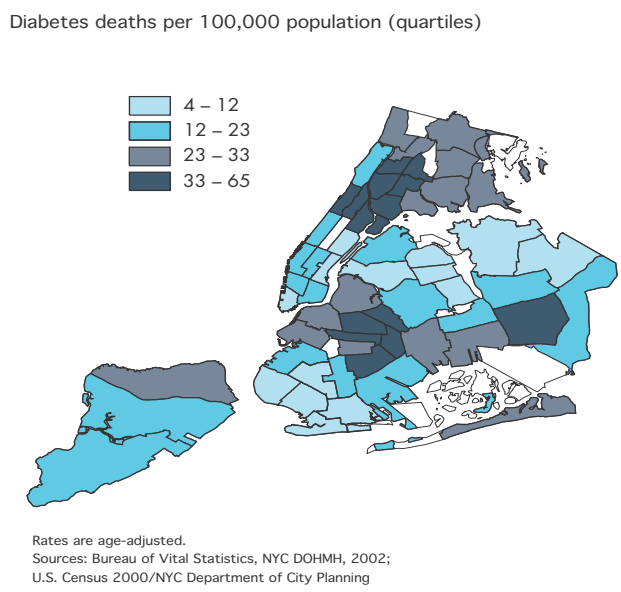
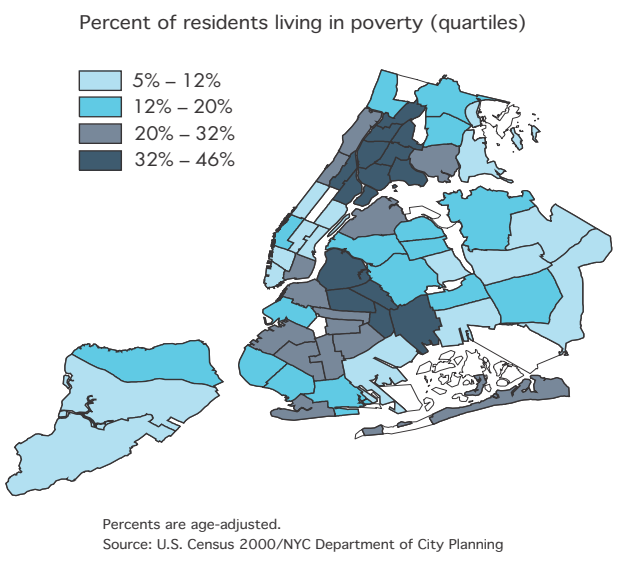
New York City, specifically, has substantial inequalities among different racial/ethnic and economic status groups (Karpati, 2004). South Bronx as well as East and Central Harlem are among the lowest income neighborhoods in New York City and residents are primarily Black and Hispanic. One in three residents in these neighborhoods lives in poverty and all of those that live in these areas have shorter life expectancy by eight years and poorer overall health, notably increased rates of diabetes, compared to White New Yorkers.

There are many reasons for health disparities and only a handful are discussed here. A review of disparities in access to healthy foods identified the lack of supermarkets with fresh produce and overabundance of fast food and outlets supplying cheap, energy dense food products (Larson, Story, & Nelson, 2009). Zoning laws often encourage fast food outlets in poorer neighborhoods, and media often targets the marketing of unhealthy foods to these areas (Dreier, 2005; Maantay, 2001). Nutrition education in schools and community centers is often lacking in lower socioeconomic areas, as is access to medical care. All of these factors contribute to unhealthy eating patterns in these communities, which contribute to serious consequences, such as high rates of chronic disease. Thus, individuals in these communities have higher morbidity and mortality.

Racial differences in the health of New York City residents include some of the following: Hispanic residents are more than two times as likely as White residents to be diagnosed with diabetes at some point in their lives. Black residents are more than three times

as likely as white residents to die from diabetes (Karpati et al., 2004). Figure 2.1 shows the level of poverty and deaths due to diabetes in areas of New York City. The concentration of both lies in many of the same areas. The study population is mostly located in the darkest areas of these maps, those with the highest rates of poverty and deaths due to diabetes.

Figure 2.1: New York City Poverty and Death Due to Diabetes Maps (Karpati et al., 2004)



Causes of Childhood Obesity

It is well accepted that weight status in children and adults is the result of a complex interaction between behaviors, environment and genetics. Genetics also plays a big role in obesity with studies concluding that about 25-40% of BMI is heritable (World Health Organization, 1997). The prevalence of obesity at the population level, though, has risen too quickly to suggest a genetic shift (Barlow et al., 2007). Instead, it is believed that a shift in individuals' caloric energy balance – calories in versus calories out – has shifted over time due to behavioral factors, environmental changes, and gene-environment interactions, all complex entities. In today's food and activity environment, often supportive of unhealthy food choices and lack of opportunities for physical activity, individuals and groups with and without a genetic predisposition to obesity can be both consciously and unconsciously swayed towards less healthful behaviors which can lead to weight gain.

The basic physiology of change in body weight is well understood: weight is gained when energy intake (measured in kilocalories, commonly referred to as calories) exceeds energy expenditure. As children grow taller, increases in body weight are expected. However, many children today gain too much weight. There are possible endocrinological or neurological syndromes are known to lead to excessive weight gain in childhood, and these are often tested for in very obese children, but it is estimated that less than 5% of obesity cases in children result from these endogenous factors (Anderson & Butcher, 2006).

Children seem capable of self-regulating energy balance through early childhood, around age 5, when they seem to lose this apparently innate ability (Birch & Deysler, 1986).

Food intake eventually becomes influenced by external cues, such as predetermined portions (Fisher, Rolls & Birch, 2003).

A systematic review of the evidence on the nature, extent, and effects of food marketing to children supports the common belief that current food company marketing practices promote mostly unhealthful foods and beverages to children. Food promotions in the form of commercials on television, internet advertisements, and other media advertisements have been found to directly affect children's nutrition knowledge, preferences, purchasing behavior, consumption patterns, and health (Cairns, Angus, Hastings, & Caraher, 2012). The most common food products promoted to children are breakfast cereals, sweetened beverages, savory snacks, candy, and fast foods. Studies have linked preference for these foods – that are high in fat, salt, or sugar – to food advertising (Halford et al., 2008).

The three decades when childhood obesity was rising, starting in the 1980s, coincided with many societal and environmental changes. Energy-dense convenience foods – high in calories and low in nutrients – such as sweetened beverages and processed packaged snacks became increasingly available at schools, increasingly seen in large portions and increasingly advertised to children. Consumption of food prepared away from home increased along with increases in families with a single working parent or two working parents. Finally, with the rapidly changing nature of media, children spent more time engaging in sedentary activities such as watching television, playing video games, and using computers (Anderson & Butcher, 2006; Bray, 2007).

Obesity research singles out no one cause of childhood obesity. Instead, the many behavioral and environmental shifts over the past decades seem to have disrupted energy balance in children and adults alike.

Obesity Prevention Behavioral Interventions

Despite the plethora of research already done, obesity prevention interventions in children have produced some promising results, but to date have failed to produce consistent positive behavioral changes and physiological outcomes such as changes in BMI. In a recent Cochrane Collaboration review of 55 intervention studies aimed at prevention of obesity in children, Waters and colleagues (2012) concluded that interventions with children can have positive effects on the outcome of more healthful weight status, though the specific components or targeted behaviors cannot be elucidated due to differences in measures, theoretical frameworks, and intervention design, and future studies should aim for large sample sizes and more rigorous evaluations.

Mixed results in these interventions lead us to question theory, targeted behaviors, targeted outcomes, and measurement in research (Kambalia et al., 2012). Because no intervention can target all food and activity behaviors, the selection of behaviors to target is critical to the success of the intervention and this is difficult considering the complex nature of behaviors and obesity. Furthermore, once behaviors are selected, mediators of those behaviors need to be identified and addressed (Baranowski et al., 2009). The selection of behaviors and mediators for this study is discussed later in this chapter.

Child Weight Status

Several different standards exist to classify children as having excess weight or excess fat. The following sections describe the definitions, classification systems, and methods of collecting data to determine weight status in children.

Defining and Measuring Child Weight Status

Weight status refers to the classification of weight, accounting for height, into the categories determining the presence and degree of obesity. In children, weight status is most often determined by body mass index percentile for age (BMI). BMI is calculated as weight in kilograms divided by the square of height in meters. Current CDC BMI cutoffs for children define categories by BMI range as: <5th percentile=underweight, 5-84.9th percentile=normal weight, 85-94.9th percentile=overweight, and >95th percentile=obese (CDC, 2000). The World Health Organization provides another reference data set of BMI for international comparison and therefore will not be considered here as this study is limited to the United States.

BMI is a measure of weight for height and not necessarily indicative of body fat. It was originally designed by a Belgian statistician by the name of Quetelet in the nineteenth century as a simple method of adjusting weight for height in adults in order to compare weight across groups (Weigley, 2000). Only in recent decades has the use of BMI become more popular in children (Cole, Bellizzi, Flegal, & Dietz, 2000).

The use of BMI in children compared to adults is more complicated because children's BMI varies with age and sex and must therefore be transformed into a percentile or z-score and compared to a reference standard. Reference standards are based on population data and are themselves manipulated statistically via smoothing processes and normalization

transformations (Cole, 1990). Caution must be taken when observing the BMI of children because, unlike adults, the same BMI value at a different age or for the opposite sex in children can indicate a different level of adiposity (Flegal & Ogden, 2011). Thus, the correlation between BMI and adiposity varies by age, sex, and race/ethnicity (Prentice & Jebb, 2001).

BMI is a measure of excess weight and not necessarily excess body fatness; its accuracy varies according to degree of body fatness. A review by Freedman and Sherry (2009) suggests that BMI is a good indicator of excess adiposity in relatively fat children, but differences in the BMI of relatively thin children may have more to do with fat free mass than fat mass. The authors report that BMI for age at ≥ 95 th percentile based on the CDC reference population is only moderately high (70%–80%) in sensitivity, or true positive cases. Implications of these conclusions are that use of more precise measures of body fat, to determine true excess body fatness, are warranted.

BMI is often considered a surrogate for body fatness. Concerns with the measure of BMI include that if excessive weight is lean body mass, there can be misclassification of an individual as overweight or obese when body fat is not at an unhealthy level. Likewise, if percent body fat is high and total weight is normal for height, an individual could be misclassified as healthy when there is health concern. BMI itself does not give information on the relative proportions of fat and lean masses. In White children, for example, it has been shown that for the same age and sex, an individual can have a twofold range of fat for the same BMI value (Wells, 2000).

The CDC reference data for BMI is based on NHANES I and II in the 1970s because data from subsequent NHANES in the 1980s and beyond exhibited a sharp rise in overall child

weight in those years compared to the relatively stable values of the previous decades (Kuczmarski et al., 2002). Thus, these reference standards represent the weight distribution that is considered acceptable for American children and where we, as a society, should be aiming to reduce childhood obesity.

In adults, BMI cut points for overweight and obese status are based on approximate health risk (National Institutes of Health, 1998). There are no accepted BMI cutoffs for children based on health risk because of the lengthy amount of time before adverse outcomes appear, making health risk at different levels of BMI difficult to assess. The United States Preventive Services Task Force report considerable gaps in knowledge for the association of childhood obesity and future health outcomes (Whitlock, Williams, Gold, Smith, & Shipman, 2005). Additionally, the current CDC BMI cut points are not clearly justified, but are related to z-scores above 2 and 3 respectively for overweight and obesity. Thus, values of the 5th, 85th, and 95th percentiles are convenient, rather than precise, cut points.

The terms overweight and obese that go along with the cut points have also been controversial in the past since categorization into these does not necessarily imply any present health risk. “Heaviness” and “at risk for overweight” are other terminology that have been used at the higher end of BMI (World Health Organization, 1995; Krebs, Himes, Jacobson, Nicklas, Guilday, & Styne, 2007).

Percent Body Fat in Children

Fat is a normal component of the human body and is stored mainly in adipose tissue, subcutaneously or viscerally. Mean body fat percentage in upper elementary children, based on 1999-2004 NHANES data is about 28% in boys and 31% in girls (Ogden et al., 2011).

Measurement of body fat is proposed in order to identify children with excess adiposity as opposed to excess weight. Body fat can be measured via a number of different methods. Methods available for use in real world settings such as clinics and schools include: body mass index percentile for age (BMI), waist circumference, waist-to-hip ratio, skinfold thickness, and bioelectric impedance (BIA). More rigorous methods of measuring body fat in research settings include: underwater weighing/densitometry, air-displacement plethysmography, dilution method/hydrometry, dual-energy x-ray absorptiometry (DXA), computerized tomography, and magnetic resonance imaging (Hu, 2008).

The most common surrogate for body fat in children, BMI, was discussed in the previous section. This section aims to provide evidence for the use of BIA as an accurate, reliable, and readily accessible method for determining percent body fat for use in distinguishing weight status in children.

BIA is a method of measuring body composition using an imperceptible and safe electric current that runs through the body measuring resistance. The current distinguishes between body fat, lean body mass, and water by the degree of resistance it faces when passing through the body. Fat mass and fat free mass are then calculated using the equation: fat mass divided by the sum of fat mass and fat free mass, multiplied by 100 to determine percent body fat (Hu, 2008).

BIA has recently become more affordable, safe, and portable, making it convenient for the measurement of body fat in large studies. Limitations of this method include decreased accuracy when a subject is improperly hydrated and decreased accuracy in individuals with very high BMI. Compared to one of the highest quality reference standards, DXA, BIA in

children is an adequate measure of percent body fat, though results are typically lower for BIA (Hosking et al., 2006).

BIA is more sensitive and specific than other measures such as BMI for categorizing average adiposity in groups. Prediction equations based on BIA have been validated and cross-validated in children and adults, but primarily in white populations (Houtkooper, Lohman, Going, & Howell, 1996). As with BMI and any measure of body fat, particular attention needs to be paid to differences in ethnic groups. Fat patterning in the body as well as relative leg and arm length are different among ethnic groups and can affect the measurement and comparability of body fat (Deurenberg & Deurenberg-Yap, 2003).

Although there are no currently accepted standards for percent body fat in children or adults, nationally representative reference data from NHANES IV skinfold thickness calculations of percent body fat, comparable to BIA when measured by a trained professional, are available for children by sex and year of age (Klipstein-Grobusch, Georg, & Boeing, 1997; Laurson, Eisenmann, & Welk, 2011). Smoothed percentage body fat percentile graphs for a nationally representative sample of children using DXA body fat measurements are available as well (Ogden, Li, Freedman, Borrud, & Flegal, 2011). Similar percentiles were obtained from a Black and White sample of children in Texas were measured using bioelectric impedance analysis (Mueller, Harrist, Doyle, & Labarthe, 2004).

BIA may be better at categorizing health risk than BMI. For example, in children of the same weight (adjusted for age and sex), an increased proportion of fat mass and a decreased proportion of lean mass have been shown to increase the risk of developing cardiovascular problems (Barker, 2006).

Laurson and colleagues (2011) developed youth percent body fat standards using receiver operating characteristic curves for 12-18 year-olds based on risk of metabolic syndrome. Thresholds of %BF were 23.7% and 35.9% in boys and 26.8% and 35.5% in girls at 12 year of age for “low” and “high” metabolic syndrome risk.

Similar values were found for a 75th percentile “high-adiposity” cut point in children 8-19 years old in a study of the association of body fat percentage with lipid concentrations from NHANES DXA data (Lamb, Ogden, Carroll, Lacher, & Flegal, 2011)

Evidence-Based Associations Among Energy Balance Related Behaviors and Weight Status in Children

Many food and activity behaviors have been associated with energy balance and weight status in children. This section provides evidence for the selection of energy balance related behaviors (EBRB) of interest to this study. Specifically, the evidence from large cross-sectional studies showing associations between EBRB and weight status in children is presented. This information is summarized in Table 2.1. In addition to research supporting the link between this study’s EBRB and weight status, EBRB were chosen based on the level of control children had on these behaviors, which was supported by pilot research as well as previous peer-reviewed research (Lytle, Seifert, Greenstein, & McGovern, 2000).

First, we review EBRB recommendations from key sources. To prevent excess weight gain in children, the Expert Committee of the American Academy of Pediatrics recommends consuming more fruits and vegetables, 60 minutes or more of moderate to vigorous physical

activity, limiting television and other screen time to less than 1-2 hours per day, limiting fast food, sweetened beverages, portion size, and consumption of energy-dense foods (Barlow, 2007). The Dietary Guidelines for Americans recommend consuming about 4 cups a day of fruits and vegetables and limiting consumption of empty calories – items with high levels of added sugars and solid fats (Dietary Guidelines for Americans Advisory Committee, 2010). Limits of empty calories for children ages 9-13 are 120 calories for girls and 160 calories for boys. The Physical Activity Guidelines for Americans recommends for children perform at least 60 minutes of moderate to vigorous physical activity daily (US Department of Health and Human Services, 2008). The American Heart Association and the American Cancer Society publish similar recommendations for prevention of chronic disease. Overall, research supports the behaviors listed above for optimal health and weight status, but inconsistencies in the literature do exist and cause concern for the selection of the most appropriate behaviors to target for prevention of childhood obesity.

Many studies on food-related EBRB focus on frequency and some include data on portion size consumed. It is important to note here that food portions have been positively associated with energy intake (McConahy, Smiciklas-Wright, Birch, & Mitchell, 2002; Diliberti, Borti, Conklin, Roe, & Rolls, 2004). Piernas & Popkin (2011) examined trends among portion sizes and energy intake at both meals and snack times in nationally representative data from 1977 to 2006. In 7 to 12 year olds, larger portion sizes of sweetened beverages, French fries, and salty snacks coincided with higher energy intakes at meals. The larger portions children choose, the more calories consumed at the meal or snack (Fisher et al., 2003). Portion sizes, particularly of high calorie and low nutrient-dense foods, have increased

drastically since the late 1980's (Young & Nestle, 2012; Matthiessen, Fagt, Biloft-Jensen, Beck, & Ovesen, 2003). In the same time, researchers have found a decrease in ability to estimate caloric content of food and an increase in intake have been associated with increases in portion size (Young & Nestle, 2012).

Fruits and Vegetables

Fruit and vegetable consumption seems to have a modest effect on weight status, with the relationship between fruit and lower weight status being stronger than that with vegetables (Academy of Nutrition and Dietetics, 2004). As described in Table 2.1, a large, nationally representative, cross-sectional sample, using the United States Department of Agriculture and Agricultural Research Service instrument – called the Continuing Survey of Food Intakes by Individuals (CSFII) – for children showed negative associations between fruits and adiposity in boys and girls as well as vegetables in adiposity in boys (Lin & Morrison, 2002). The NHANES later combined with the CSFII and is now used in national research.

In another high-quality study by Neumark-Sztainer and colleagues (1996) researchers found a negative association between fruit and vegetable intake and overweight status in the Minnesota Adolescent Health Survey. The sample included a very large (N=36,284) and diverse sample of children.

Sweetened Beverages

Soda is one of the top sources of calories for children ages 2-18 in the United States with an average child consuming 118 calories per day of soda (Reedy & Krebs-Smith, 2010). Figure 2.2 illustrates that soda, energy drinks, and sports drinks make up the majority of added sugar in the diets of youth (National Cancer Institute, 2010). All of the calories in soda are

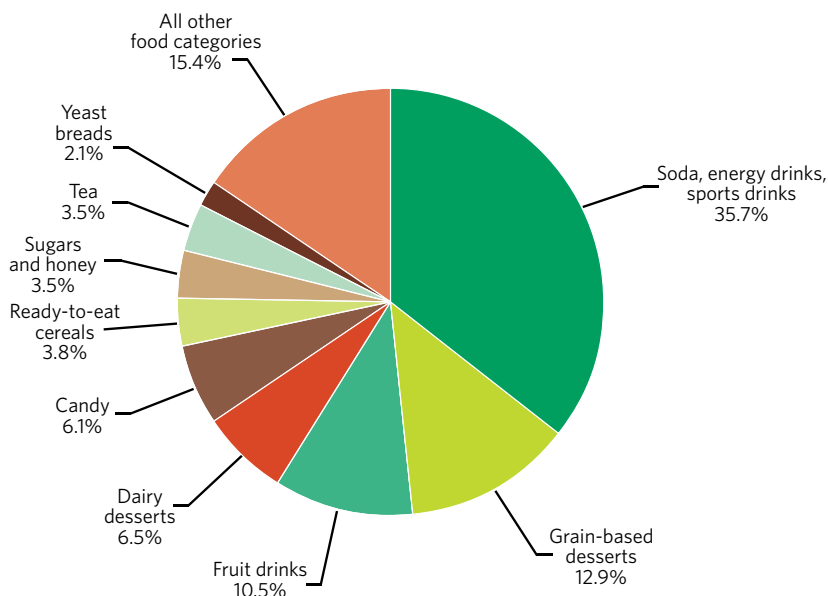
considered empty calories by the United States Department of Agriculture (Dietary Guidelines Advisory Committee, 2010). Empty calories are calories from solid fats and/or added sugars that add little or no nutrients to the food in which they are added. Solid fats will be discussed in the next section. In this section on sweetened beverages, the concern lies in added sugar within beverages.

Sweetened beverages are any drinks that have added sugar. Examples include soda, sweetened iced teas, sweetened fruit or fruit-flavored drinks, flavored waters with added sugar, and sports drinks. There are many strongly designed studies of high quality showing that sweetened beverage consumption is associated with higher weight status in children (Academy of Nutrition and Dietetics, 2004).

Troiano and colleagues (2000) studied 10,371 children in a cross-sectional design and noted a significant positive relationship between BMI and soda intake. Another large study by Nicklas and colleagues (2003) found a positive association between sweetened beverages and BMI in the Bogalusa Heart Study.

The strength of current research on sweetened beverages and obesity has led to proposed policy changes and the recommendation to limit consumption of sweetened beverages by the American Medical Association, American Academy of Pediatrics, and the American Heart Association to name a few (Friedman & Brownell, 2012).

Figure 2.2: Sources of Added Sugars in the Diet of the U.S. Population Ages 2 Years and Older, NHANES 2005-2006^a (National Cancer Institute, 2010)



a. Data are drawn from analyses of usual dietary intake conducted by the National Cancer Institute. Foods and beverages consumed were divided into 97 categories and ranked according to added sugars contribution to the diet. "All other food categories" represents food categories that each contributes less than 2% of the total added sugar intake.

Processed Packaged Snacks

The literature on snacks is difficult to tease apart due to multiple definitions of the term "snack." In the literature, snacks vary in terms of type of food and consumption amount and this may account for some of the inconsistencies in the literature. This study defines processed packaged snacks as food items made from a combination of many ingredients and typically packaged in a single serving container. Although the term snack implies an eating occasion in between meals, processed packaged snacks can also be consumed at meals and obtained from

larger than single-serving containers. The types of foods commonly described as processed packaged snacks include chips, candy, baked goods, and ice creams.

One of the top sources of energy for children ages 2-18 in the United States is a category called “grain desserts,” which often come in individual packages and fit the definition of processed packaged snacks (Reedy & Krebs-Smith, 2010). Children consume an average of 138 calories of grain desserts per day, which is more than the maximum 120 empty calories allowance recommended by the USDA for girls between the ages of 9 and 13 years, and almost the maximum of 160 empty calories recommended for boys the same age (Dietary Guidelines Advisory Committee, 2010).

Processed packaged snacks, such as grain desserts, often contain very high levels of added fat as well as sugar. Added sugar was discussed in the previous section on sweetened beverages. Dietary fat is positively associated with adiposity in children (Academy of Nutrition and Dietetics, 2004). Dietary fat may be more concerning than protein and carbohydrates with respect to weight gain specifically because of its high energy density and palatability (Parsons, Power, Logan, & Summerbell, 1999). Many children exceed current dietary recommendations of fat (Troiano et al., 2000; Kennedy & Powell, 1997). Techniques used to measure nutrient intake, such as self-reported records of frequency and amount over one or several days, however, may not be able to capture the small variations in dietary fat intake, which can lead to significant weight gain over time.

The research that links weight and health to processed packaged snacks as defined by this study is limited, hence the presentation of studies linking dietary fat and BMI. Storey and colleagues (2003) found a positive association between BMI and total fat intake in a nationally

representative sample of 13,012 adolescents. Obaranek et al. (1994) found a similar association in a sample of 2,147 girls.

Corner stores, or bodegas, supply a great portion of processed packaged snack foods to youths and adults alike in New York City, especially in low-income areas and areas surrounding schools. This is similar to other large urban cities. A study by Lucan and colleagues (2010) evaluated the healthfulness of snack items in Philadelphia corner stores in three ethnically distinct, low-income neighborhoods surrounding public schools. Authors reported finding no produce. By national school food nutrition standards, 80-91.5% of snack foods in the corner stores were considered unhealthy with high amounts of added fat and sugar. And a single snack item averaged 6-14% of daily calories for a typical child.

Fast Food

Evidence points to frequent patronage of fast food restaurants having associations with higher weight status in children (Academy of Nutrition and Dietetics, 2004). The same issues with added solid fat from the previous section are present in the behavior of fast food intake. However, eating outside of the home, usually at counter-style, quick-service restaurants and fast food outlets has been the focus of much research.

The School Health Promotion Study from Finland measured “eating outside the home” in 60,252 adolescents and found a positive association with BMI (Mikkila, Lahti-Koski, Pietinen, Virtanen, & Rimpela, 2003). Project Eating Among Teens (EAT) also found a similar association in the United States with a sample of 4,746 teens. Large cross-sectional studies with children and fast food are limited because in many areas, children do not attain the same

level of autonomy by late childhood as children do in New York City and other large metropolitan areas.

Physical Activity

Evidence for the link between increased physical activity and lower weight status in children is the strongest of all the EBRB of interest in this study. The magnitude of this association is not clear, however, the effect is most likely greater in boys. It is also dependent on the intensity of activities measured, typically categorized as low, moderate, and vigorous activity (Academy of Nutrition and Dietetics, 2004).

In an analysis of the Youth Risk Behavior Survey by Levin and colleagues (2003) moderate intensity physical activity was negatively associated with BMI in boys. McMurray et al. (2000) reported a similar association with vigorous intensity physical activity.

In a systematic review by Reichert and colleagues (2009), researchers concluded that the majority of studies demonstrate a protective effect of physical activity on adiposity in children. Limitations in the research on physical activity and adiposity include the use of BMI to measure adiposity because of its association with lean mass and the subjective nature of self-reported questionnaires measuring physical activity.

Physical activity not only protects against obesity, it also may benefit children in the future as risk-factor levels in childhood predict levels in young adulthood, and cardiovascular disease often has its origin in childhood, though it does not usually present clinically until adulthood (Kavey et al., 2003). Physical activity also seems to enhance self-esteem in children and young adults among other psychological outcomes such as socialization and better mental health (Tremblay, Inman, & Williams, 2000; Kenyon & McPherson, 1973). The health

benefits of physical activity far outweigh the possible adverse outcomes, such as injury. And a dose-response is apparent with increased intensity and duration of physical activity leading to increased health benefits (US Department of Health and Human Services, 2008).

Recreational Screen Time

The term recreational screen time describes time spent in front of a computer, television, or other device with a screen, and typically involves some form of entertainment in the form of interactive media (such as games) or non-interactive media (such as a television program). This term excludes time spent in front of a computer or other screen for educational purposes. This term also excludes games that require physical activity in order to play, such as the Wii® or Kinect® systems.

Clear associations are observed in the relationship between increased television viewing and increased weight status, though the mechanism seems to act indirectly and requires further investigation (Academy of Nutrition and Dietetics, 2004). The association of video games and increased weight status is also becoming more evident, though the rapidly changing landscape of media makes it difficult to measure consistently and accurately.

Storey and colleagues (2003) analyzed data from the CSF II/NHANES III data set (N=10,012) and reported a positive association between television viewing time and BMI. A positive association between video game playing time and BMI was also shown in a large cross-sectional study (McMurray et al., 2000).

Energy Balance Related Behavior Summary

Fruit and vegetable intake as well as physical activity are associated with lower weight status in children. Intake of sweetened beverages, processed packaged snacks, and fast food as

well as recreational screen time are associated with higher weight status in children.

Psychosocial mediators of these behaviors are discussed in the following section.

Table 2.1: Cross-Sectional Studies Justifying Relationship of Energy Balance Related Behaviors with Weight Status

Reference	Sample	Weight Status Measures	Behavior Measures	Results
Lin & Morrison, 2002 Supplemental CSFII Children's Survey	N=2181 Sex: Both Age: 6-12 years Race: Nationally representative Location: USA	BMI percentile	Fruits and vegetables 2-day food record	Fruits: negative association Vegetables: negative association (boys only) (multiple regression)
Neumark-Sztainer, Story et al., 1996 MN Adolescent Health Survey	N=36284 Sex: Both Age: 13-18 years Race: Black, Hispanic, Asian, Caucasian, American Indian Location: MN, USA	BMI (adult value, not percentile)	Fruits and vegetables 10-item FFQ	Fruits: negative association Vegetables: no association (multiple logistic regression)
Levin, Lowrey et al., 2003 YRBS	N=13295 Sex: Both Age: 13-18 years Race: Nationally representative Location: USA	BMI (self-reported height and weight)	Physical activity 24-hour activity recall	Moderate-intensity physical activity: negative association (boys only) (multiple logistic regression; odds ratios)
McMurray et al., 2000	N=2563 Sex: Both Age: 6-12 years Race: Black, Caucasian Location: USA	BMI percentile	Physical activity: 24-hour activity recall	Vigorous-intensity physical activity: negative association (boys only) (logistic regression)
Troiano et al., 2000	N=10371 Sex: Both Age: 6-12 years Race: Nationally representative Location: USA	BMI percentile	Sweetened beverages 24-hour recall	Sweetened beverage: positive association (statistics not described)
Nicklas et al., 2003 Bogalusa Heart Study	N=1562 Sex: Both Age: 6-12 years Race: Black, Caucasian Location: LA, USA	BMI percentile	Sweetened beverages 24-hour recall	Sweetened beverage: positive association (multivariate logistic regression)

Table 2.1 (continued): Cross-Sectional Studies Justifying Relationship of Energy Balance Related Behavior with Weight Status

Reference	Sample	Weight Status Measures	Behavior Measures	Results
Storey et al., 2003 CSF II & NHANES III	N=13012 Sex: Both Age: 13-18 years Race: Nationally representative Location: USA	BMI percentile	Processed packaged snacks: 24-hour recall	Total fat intake: positive association (multiple logistic regression)
Obarzanek et al., 1994	N=2147 Sex: Girls Age: 6-12 years Race: Black, Caucasian Location: USA	BMI percentile	Processed packaged snacks: 3-day food record	Total energy from fat: positive association (multiple logistic regression)
Mikkila et al., 2002 School Health Promotion Study	N=60252 Sex: Both Age: 13-18 years Race: Not specified Location: Finland	BMI percentile	Fast food: Food behavior survey	Eating outside the home (besides school): positive association (multiple logistic regression)
French et al., 2001 Project EAT	N=4746 Sex: Both Age: 13-18 years Race: Not specified Location: MN, USA	BMI percentile	Fast food: Youth Adolescent Questionnaire	Eating outside the home (besides school): positive association (multiple logistic regression)
McMurray et al., 2000	N=2563 Sex: Both Age: 6-12 years Race: Black, Caucasian Location: USA	BMI percentile	Recreational screen time: Viewing Questionnaire	Video game time: positive association (logistic regression)
Storey et al., 2003 CSF II & NHANES III	N=13012 Sex: Both Age: 6-12 years Race: Nationally representative Location: USA	BMI percentile	Recreational screen time: CSF II & NHANES III	Television viewing time: positive association (multivariate regression)

Associations Among Energy Balance Related Behaviors and Theory-Based Psychosocial Mediators

Many factors influence the behavior of individuals. In the field of behavioral nutrition research, we are interested in mediators, explanatory links in the relationship between a behavior and an outcome – weight status in this case (Baron & Kenny, 1986; Holmbeck, 1997).

Mediating Variables Model

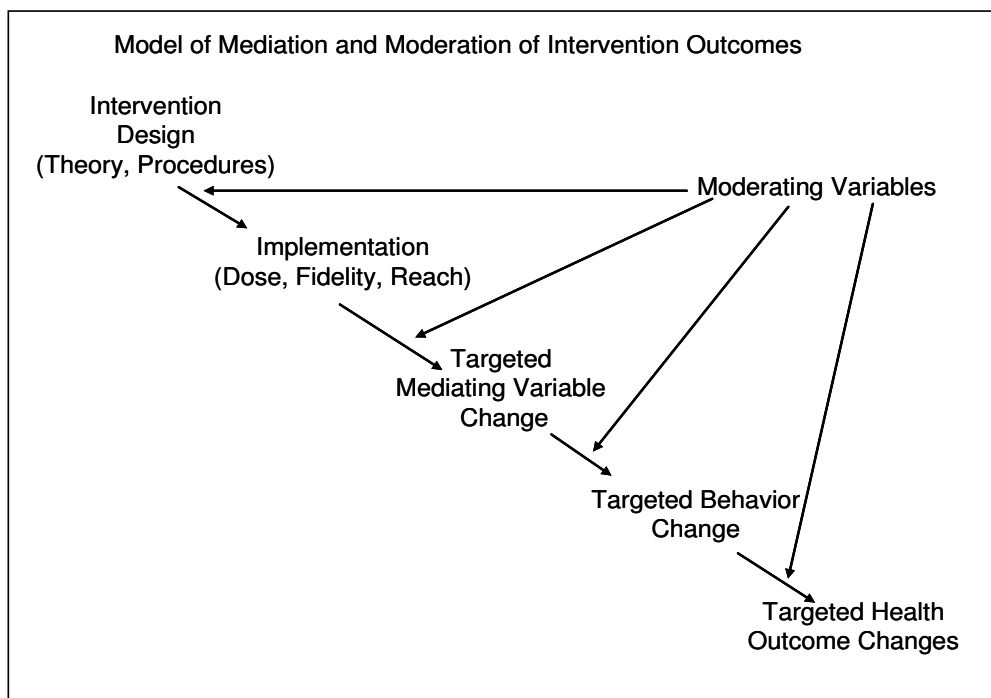
Baranowski (1997) proposed the mediating variables model for research in the field of behavioral nutrition. This model posits that changes in the mediating variables, selected from relevant psychological, social, and ecological theories, result in changes in actual behavior. Behavioral changes can then lead to changes in desired outcomes, which in childhood obesity research typically include improved physiological and anthropometric measurements because of the links between these outcomes and health status (Figure 2.3).

The mediating variables model implies the following stepwise approach in order to design and develop effective EBRB interventions. First, the behaviors selected for intervention must be strongly and causally related to the outcomes of interest in order for outcomes to change. Second, mediators must be selected that are strongly and causally related to the behavior; these mediators must be proven to predict the variance in the behavior. Intervention activities can then be created to maximally target and manipulate mediators in order to produce a significant level of behavior change to influence desired health outcomes.

Evaluations of interventions have identified areas for improvement including: adequate measurement of the behavior and mediators; lack of strength in the relationship

between outcomes and behaviors as well as behaviors and mediators (Bachman, Baranowski, & Nicklas, 2006; Bar-Or & Baranowski, 1994; Foster et al., 2008; Haerens, Cerin, Deforche, Maes, & De Bourdeaudhuij, 2007).

Figure 2.3: Mediating and Moderating Variable Effect on Intervention Outcomes Model (Baranowski et al., 2009)



Theoretical Framework

Social cognitive theory (SCT) proposes that personal, behavioral, and environmental factors work in a reciprocal fashion to influence behavior (Bandura, 2001). It is a learning theory based on the notion that people learn by the modeling of behaviors by others and that human thought processes are central to understanding personality. SCT places special

importance on outcome expectations and self-efficacy beliefs as means toward motivating people to form goal intentions and take behavioral action. It also recognizes the importance of self-regulation in maintaining behavior.

SCT places emphasis on personal agency: the sense of ability to exert personal influence over one's environment as well as over one's own behaviors (Bandura, 1989; Bandura, 2001). Personal agency consists of four different capacities. The first, forethought, is anticipation of probable consequences of a behavior and is typically called outcome expectations. The second, intentionality, is a purposeful commitment to a future behavior. The third, self-efficacy refers to confidence in the ability to execute particular behaviors in different situations and to overcome barriers to the behavior. Last, self-regulation is the control of behavior through self-assessment and goal-setting practices. Via these four capacities, personal agency can be enhanced in interventions through motivational activities and skill building.

SCT is used widely in childhood obesity-prevention studies with success (Kridli, 2009; Gonzalez-Suarez, Worley, Grimmer-Somers, Dones, 2009; Katz, O'Connell, Njike, Yeh, & Nawaz, 2008; Shaya, Flores, Gbarayor, & Wang, 2008; Summerbell, Waters, Edmunds, Kelly, Brown, & Campbell, 2005). Whereas Social Cognitive Theory posits that behavior is primarily regulated by expectancies regarding desired outcomes, Self-Determination Theory (SDT) takes into account multiple types of regulation, some intrinsic and some extrinsic (Deci & Ryan, 2000). Intrinsically motivated behaviors do not require reinforcement like extrinsically motivated behaviors. Internalization occurs when behavior is initially motivated by external factors, such as a reward from parents, and over time the behavior is given value

and becomes regulated by the individual. The more self-determined a behavior, whether intrinsically motivated or internalized, the more positive feelings and high performance an individual displays.

Important concepts in self-determination theory are autonomy, competency, and relatedness. Autonomy refers to the personal choice in one's behaviors. Competence refers to beliefs in one's capability and competency in controlling his or her environment as well as being able to reliably predict outcomes of behaviors. Relatedness refers to satisfaction in social world involvement. When these psychological functions are fulfilled in an individual, autonomous motivation is enhanced. Autonomous motivation is one of the key concepts in self-determination theory. This refers to the ability to reflect on and engage in behaviors while having a full sense of choice (Deci & Ryan, 2000; Deci & Ryan, 2008).

Self-determination has been found to be positively associated with improved behavior and attitudes in health-related research, especially that in physical activity (Webber, Tate, Ward, & Bowling, 2010; Gillison, Standage & Skevington, 2006; Standage, Sebire, & Loney, 2008; Stangage, Duda, & Ntoumanis, 2005).

Combined, Social Cognitive Theory and Self-Determination Theory provide a robust model for predicting energy balance related behaviors. Table 2.2 provides a list of definitions and for each mediator of interest to the study. The mediators and examples of interventions targeting them are described in more detail below.

Table 2.2: Psychosocial Mediators based on Glanz, Rimer, & Viswanath (2008) and Deci & Ryan (2000)

Mediator	Definition
Outcome expectations	Beliefs about the likelihood and value of consequences that result from behavior
Self-efficacy	Beliefs about personal ability to perform behaviors that lead to desired outcomes
Intention	Degree to which a person has consciously planned to perform a specific behavior
Habit strength	Degree to which a person currently performs a specific behavior
Knowledge	Awareness of information (in this case, awareness of basic health recommendations for energy balance related behaviors)
Goal setting skills	Part of the concept of self-regulation; identification of incremental and long-term changed that can be achieved
Competence	Belief about the ability to perform a task
Autonomy	Includes amotivation, autonomous motivation, and controlled motivation, all defined below
Amotivation	Sense of lack of reason and desire to engage in a behavior
Autonomous motivation	Ability to reflect on and engage in behaviors while having a full sense of choice
Controlled motivation	Choosing to perform behaviors due to perceived control by others, such as parents

Mediators of Interest

Social Cognitive Theory guided questions regarding outcome expectations, self-efficacy, behavioral intention, goal-setting skills, habit strength, and knowledge. Self-Determination Theory guided questions on competence and autonomy, which includes amotivation, autonomous motivation, and controlled motivation.

Outcome expectations are beliefs about the consequences of a specific behavior (Glanz et al., 2008). Self-efficacy is the conviction of an individual that he or she can perform a specific behavior (Bandura, 1997). Intention is the degree to which a person has consciously planned to perform a specific behavior, while habit strength is the degree to

which a person currently performs a specific behavior (Glanz et al., 2008). Goal setting skills are part of the concept of self-regulation; identification of incremental and long-term changes that can be achieved (Schunk, 1990; Bandura, 1997). Finally, knowledge is the awareness of information, in this case regarding basic health recommendations for a specific energy balance related behavior. While not a key concept in SCT, knowledge of the relevant behaviors is the basis of outcome expectations and other concepts in this theory.

Self-Determination Theory is based on the principles of competence, autonomy, and relatedness. Competence is the belief about the ability to perform a task. Autonomy includes amotivation, autonomous motivation, and controlled motivation defined. Amotivation is a lack of motivation. Autonomous motivation is motivation that stems from within the person. And controlled motivation is motivation that stems from perceived control by others, such as parents (Deci & Ryan, 2000). Relatedness is not discussed here as it was not chosen as part of the combined theoretical basis of the *Food, Health & Choices* intervention.

Three reviews have been published to date on the role of psychosocial mediators in relation to energy balance behaviors (Lubans, Karpyn, & Sherman, 2008; Cerin, Barnett, & Baranowski, 2009; van Stralen et al., 2011). These reviews conclude that there is support for self-efficacy, self-regulation strategies, and outcome expectations. The most recent review supports self-efficacy and behavioral intention as the most relevant mediators, especially in relation to physical activity (van Stralen et al., 2011). Attitude, knowledge, and habit strength were reported as relevant for dietary interventions. Too few recreational screen time studies have been conducted targeting mediators, therefore conclusions cannot be drawn for mediators most closely related to this behavior.

Summary of Psychosocial Mediators

Based on the Mediating Variables Model, measuring psychosocial mediators related to EBRB targeted in studies can lead to more effective and systematic understanding of why children are doing their current behaviors. Combining theories, such as Social Cognitive Theory and Self-Determination Theory can provide a robust basis for understanding behavior via several complimentary psychosocial mediators.

Survey Measurement in Children

Survey measurement in children is commonly used in childhood obesity studies, though techniques vary based on the nature of the study. This section presents a justification for the use of self-reported questionnaires as well as the challenges that go along with such measures.

Measuring Energy Balance Related Behaviors

Measurement of EBRB is often tricky, especially with children since measures often require individuals to recall a number of specific behaviors from the previous days, weeks, or months.

Additionally, dietary and physical activity measurement is sometimes collected via parental report. Upper elementary school age children represents an age group where children are starting to exhibit more autonomous control over food and activity behaviors and are able to sufficiently report these behaviors via survey responses. At this age, children are thought to be able to report their own food and activity behavior with relative accuracy (Rockett & Colditz, 1997).

Food Frequency Questionnaires, 24-Hour Recalls, & Food Diaries. In a systematic review of dietary intake reporting and methodology in intervention trials, Burrows and colleagues (2012) concluded that common measures of intake were food diaries/24-hour recalls, food frequency questionnaires (FFQ). The authors concluded that improvements are needed in the quality of assessment and reporting of dietary intake in childhood obesity studies. The authors also call for more robust validation and reliability measures, especially among new questionnaires and assessment tools. Previous reviews have come to similar conclusions (Contento, Randell, & Basch, 2002).

In a study by Domel and colleagues (1994), researchers assessed the reliability and validity of both weekly and monthly fruit and vegetable food frequency questionnaires in a multiethnic, low/middle-income sample of fourth and fifth grade students. The food frequency questionnaires were compared to self-reported daily food records, which were previously validated by observations of school lunch. Acceptable reliability was obtained, however, validity was unacceptable for both the weekly and monthly food frequency questionnaires due to significant over-reporting. Authors concluded the food record procedure was the preferred method of fruit and vegetable consumption. As with all self-reported dietary questionnaires, results are subject to measurement errors and misreporting (Subar et al., 2003; Neuhouser et al., 2008).

Researchers desire to use the simplest, yet most accurate and reliable dietary assessment method appropriate to the nature of the study. FFQ, as noted above, are often inaccurate and are largely avoided in current research focusing on behavioral change in children. Food records, precisely 24-hour recalls, are the gold standard for recording food

behaviors, though these are often not feasible or necessary in large samples due to time and budget constraints. For these reasons, researchers have attempted to create new assessments measuring relevant items to their research. Several instruments relevant to this study are described below.

Beverage and Snack Questionnaire (BSQ). The BSQ is a 19-item survey assessing the frequency of consumption of the following categories of items both at school and not at school: beverages, snacks and sweets, and fruits and vegetables (Neuhouser, Lilley, Lund, & Johnson, 2009). It was developed as a cost-effective tool for use in a nutrition policy research project because other methods such as FFQ and food records were too intensive for the purposes of their research. In the validation of this instrument with 7th grade students (N=46) of diverse backgrounds from metropolitan Seattle, the BSQ was highly correlated with 4-day food records. Correlation coefficients (r) ranged from 0.63 to 0.71 for the three categories. Test-retest reliability was reported as $r=0.72$ to 0.85 .

Physical Activity Questionnaire – C (PAQ-C). The PAQ-C is a 10-item survey validated to assess self-reported physical activity in children ages 8 to 14 years in White, Black, European American, and Hispanic populations (Moore, Hanes, Barbeau, Gutin, Trevino, & Yin, 2007). The PAQ-C measures physical activity behavioral frequency, duration, and intensity during the past week. It has been extensively tested against various indices of physical activity-related cardiovascular fitness, fatness, and psychological measures. However, similar to most self-reported physical activity questionnaires, there is room for improvement, especially with ethnically diverse populations.

School Physical Activity and Nutrition Questionnaire (SPAN). The SPAN is a 63-item survey created to quickly measure nutrition behaviors, attitudes, and knowledge, and physical activity behaviors of elementary school children for the School Physical Activity and monitoring system in Texas (Springer, Hoelscher, Kelder, Castrucci, & Perez, 2009). Three items of interest include those related to recreational screen time behavior as measurement of this type of behavior, which is not well documented in the literature. SPAN asks about hours per day spent watching television, using the computer, and playing video games for non-educational purposes. Unfortunately, only the food behavior questions from this survey have been validated (Thiagarajah et al., 2008).

Measuring Psychosocial Mediators

Baranowski and colleagues (1999) reviewed the literature on mediating variable models with psychosocial variables predicting dietary fat and fruit and vegetable consumption. Studies generally showed low predictiveness, $R^2 < 0.3$. Results showed no single theory provided models that consistently out-predicted others and in order to increase the predictiveness of models in the future, researchers should combine mediators from several theories.

The *Choice, Control and Change* study developed an instrument for measurement of theory-based psychosocial mediators from which the FHC-Q mediator items are based (Contento, Koch, Lee, & Calabrese-Barton, 2010). Scales, consisting of at least three items, were developed to measure outcome expectations, behavioral intention, and self-efficacy for most of the targeted EBRB. Four scales on the EatWalk survey measure autonomy and competence and were developed based on those used in related studies (Gillison, Standage, &

Skevington, 2006; Standage, Sebire, & Loney, 2008). The relatedness concept from Self-Determination Theory was not measured.

The *Choice, Control and Change* outcome evaluation by Contento and colleagues (2010) studied psychosocial mediators and EBRB in 562 middle school students in New York City. Students in intervention schools compared to controls reported healthier behaviors in the following categories: sweetened beverages, processed packaged snacks, fast food, and recreational screen time. Related to these behaviors, authors reported substantial increases in positive outcome expectations of the behaviors, self-efficacy, goal intentions, competence, and autonomy.

Measuring and Controlling for Social Desirability

Social desirability of survey responses is of interest to behavioral nutrition researchers. Because many foods or activities are socially considered “good” or “bad,” some children may respond in a socially desirable way to food or activity behavior questions instead of responding honestly. Measuring degree of social desirability allows researchers to control for this variable.

Social desirability is a form of response bias (Paulhus, 1991). Individuals vary systematically in their tendency to respond in a socially desirable way. For children, responding in a socially desirable way is whether they answer the way an adult would want such as saying “I always do what I am told.” The degree of social desirability can be measured by asking questions about behaviors that typically children do not always do. Those that respond in a socially desirable way to questions similar to the example may tend to respond to other questions, such as dietary intake, in a socially desirable way.

The Children's Social Desirability (CSD) scale instrument was developed by Crandall and colleagues (1965) decades ago and is still used in research today. A 14-item version based on the original 46-item CSD was recently validated in primarily Black 4th graders in conjunction with dietary report data collection (Baxter, Smith, Litaker, Baglio, Guinn, & Shaffer, 2004). The 14-item version performed almost as well as the 46-item version ($r=.83$). Children's rating of social desirability on the 14-item scale remained similar after one month and performed well on test-retest studies ($r=.79$). Authors recommended it for use in similar populations in order to relate dietary reporting error to social desirability.

Use of Audience Response System Technology for Survey Administration in Children

Audience response system (ARS) technology allows for data to be collected and automatically entered into a database from a large group of people at one time. ARS material is presented via PowerPoint® slides with multiple-choice options. Participants can key in their responses as the survey moves along at the same pace for everyone. This technology has been used in a variety of settings, most often for educational purposes such as in-class assessments of learning, especially in college and graduate school settings (Graham, Tripp, Seawright, & Joeckel, 2007; Caldwell, 2007).

It has been found to increase student participation in classroom lectures and has been rated in studies as more engaging and enjoyable than typical lecture-style learning (Boyle, 1999; Burnstein & Lederman, 2001). Some studies even show student increases in confidence, knowledge, and mastery of material with the use of ARS (Cain, Black, & Rohr, 2009; Graham et al., 2007). Interestingly, students reported paying closer attention to lecture

material when ARS technology was incorporated in the classroom (Mestre, Gerace, Dufresne, & Leonard, 1997).

In addition to student engagement, methodological issues of data collection can be improved using ARS technology. Gathering complete and accurate food and activity behavior data from children is challenging. ARS offers a novel method for the efficient collection of group data while maintaining participant confidentiality. It provides the opportunity to present a colorful and engaging questionnaire which may be limited in paper-and-pencil format due to printing and space constraints. ARS also eliminates the need to transfer paper forms to a database because data are captured electronically (Gamito, Burhansstipanov, Krebs, Bemis, & Bradley, 2005).

ARS has been tested in the assessment of a health education program with low-income urban minority children (ages 9-11 years, N=265) by DeSorbo and colleagues (2012). Students using the ARS assessment versus paper-and-pencil controls reported having more fun, paying more attention, learning more, and participating more in the health education program, which began and ended with a 5-question assessment.

The use of ARS for survey data collection in large studies (N>300) with children has not been studied to date. Based on the increased usage and success in classroom settings as well as emerging evidence for use as a data collection system, it is believed that ARS has the potential to engage students in surveys more so than traditional paper-and pencil format.

Summary of Survey Measurement

Measurement of EBRB and psychosocial mediators in children is complicated and dependent on research goals. Gold standards exist for measurement of EBRB (24-hour

recalls), but no standards exist for psychosocial mediators and inconsistency in the literature points to the need for further research on predictive mediators of relevant behaviors. Cost-effective and child-friendly administration methods are needed, such as the use of ARS technology to engage participants in the content and experience of EBRB and psychosocial mediator measurement.

Summary

In the context of the childhood obesity epidemic, this literature review justified assessing %BF in addition to BMI for assessing the relationship between the two and for testing the relationship of both with EBRB and psychosocial mediators. It also made the case for measuring the selected EBRB because of their associations with weight status as well as the case for the selected psychosocial mediators because their combined predictive value as part of a theory and their past use as part of childhood obesity prevention intervention programs. Finally, this chapter justified the use of ARS for survey data collection. The information in this chapter, taken together, provides the basis for the study of the three key study variables together: weight status, EBRB, and psychosocial mediators. Chapter III provides a description of the methods used in this study.

Chapter III

METHODS

This chapter describes the methods used in the cross-sectional analysis of the baseline anthropometric and behavioral and psychosocial survey data from the *Food, Health & Choices* study. Unless indicated, “the study” refers to the cross-sectional analysis and not the larger *Food, Health & Choices* intervention and outcome evaluation study. The aim of the current study is to examine the associations among measures of weight status in children (by both body mass index percentile-for-age and percent body fat), their energy balance related behaviors, and psychosocial mediators of those behaviors. This chapter presents the detailed methods used in the study: study design, participant description, survey data collection and instrument, anthropometric data collection and instruments and data analysis descriptions.

Review of Research Questions

1. What is the association between body mass index percentile for age (BMI) and percent body fat (%BF)?
 - 1a. What is the correlation between BMI and %BF?
 - 1b. What is the range of %BF for each weight category as defined by BMI: underweight, normal weight, overweight, and obese (CDC, 2000)?
2. What are the associations among energy balance related behaviors (EBRB), BMI, and %BF?

- 2a. To what extent are EBRB associated with BMI and %BF?
- 2b. How do EBRB differ with BMI and %BF?
- 2c. To what extent are EBRB associated with each other?
- 3. What are the associations among psychosocial mediators, EBRB, BMI, and %BF?
 - 3a. Which psychosocial mediators are most predictive of EBRB?
 - 3b. How do psychosocial mediators differ with BMI and %BF?

The Food, Health & Choices Study Background Information

The *Food, Health & Choices* study is funded by the United States Department of Agriculture. Its purpose is to develop and implement curriculum and wellness interventions to determine the individual and combined effectiveness of these interventions on childhood obesity prevention. The population of interest is children in the fifth grade in New York City public school districts 3, 4, 5, 6, 7, and 9. The *Food, Health & Choices* intervention focuses on six specific EBRB goals separated into “choose more” and “choose less” categories based on healthfulness. “Choose more” behaviors include fruit and vegetable frequency and size as well as physical activity frequency and duration. “Choose less” behaviors include frequency and size/duration of sweetened beverages, processed packaged snacks, fast food, and recreational screen time. The intervention focuses on these behavioral changes by targeting related theory-based psychosocial mediators, which include outcome expectations, self-efficacy, behavioral intention, habit strength, knowledge, goal setting skills, autonomy, and competence.

Effectiveness of the *Food, Health & Choices* intervention will be measured by analyzing the difference between the pre- and post-intervention assessments of BMI, %BF, and self-reported EBRB psychosocial mediators measured by the *Food, Health & Choices* Questionnaire (FHC-Q).

The current study evaluates the pre-intervention assessments from the *Food, Health & Choices* study.

Study Design

This study is a cross-sectional analysis of the anthropometric, EBRB, and psychosocial mediator measurements collected from children at the end of the fourth grade or beginning of fifth grade in participating public elementary schools in New York City. Data were collected between May 2012 and January 2013.

Institutional review board approval for the *Food, Health & Choices* study was obtained from Teachers College Columbia University (Protocol Number: 10-164CR2) and the New York City Department of Education (Protocol Number: 166). Institutional review board approval for the current study was obtained from Teachers College Columbia University (Protocol Number: 13-125).

Setting and Participants

This section describes the setting and participants of the study, including recruitment and criteria for inclusion and exclusion of schools and children.

Eligibility, Exclusion Criteria, and Enrollment of Schools

This study targets New York City public elementary schools in districts 3, 4, 5, 6, 7, and 9. Districts were chosen for two reasons: (1) because they are considered to be part of Harlem/East Harlem and the South Bronx, which are some of the highest health risk areas in New York City and (2) they are easily accessible for study staff.

Starting in Spring 2012, all 117 schools in the selected school districts were invited to participate in the *Food, Health & Choices* study via one color advertisement mailing, one phone call to the principal or assistant principal, and two emails to the principals, within the span of two weeks. The first schools to respond yes to the invitations within a one-month period (n=38) were emailed a request to schedule a time for one of the principal investigators to meet with the principal of his or her school. The first 20 schools to have a meeting with the principal investigators and agree to the terms of the *Food, Health & Choices* study were included in the final group of schools. These schools began pre-assessments followed by randomization into one of the study groups – curriculum, wellness, curriculum plus wellness, and delayed control. Intervention activities began after the pre-assessment was completed. The intervention is not relevant to this study and will not be discussed further. Table 3.2 describes the recruitment of schools and total participants for each component of the study.

Eligibility, Exclusion Criteria, and Enrollment of Participants

All students in the selected grade (fourth grade during the 2011-2012 school year and fifth grade in the 2012-2013 school year) at participating schools were invited to participate in the study (N=1471). Inclusion criteria for the individual student participants included “passive” consent from a parent/legal guardian for the anthropometric measurements and survey

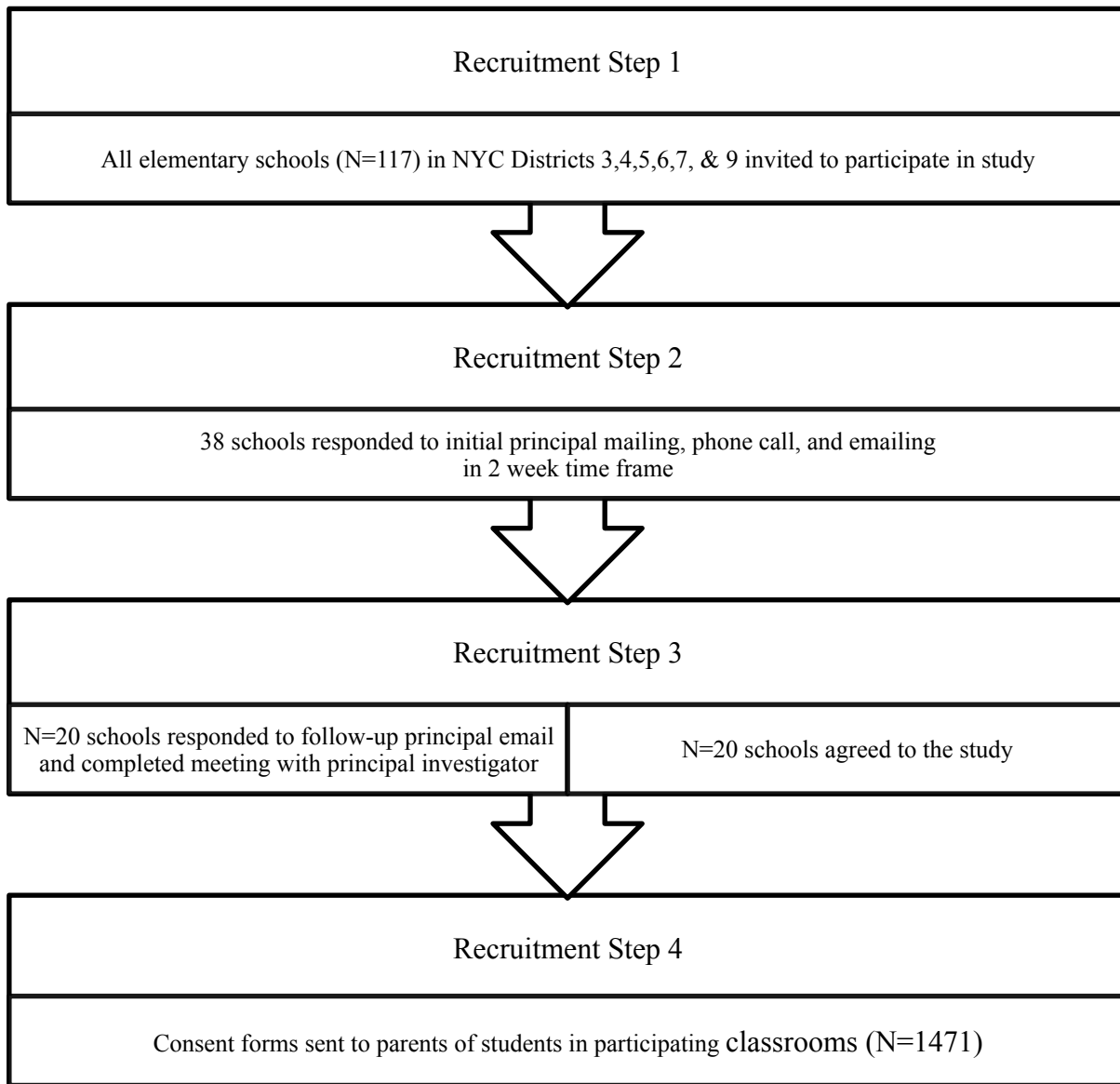
measurements. Passive consent, as opposed to active consent where parents must sign and return consent forms before study activities can take place, refers to implied consent where only those parents who wished to refuse consent for their child to participate were instructed to sign and return the consent form.

Parent passive consent forms were sent home with the children prior to data collection. If parents did not want their child's anthropometric or survey data to be used, parents were instructed to indicate this on the consent form and send it to the principal investigators of the *Food, Health & Choices* study in an attached self-addressed, stamped envelope. All returned forms that were reviewed by the principal investigator and the data specified was deleted.

Child assent was obtained from all children for all measures at the first point of data collection. Children were asked to sign an assent form if they agreed to have their anthropometric measurements taken and complete the surveys.

Exclusion criteria included any refusal of assent or consent from the participants or parents for any of the measurements.

Figure 3.1: School and Participant Recruitment



Survey Design and Description

The *Food, Health & Choices* food and activity questionnaire (FHC-Q) used in this study was designed specifically for the *Food, Health & Choices* study. The conceptualization of the survey took into account several factors. These included appeal to the target audience in content and method of delivery as well as overall cultural appropriateness and incorporation of theory-based questions from previously published studies. The most unique aspect of the survey was the use of an audience response system (ARS) for delivery as opposed to standard paper-and-pencil survey administration. The justification of ARS use in this study is located in Chapter II. The survey and procedures are described in the sections below.

Survey Conceptual Design

Previously validated surveys of food and activity behaviors in children guided the design of behavioral questions. These include: the Beverage and Snack Questionnaire (BSQ) (Neuhouser et al., 2009), the Physical Activity Questionnaire Version C (PAQ-C) (Moore et al., 2007), and the School Physical Activity and Nutrition (SPAN) questionnaire (Springer et al., 2009). These are described in Chapter II. Previously validated surveys also guided the design of questions measuring psychosocial mediators (Contento et al., 2010).

Measures

The survey for this study was designed to capture information on reported food and activity behaviors, related psychosocial variables and demographics. The survey consisted of 132 total items and was delivered via ARS using PowerPoint® slides by trained research

staff. A copy of the FHC-Q PowerPoint® slides containing the entire survey and instructions as presented to the participants can be found in Appendix A.

Energy balance related behavior measures. Measures of EBRB included: intake of fruits and vegetables, sweetened beverages, processed packaged snacks, fast foods, physical activity, and recreational screen time. Questions focused on both frequency as well as typical portion size of intake for specific items consumed in the past week. Response options for questions ranged from four to six options and were always listed in order from smallest to greatest, similar to a Likert scale. Color photographs accompanied each intake question and examples were listed for any item that could refer to a number of specific foods, drinks, or activities. Examples of behavioral questions and scales from the survey are included in Figure 3.2, Table 3.1, and Table 3.2.

Figure 3.2: Examples of FHC-Q PowerPoint® Slides (Energy Balance Related Behaviors)

The figure displays four examples of FHC-Q PowerPoint slides, arranged in a 2x2 grid. Each slide features a question, a visual aid, and a set of response options.

Slide 1 (Top Left): Question: "In the past **week** I ate...". Item: "4. bananas" with a banana image. Response options: 1A (0 times), 2B (About 1-2 times), 3C (About 3-4 times), 4D (Almost everyday), 5E (2 or more times every day).

Slide 2 (Top Right): Question: "How much did you usually drink at one time?". Item: "38. sodas, fruit drinks or iced-teas". Response options: 1A (I didn't eat this), 2B (Less than small), 3C (small), 4D (medium), 5E (large), 6F (more than large). Visual aids include icons for a glass, a can, and a bottle.

Slide 3 (Bottom Left): Question: "In the past **week** I ate...". Item: "8. candy" with a pile of various candies. Response options: 1A (0 times), 2B (About 1-2 times), 3C (About 3-4 times), 4D (Almost everyday), 5E (2 or more times every day).

Slide 4 (Bottom Right): Question: "In the past **week** I...". Item: "17. did things that got my heart beating really fast" with icons of people playing soccer, basketball, and tennis. Response options: 1A (0 times), 2B (About 1-2 times), 3C (About 3-4 times), 4D (Almost everyday), 5E (2 or more times every day).

Table 3.1: Examples of Energy Balance Related Behavior Questions

Behavior	# of Questions	Range of responses	Examples of Questions
Fruits and Vegetables			
Frequency	12	1-5*	In the past week, I ate apples.
Size	2	1-7**	In the past week, what size did you usually drink or eat? Vegetables (such as green salad, broccoli, carrots, corn, or tomatoes. DO NOT count fried potatoes or French fries)
Physical Activity			
Frequency	3	1-5*	In the past week I did things that get my heart beating really fast such as running, jumping rope, basketball, playing football, or heavy exercise in gym class.
Duration	3	1-5***	In the past week, how long did you do things like stretching, yoga, or doing chores at home.
Recreational screen time			
Frequency	2	1-5*	In the past week I sat and watched tv.
Duration	2	1-5***	In the past week, how long did you do things like sit and played video or computer games (DO NOT count Wii Fit or other fitness games).
Sweetened Beverages			
Frequency	6	1-5*	In the past week, I drank soda (such as Coke Pepsi, 7-Up, Sprite, or root beer)
Size	2	1-7**	In the past week, what size did you usually drink or eat? Sports drinks or flavored waters (such as Gatorade, PowerAde, or Vitamin water)
Processed Packaged Snacks			
Frequency	6	1-5*	In the past week I ate candy (such as chocolate, candy bars, jelly bellies, gummies, or Lifesavers)
Size	4	1-7**	In the past week, what size did you usually drink or eat? Chips and other salty snacks (such as Ruffles, Lay's Cheese nips, Chex mix, or pretzels)
Fast Food			
Frequency	3	1-5*	In the past week, I ate Q19. Fast food (such as burgers, pizza, French fries, fried chicken, or tacos)
Size	4	1-5**** OR 1-4*****	In the past week, what size did you usually have? Value menu (such as combo menu or happy meals) At fast food restaurants I had salad, apples, or fruit bowls

*Response options: 1=0 times/week, 2=about 1-2 times/week, 3=about 3-4 times/week, 4=almost every day, 5=2 or more times every day

**Response options: 1=I didn't drink this, 2=less than small, 3=small, 4=medium, 5=large, 6=more than large

***Response options: 1=Less than half an hour, 2=half an hour to 1 hour, 3=2 hours, 4=3 hours, 5=more than 3 hours

****Response options: 1=Did not have this food, 2=small, 3=medium, 4=large, 5=x-large (super size)

*****Response options: 1=Never, 2=rarely, 3=sometimes, 4=always

Table 3.2: Items Included in Energy Balance Related Behavior Scales

Scale	Individual Frequency Items	Individual Size/Duration Items
Fruits and vegetables	<ul style="list-style-type: none"> • Fruits at breakfast • Fruits at lunch • Vegetables at lunch • Vegetables at dinner 	<ul style="list-style-type: none"> • Fruits • Vegetables
Sweetened beverages	<ul style="list-style-type: none"> • Sodas • Fruit drinks • Flavored waters • Sports drinks 	<ul style="list-style-type: none"> • Sodas & fruit drinks • Sports drinks & flavored waters
Processed packaged snacks	<ul style="list-style-type: none"> • Chips • Other salty snacks • Candy • Donuts, pastries • Cookies, cakes and pies • Ice cream 	<ul style="list-style-type: none"> • Chips & other salty snacks • Candy • Donuts, pastries, cookies, & cakes • Ice cream
Physical activity	<ul style="list-style-type: none"> • Medium intensity physical activity • Vigorous physical activity 	<ul style="list-style-type: none"> • Medium intensity physical activity • Vigorous physical activity
Sedentary activity	<ul style="list-style-type: none"> • Television viewing • Video and computer games 	<ul style="list-style-type: none"> • Television viewing • Video and computer games

Psychosocial mediator measures. Psychosocial mediators were selected for inclusion in the study for their association with EBRB. This is discussed in detail in Chapter II. Selected mediators are measured in the FHC-Q. Social Cognitive Theory guided questions regarding outcome expectations, behavioral intention, goal-setting skills, knowledge, habit strength, and self-efficacy. Self-Determination Theory guided questions on competence and autonomy. Autonomy includes amotivation, autonomous motivation, and controlled motivation. Questionnaire items and scales for psychosocial mediators were based strongly

on the previously studied “EatWalk” survey (Contento et al., 2010). Theoretical framework and psychosocial mediators are described in detail in Chapter II. Examples of psychosocial mediator questions, both behavior-specific and general, from the survey are shown in Figure 3.3, Table 3.3 and Table 3.4.

Figure 3.3: Examples of FHC-Q PowerPoint Slides (Psychosocial Mediators)

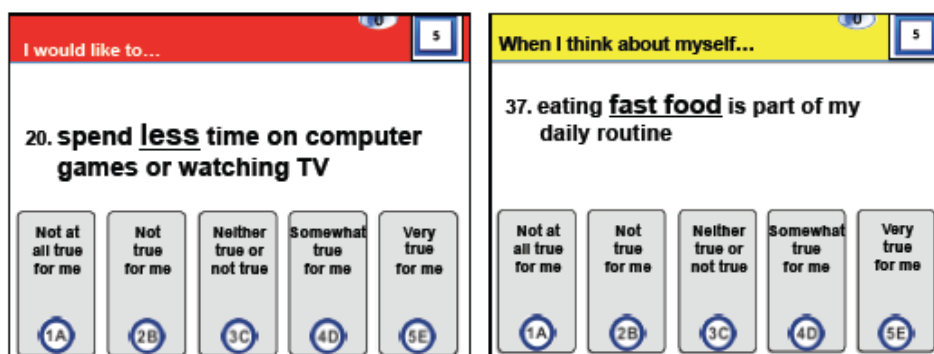


Table 3.3: Examples of General Psychosocial Mediator Questions

Mediators	# of Questions	Range of responses	Examples of Questions
Goal setting skills	4	1-5*	I believe that I can set a goal for healthy eating. I believe that when I have a goal I can follow through with it pretty well.
Autonomy	9	1-5**	The reason I would eat healthy foods is because others would be upset with me if I did not. The reason I would eat healthy foods is because I personally believe it is the best thing for my health.
Competence	3	1-5**	When I think about myself and my daily routine I am capable of eating healthy regularly. -When I think about myself and my daily routine I can keep eating healthy over the long-time.

*Response options: 1=Not at all sure, 2=a little sure, 3=neutral, 4=sure, 5=very sure

**Response Options: 1=Not at all true for me, 2=not true for me, 3=neutral, 4=somewhat true for me, 5=very true for me

Table 3.4: Examples of Behavior-Specific Psychosocial Mediator Questions

Mediator	# of Questions	Range of responses	Examples of Questions
Outcome expectations <ul style="list-style-type: none"> • Fruits and vegetables • Physical activity • Recreational screen time • Sweetened beverages • Processed packaged snacks • Fast food 	19	1-5**	Being physically active helps me do better in school. Eating fruits and vegetables makes me feel good about myself.
Self-efficacy <ul style="list-style-type: none"> • Fruits and vegetables • Physical activity • Recreational screen time • Sweetened beverages • Processed packaged snacks • Fast food 	18	1-5*	I am sure I can eat fruit at school lunch. I am sure I can participate in sports or other exercise at school.
Intention <ul style="list-style-type: none"> • Fruits and vegetables • Physical activity • Recreational screen time • Sweetened beverages • Processed packaged snacks • Fast food 	18	1-5**	I would like to eat fewer processed packaged snacks. I would like to eat more fruits and vegetables.
Habit strength <ul style="list-style-type: none"> • Fruits and vegetables • Physical activity • Recreational screen time • Sweetened beverages • Processed packaged snacks • Fast food • Breakfast • Water 	8	1-5**	When I think about myself and my daily routine, watching TV or playing video games is part of my daily routine. When I think about myself and my daily routine, drinking sweetened beverages such as soda, iced teas, and fruit drinks is part of my daily routine.
Knowledge <ul style="list-style-type: none"> • Fruits and vegetables • Physical activity • Recreational screen time • Sweetened beverages • Processed packaged snacks • Fast food • Breakfast 	8		According to experts, which size of packaged snacks such as chips, candy, and cookies would experts say is the limit per day for children your age? Response options: small, medium, large, x-large (super size) How many hours a day (at most) do experts say you can watch TV or play video games? Response options: 1,2,3,4

*Response options: 1=Not at all sure, 2=a little sure, 3=neutral, 4=sure, 5=very sure

**Response Options: 1=Not at all true for me, 2=not true for me, 3=neutral, 4=somewhat true for me, 5=very true for me

Social desirability measures. Nine questions from the modified Child Social Desirability (CSD) instrument, validated for use with dietary questionnaires in children by Baxter et al., (2004), were used to determine a social desirability score of for each participant. The score was a scale of 1-9 (0-1 per individual item all weighted equally) that could be used as a control variable in any analysis of the FHC-Q. The modified CSD is described in Chapter II. Examples of social desirability questions from the survey are shown in Table 3.5.

Table 3.5: Examples of Social Desirability Questions

Question Type	# of Questions	Examples of Questions
Social desirability scale	9	When I think about myself and my daily routine, I always listen to my parents. Response options: 1=Yes, 2=No When I think about myself and my daily routine, I sometimes feel angry when I don't get my way. Response options: 1=Yes, 2=No

Demographic Measures. Demographic information captured in the survey consisted of age, sex, and race. The demographic questions are listed in Table 3.6.

Table 3.6: Demographic Questions

Question Type	# of Questions	Examples of Questions
Demographics	3	How old are you? Response options: 9 or younger, 10, 11, 12 or older Are you a boy or girl? Response options: boy, girl What is your race? Response options: Hispanic or Latino, Black or African American, White, Asian, American Indian or Alaskan Native, Native Hawaiian or other Pacific Islander, More than one, Other

Validation of Survey Instrument

The *Food, Health & Choices* food and activity questionnaire (FHC-Q) delivered via ARS technology was tested for several indicators of validity and reliability between May and March of 2013.

Validity and Cognitive Testing

Validity was determined via assessments of content validity and criterion validity.

Content validity. Content validity was established via review by a panel of nutrition, physical activity and measurement experts from the research staff of the *Food, Health & Choices* study. The instruments were then extensively pilot-tested in schools with similar youth. Cognitive interviewing was used to improve clarity and understanding.

Criterion validity. The purpose of the criterion validity analysis was to determine how well the food and activity behavior instrument correlates with previously validated food and activity behavior measurement instrument.

Surveys used for food and activity behavior validation included the Beverage and Snack Questionnaire (BSQ), all 19 items, Physical Activity Questionnaire – C (PAQ-C), all 10 items, and a selection of 4 items from the School Physical Activity and Nutrition Questionnaire (SPAN).

Validity study. The 132-item FHC-Q was administered in 4 classrooms (another school) (n=82), followed two weeks later by in-class paper and pencil versions of validated questionnaires. See Chapter II for detailed descriptions of the BSQ, PAQ-C, and SPAN survey instruments used in the validation.

Pearson correlations assessed validity between instruments. Correlations with validated instruments were: physical activity: 0.51 ($p<.001$) recreational screen time: 0.58 ($p<.001$); fruits and vegetables: 0.36 ($p<0.01$); sweetened beverages: 0.55 ($p<.001$); processed packaged snacks: 0.60 ($p<0.001$). Though the correlation for fruits and vegetables is low, we interpret this with caution as the validating survey asked about fruits and vegetables at home and at school separately, which was slightly different from our instrument.

Table 3.7: Correlation Coefficients Between FHC-Q Scales and Validated Instruments

Scale	Validated Comparison Instrument	Correlation Coefficient	p-value
Fruits and vegetables	BSQ	0.36	<0.01
Sweetened beverages	BSQ	0.55	<0.001
Processed packaged snacks	BSQ	0.60	<0.001
Physical activity	PAQ-C	0.51	<0.001
Recreational screen time	SPAN	0.58	<0.001

Reliability of Survey Data

Reliability of survey data was assessed via two separate test-retest studies. One study assessed the test-retest reliability of the ARS-administered FHC-Q and the other assessed the test-retest reliability of the FHC-Q administered once via ARS and the second time via standard paper and pencil survey administration.

Test-retest reliability. Reliability of the instruments was assessed through a test-retest assessment in one participating school with four classes. A total of 67 students, who were at the end of their fourth grade year in school, participated in both the test and retest survey with a two-week period in between the test and retest.

Test-retest reliability study 1. New York City public school student participants ranged in age from 9-13 years, predominantly Hispanic and African American (96%), similar to the study population. The 132-item FHC-Q was administered via ARS in four classrooms (one school) twice, two weeks apart (n=62) in May 2012. Intraclass correlations assessed test-retest reliability. Behavior scales ranged from $r=.52-.85$ and psychosocial mediator scales ranged from $r=.55-.81$. Amotivation, physical activity self-efficacy, and processed packaged snack self-efficacy were slightly below $r=.5$ and should be interpreted with caution.

Test-retest reliability study 2. A second form of test-retest reliability was conducted comparing administration of the FHC-Q via ARS versus FHC-Q delivered via paper-and-pencil format. The FHC-Q was given to 92 children, once in paper and pencil format and once in ARS format in February 2013. Participants were New York City public school students similar to the study population, ranging in age from 9-12 years. The 132-item FHC-Q

was administered via ARS in four classrooms (at one school) twice, once in paper and pencil format and once in ARS format. Two classrooms received the paper and pencil format first and the other two classrooms received the ARS administration of the survey first. Surveys were completed again one week later in the format not completed first week. Intraclass correlations were $r=.53-.87$ for behaviors and $r=.52-.71$ for mediators. Results were very similar to the test-retest study of ARS versus ARS with intra-class correlations as seen in Table 3.8.

Internal consistency reliability. Reliability of the instruments was tested by comparing each response in a scale to the other responses in the corresponding scale. Internal consistency reliability was tested on the entire study sample after all data collection was completed ($N=1089$). Chronbach's alpha ranged from .556-.879 for behaviors. Fruit and vegetable size was an outlier at .292. This may be due to the low number of items in the scale, two items, and the typical lower consumption of vegetables compared to fruit by children. For psychosocial mediator scales, Chronbach's alpha ranged from .564-.796. Physical activity self-efficacy and amotivation were slightly less than .5 and should be interpreted with caution.

Table 3.8: Intraclass Correlations (ICC) for Audience Response System FHC-Q (ARS) versus ARS and ARS versus Paper-and-Pencil FHC-Q (PP) Reliability Studies of the FHC-Q

Scale	ARS vs ARS		ARS vs PP	
	ICC	p-value	ICC	p-value
Frequency				
Fruit and vegetables	0.76	<.001	0.86	<.001
Physical activity	0.70	<.001	0.54	<.001
Sweetened beverages	0.79	<.001	0.81	<.001
Processed packaged snacks	0.85	<.001	0.75	<.001
Fast food (single survey item)	N/A	N/A	N/A	N/A
Recreational screen time	0.52	<0.01	0.64	<.001
Size				
Fruit and vegetables	0.65	<.001	0.53	<.001
Physical activity	0.72	<.001	0.67	<.001
Sweetened beverages	0.70	<.001	0.78	<.001
Recreational screen time	0.68	<.001	0.75	<.001
Fast food	0.76	<.001	0.76	<.001
Recreational screen times	0.68	<.001	0.87	<.001
General Psychosocial Mediators				
Goal setting skills	0.57	<.001	0.52	<0.01
Knowledge	N/A	N/A	0.53	<.001
Competence	0.62	<.001	0.54	<.001
Autonomous motivation	0.73	<.001	0.36	<0.05
Controlled motivation	0.51	<0.01	0.69	<.001
Amotivation	0.36	<0.05	0.24	0.107
Behavior-Specific Psychosocial Mediators				
Habit strength	0.75	<.001	0.55	<.001
Behavioral intention				
Fruit and vegetables outcome expectations	0.55	<0.01	0.71	<.001
Physical activity outcome expectations	0.77	<.001	0.69	<.001
Sweetened beverages outcome expectations	0.62	<.001	0.68	<.001
Processed packaged snacks outcome expectations	0.81	<.001	0.63	<.001
Recreational screen time outcome expectations	0.62	<.001	0.67	<.001
Fruit and vegetables self-efficacy	0.57	<.001	0.57	<.001
Physical activity self-efficacy	0.41	<0.05	0.55	<.001
Sweetened beverages self-efficacy	0.56	<.01	0.44	<0.01
Processed packaged snacks self-efficacy	0.44	<0.05	0.57	<.001
Fast food self-efficacy	0.56	<0.01	0.66	<.001
Recreational screen time self-efficacy	0.64	<.001	0.73	<.001
Social Desirability Scale				
Social desirability	0.76	<.001	0.71	<.001

Table 3.9: Internal Consistency Results for Behavior and Mediator Scales

Scale	Number of Items in Scale	Cronbach's alpha N=1089
Frequency		
Fruit and vegetables	4	0.827
Physical activity	3	0.596
Sweetened beverages	4	0.668
Processed packaged snacks	6	0.879
Fast food	1	N/A
Recreational screen time	2	0.561
Size		
Fruit and vegetables	2	0.292
Physical activity	3	0.766
Sweetened beverages	2	0.556
Recreational screen time	2	0.850
Fast food	3	0.825
Recreational screen time	2	0.634
General Psychosocial Mediators		
Goal setting skills	3	0.622
Knowledge	1 per behavior	N/A
Competence	3	0.767
Autonomous motivation	3	0.734
Controlled motivation	3	0.564
Amotivation	3	0.478
Behavior-Specific Psychosocial Mediators		
Habit strength	8	0.663
Fruit and vegetables outcome expectations	3	0.665
Physical activity outcome expectations	3	0.640
Sweetened beverages outcome expectations	3	0.719
Processed packaged snacks outcome expectations	3	0.704
Recreational screen time outcome expectations	3	0.796
Fruit and vegetables self-efficacy	3	0.710
Physical activity self-efficacy	3	0.466
Sweetened beverages self-efficacy	3	0.695
Processed packaged snacks self-efficacy	3	0.791
Fast food self-efficacy	3	0.761
Recreational screen time self-efficacy	3	0.668

Social Desirability

The FHC-Q instrument used a 9-item social desirability scale modified from the 13-item Children's Social Desirability (CSD) scale instrument described in detail in Chapter 2 and validated in a similar population for use in dietary survey measurement to this study by Baxter and colleagues (2004). Four items were dropped from the CSD for the purposes of this study due to repetitiveness of the CSD question content and consideration of time to complete the FHC-Q.

In a test of the ARS-administered FHC-Q versus the paper-and-pencil FHC-Q, children scored higher on the 9-item modified CSD scale (0=not socially desirable to 9=most socially desirable) when responding on the paper-and-pencil version (ARS social desirability mean=4.08(2.1) and paper-and-pencil mean=5.10(2.3)). This difference was significant at the $p<.001$ level in an paired samples t-test.

Summary of Survey Instrument Validation

Correlations with validated instruments were: physical activity: 0.51 ($p<.001$) recreational screen time: 0.58 ($p<.001$); fruits and vegetables: 0.36 ($p<0.01$); sweetened beverages: 0.55 ($p<.001$); processed packaged snacks: 0.60 ($p<0.001$). Test-retest reliability intraclass correlations for behavior scales .52-.85 and .55-.81 for mediator scales, though amotivation, physical activity self-efficacy and processed packaged snack self-efficacy were slightly below .5. Data were very similar in the test of ARS versus paper and pencil ($r=.53-.87$ for behaviors and $r=.52-.71$ for mediators) showing no difference in response based on method of administration. Internal consistency data from the entire sample revealed

Chronbach's alpha ranged from .556-.879 for behaviors, with fruits/vegetables lower at .292. Chronbach's alpha ranged from .564-.796 for mediators, with physical activity self-efficacy and amotivation slightly less than .5. Additionally, socially desirable response bias, as determined by the modified CSD scale, was significantly lower in survey administration via ARS.

The FHC-Q instrument has acceptable validity and reliability for collecting data on its selected food and activity behaviors as well as psychosocial variables in urban upper elementary children.

Data Collection Procedures

All student measures were collected prior to the *Food, Health & Choices* intervention using standardized protocols described below. For all data, students were assigned a numeric identifier code for data entry and analysis. All data was de-identified and stored on password-protected computers or in locked filing cabinets in the principal investigator's office. The name-code translator was kept separate from the original source documents and computer files. All data were collected by research assistants supervised by an experienced research data manager.

FHC-Q Data Collection Procedure

During the pilot phase of the *Food, Health & Choices* study, a paper-and-pencil survey administration method was used. Researchers noticed many students rushed through the questions, missed questions, and seemed bored with the process. Researchers then converted the survey to PowerPoint® slides, one question per slide, and responses could be

captured via Meridia® audience response system (ARS) software. Using this system, individual wireless “clickers” for each student. The pilot phase of the ARS system was successful in making sure students heard and/or read the question and responses in a given time frame, engaging the students in the survey process. Teachers, students, and school administrators seemed pleased with this technological innovation for conducting the survey.

The survey instrument was broken up into part 1a, part 1b, part 2a and part 2b so that students could have short breaks in between sections and for purposes of data management. Each part, including 1a and 1b, 2a, and 2b, was between 28 and 38 questions, for a total of 132 questions. Together, the four parts of the survey took two class periods to complete. Surveys were always given in the same order: part 1a, part 1b, part 2a, part 2b. Researchers made sure to schedule a break in between each part in order to reduce survey fatigue.

Survey questions were grouped together based on topic. All questions on fruits and vegetables, for example, were grouped together and included both behavior questions as well as fruit and vegetable-specific psychosocial mediator questions. The first survey included all questions related to fruits and vegetables, physical activity, and recreational screen times as well as general questions on goal-setting skills and social desirability. The second survey included all questions related to sweetened beverages, processed packaged snacks, and fast foods as well as general questions on autonomy, competence, and demographic information.

All attempts were made to schedule the surveys at the end of the participants’ fourth grade year of school. Due to time constraints, some surveys were scheduled for the beginning of the participants’ fifth grade year. When part 1 and part 2 were not completed on the same day, they were completed on consecutive days.

Pairs of trained staff visited each participating class to administer the ARS survey. Instructions and survey questions were read aloud to each class of students by one research assistant following a standardized protocol and prompted by a PowerPoint® slideshow. The second research assistant managed the computer to change the slide for each question, start the countdown clock for each response period and trouble-shoot in the case of technical difficulties with the ARS.

Anthropometric Data Collection Procedure

Anthropometric data collected consist of height, weight and body composition in terms of fat mass and fat-free mass. BMI and %BF were calculated from these measurements.

Students' heights, weights, and percent body fat were measured using procedures described below, based on the National Institutes of Health Manual of Procedures for Height and Weight Measurements (National Institutes of Health, 2007). Research data collection staff were trained during a one-day professional development session prior to the assessments. Data collection teams were managed by senior research staff.

Height and weight data were collected in a private space designated in each school on a pre-planned data collection day chosen by the school administrators and staff within the assessment time frame. All anthropometric measurements for a child were collected on the same day. Two stations with both height and weight were set up and a research assistant would escort students in small groups from class to the data collection location and back. Height and weight measurements took no more than ten minutes total per student. All anthropometric measurements for one school were done on either one or two consecutive days, early in the morning, and before lunch when possible.

Height was measured using a portable stadiometer (Seca stadiometer model 213) using standardized procedures for set-up and proper measurement technique. Measurements were repeated twice, or until there were two measures for height that were within 0.1 centimeter of each other. The average of the two measures was used as the final height data point.

Weight and percent body fat were measured using a Tanita SC-331S body composition analyzer, calibrated according to manufacturer's instructions. The children were instructed to stand on the center of the device, which looks like a digital scale, with shoes, socks, and heavy clothing (sweaters and sweatshirts) removed. Measurements were repeated twice, or until there were two measures for weight that were within 0.1 kilogram of each other. The average of the two measures was used as the final weight data point. Bioelectrical impedance on the Tanita measured fat mass and fat-free mass, from which body fat percentage was calculated as fat mass divided by fat mass plus fat free mass (Tanita Corporation, 2009).

Body mass index was calculated from the average of two height and weight measurements, within 0.1 cm and 0.1 kg respectively, as weight in kilograms divided by height in centimeters squared. Body mass index percentile was obtained from the calculation of body mass index plotted on the CDC BMI-for-age growth chart for the appropriate sex. These calculations were based on the Center for Disease Control body mass index for age growth charts for boys and girls (CDC, 2000). Appendix B, "Anthropometric Measurement Manual" describes the anthropometric measurement processes in greater detail.

Data Analysis

This section describes all analyses used to answer each research question. All data analyses were run using SPSS Version 20 and unless otherwise noted, missing cases were deleted pairwise per individual analysis. Excluded from the analyses were students whose cognitive understanding of the survey was limited, such as special education students or those with noted extreme poor behavior in the classroom during survey administration (N=67) and those refusing consent (N=18).

Analysis of Demographics

Descriptive statistics, including means, standard deviations and percentages, were used to describe the age, sex and race of the participating children. Percentage of students receiving free or reduced price lunch, number of participating classes, average class size, school race distribution, and 4th grade English Language Arts passing rates (% proficient) are also described for each school. These analyses utilized school-level data from the Department of Education, individual data based on classroom roster, and self-reported data from the FHC-Q.

Analysis of Research Question 1: What is the Association Between Body Mass Index Percentile for Age (BMI) and Percent Body Fat (%BF)?

Data analysis for this research question utilized data for all participants in the *Food, Health & Choices* program who completed the anthropometric measurements (N=1090). Body mass index percentile was categorized into underweight (< 5th percentile), normal weight (5th to 84.9th percentile), overweight (85th to 94.9th percentile), and obese (> 95th percentile) as indicated by Centers for Disease Control BMI reference curves for children (CDC, 2000). Data were removed for two male and two female outliers identified using Tukey's procedure.

The variable of BMI for children was not evenly or normally distributed. Therefore, BMI was transformed into a rank order variable with one being the lowest value. This was calculated separately and combined for boys and girls and the respective rank was used in the appropriate statistical tests. This variable will be referred to as “BMI rank.” For all analyses, except descriptive analyses, BMI rank was used in place of BMI.

Research Question 1a: What is the correlation between BMI and %BF? Percent body fat means, standard deviations and ranges were described for each category of BMI and separate analyses were done for boys and girls by year of age. Pearson correlations were calculated to examine the relationship between BMI and %BF.

Research Question 1b: What is the range of %BF for each weight category as defined by BMI: underweight, normal weight, overweight and obese (CDC, 2000)?

Descriptive statistics were used to determine the range of %BF for each BMI. %BF percentiles are also presented for each age and sex for comparison to available data.

Analysis of Research Question 2: What Are The Associations Among Energy Balance Related Behaviors (EBRB), BMI, %BF, and Psychosocial Mediators?

Scales of behavioral frequency or duration consisted of one to six questions. For example, the physical activity frequency includes two measures of physical activity frequency (medium-intensity activity and heavy activity). Scales were recoded to daily values and actual measurements, if possible, from original responses as indicated in Table 3.10.

Table 3.10: Recoded Values for FHC-Q Response Options

FHC-Q Option Number	Frequency question scales	Recoded value
1	0 times/week	<i>0 times/day</i>
2	1-2 times/week	<i>0.21 times/day</i>
3	3-4 times/week	<i>0.5 times/day</i>
4	Almost everyday	<i>0.86 times/day</i>
5	2 or more times/day (not applicable for fruit and vegetables at meals questions)	<i>2.0 times/day</i>
FHC-Q Option Number	Activity item duration scales	Recoded value
1	Less than half an hour	<i>15 minutes</i>
2	30 min to 1 hour	<i>45 minutes</i>
3	About 2 hours	<i>120 minutes</i>
4	About 3 hours	<i>180 minutes</i>
5	More than 3 hours	<i>210 minutes</i>
FHC-Q Option Number	Fruits and vegetables item size scales	Recoded value
1	I didn't eat this	<i>0 cups</i>
2	Less than small	<i>0.125 cup</i>
3	Small	<i>0.25 cup</i>
4	Medium	<i>0.5 cup</i>
5	Large	<i>1 cup</i>
6	More than large	<i>1.25 cups</i>
FHC-Q Option Number	Sweetened beverage item size scales	Recoded value
1	I didn't eat this	<i>0 ounces</i>
2	Less than small	<i>4 ounces</i>
3	Small	<i>8 ounces</i>
4	Medium	<i>12 ounces</i>
5	Large	<i>20 ounces</i>
6	More than large	<i>24 ounces</i>

2a. To what extent are EBRB associated with BMI and %BF? Pearson correlations for each EBRB with BMI rank and %BF were analyzed, controlling for social desirability, race, socioeconomic status, and reading level.

2b. How do EBRB differ with BMI and %BF? ANCOVA was run for each analysis, with social desirability, race, socioeconomic status, and reading level as covariates, to determine whether means differed by weight status based on BMI (normal weight versus above normal weight for boys and girls). The same was done for differences in weight status based on %BF. The value of the 75th percentile from the NHANES reference sample was used as a cut point for body fat percentage comparable to the normal weight versus overweigh/obese cut point for BMI (Lamb, Ogden, Carroll, Lacher, & Flegal, 2011).

2c. To what extent are EBRB associated with each other? Pearson correlations, controlling for social desirability, race, socioeconomic status, and reading level were analyzed for each EBRB scale with the each other EBRB scale.

Analysis of Research Question 3: What are the Associations Among Psychosocial Variables, EBRB, BMI, and %BF?

Scales of psychosocial mediators consisted of one to four questions. For all analyses of psychosocial mediators, items were coded so higher scores indicate selection of the more desirable, healthier, options (higher score indicates a healthier response). Items for the behavior specific mediators including outcome expectations, self-efficacy and intentions were grouped and scored via a scale consisting of three to six questionnaire items. For example, the goal setting skills mediator scale includes three different measures of goal setting skills (tracking food intake, setting a goal for healthy eating, and sticking to a goal for healthy eating).

3a. Which psychosocial variables are most predictive of EBRB? Regression analyses, controlling for sex and social desirability, race, socioeconomic status, and reading level, were performed for each ERBB frequency scale with related psychosocial mediators.

3b. How do psychosocial variables differ with BMI and %BF? Psychosocial mediators were analyzed by BMI and BF. ANCOVA was run for each analysis as described for Research Question 2b.

Summary

This concludes the methods of this cross sectional analysis of weight status, EBRB, and psychosocial mediators. The next chapter describes the results of the study.

Chapter IV

RESULTS

This chapter describes the results from the cross-sectional analysis of the baseline anthropometric and survey measurements from the *Food, Health & Choices* study. Results are described by research question. Tables are color-coded so that any analyses for boys are in dark gray, girls in light gray, and both in white.

Review of Research Questions

1. What is the association between body mass index percentile for age (BMI) and percent body fat (%BF)?
 - 1a. What is the correlation between BMI and %BF?
 - 1b. What is the range of %BF for each weight category as defined by BMI: underweight, normal weight, overweight, and obese (CDC, 2000)?
2. What are the associations among energy balance related behaviors (EBRB), BMI, and %BF?
 - 2a. To what extent are EBRB associated with BMI and %BF?
 - 2b. How do EBRB differ with BMI and %BF?
 - 2c. To what extent are EBRB associated with each other?
3. What are the associations among psychosocial mediators, EBRB, BMI, and %BF?
 - 3a. Which psychosocial mediators are most predictive of EBRB?
 - 3b. How do psychosocial mediators differ with BMI and %BF?

Population Description

The population ranged in age from 9-13, with the majority of children 10 years old (mean 10.6 years). Children were almost evenly split by sex (50.6% boys). Based on school-level data, 85.3% of students were eligible for free or reduced price lunch and 33.9% of students scored at or above proficient level on the fourth grade English Language Arts test at participating schools in the previous year (Table 4.1).

Participants were mostly Black and Hispanic according to school level data (32.1% Black and 59.0% Hispanic) (Table 4.2). Self-reported data on race showed lower percentages for race (10.6% Black and 29.7% Hispanic). It was noted that students had a very difficult time understanding the questionnaire item regarding race and many chose “More than one” or “Other” if they were unsure of the other options. Analyses using individual race/ethnicity data cannot be run because of confusion associated with the question during the administration of the surveys.

Study Flow

A total of 20 New York City Public elementary schools participated in the *Food, Health & Choices* study. Student participants (N=1382) were 5th graders during the 2012-2013 school year. Excluded from the analyses were students whose cognitive understanding of the survey was limited, such as special education students or those from classes with noted extreme poor behavior in the classroom during survey administration (n=68). Since Part 1 and Part 2 of the FHC-Q as well as the anthropometric measurements were all done on separate days, 1090 students completed anthropometric measurements, 1089 completed any part of the survey data (939 completed any of Part 1, 1011 completed any of Part 2 and 771 completed any of both

surveys). Complete sets of all study measurements, anthropometric and survey, were matched for 651 students. Figure 4.1 describes the sample size per specific measurement or measurement grouping.

Figure 4.1: Sample Size by Measurement

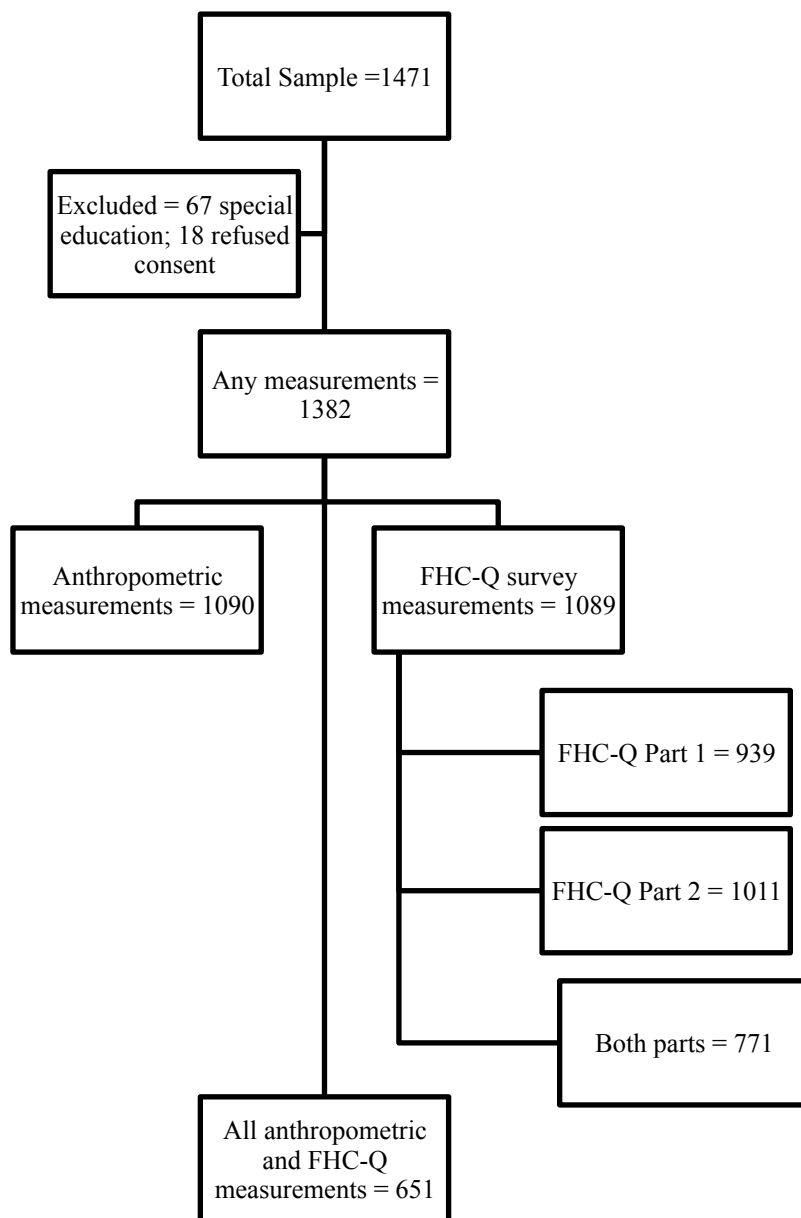


Table 4.1: School-Level Student Characteristics

School	4 th Grade Classes	4 th Grade Enrollment	% Eligible for free or reduced-price lunch	% African American	% Hispanic	% Asian	% White	% 4th grade students at or above proficient level in English Language Arts
1	4	96	35	14	26	9	51	62
2	1	46	55	9	63	4	23	53
3	3	58	62	26	49	3	23	41
4	1	47	78	29	57	4	10	32
5	3	74	81	68	28	1	3	19
6	3	43	85	51	44	0	4	32
7	2	29	85	57	36	4	3	8
8	5	131	88	46	53	0	0	18
9	4	102	89	27	67	4	2	62
10	2	45	90	81	17	0	1	11
11	4	124	92	32	66	1	0	58
12	2	75	92	30	65	2	3	29
13	4	120	93	1	97	1	1	29
14	2	51	94	73	23	3	1	42
15	2	50	96	8	90	0	1	28
16	3	89	97	4	95	0	1	27
17	5	96	98	22	77	1	0	34
18	3	59	97	21	72	3	3	21
19	4	43	99	30	67	2	1	39
20	9	146	99	13	87	0	0	32
Mean	3.3	76.2	85.3	32.1	59.0	2.1	6.6	33.9

Results for Research Question 1a: What is The Correlation Between BMI and %BF?

45.4% of the children in the study are classified as overweight or obese by BMI. Frequency and percent of children in each weight category are described in Table 4.2. The average body fat percentage for children was 24.7% (SD 9.2%). Percent body fat percentiles by sex and age in years for the participants are presented in Table 4.3, which also includes nationally representative %BF percentiles from Laurson et al., (2011), though caution must be taken when comparing as the nationally representative reference data is based on triceps skinfold measurements as opposed to BIA, which this study uses to measure %BF. The data in our population are the same or higher than the nationally representative data at every percentile listed except for the 98th percentiles for boys (ages 9, 10, and 11) and girls (age 10) as well as 11-year old boys in the 95th percentile.

A high correlation between BMI and %BF was observed as shown in Table 4.4. The correlation is slightly higher for girls (.913 $p < .001$ for boys and .955 $p < .001$ for girls). When separated by weight status category in Table 4.5, correlations within the categories of overweight, and obese, correlations were not as strong and were lowest in the overweight category (.431 $p < .001$ for boys and .652 $p < .001$ for girls). The correlations between BMI and %BF were not significant in the underweight category for boys and girls. However, the sample size was very small for the underweight portion of the population (3.3% of boys and 3.9% of girls).

Figures 4.2 and 4.3 show the relationship between BMI and %BF before transforming BMI into the BMI rank variable. The clustering of cases at the higher end of BMI and the dramatic change in slope of the graphs at the higher end of BMI should be noticed.

Table 4.2: Weight Status Categorization by Body Mass Index Percentile-for-age (CDC 2000)

Weight Category	BMI Percentile for age	Boys		Girls		Total	
		Freq.	%	Freq.	%	Freq.	%
Underweight	<5 th	18	3.3	21	3.9	39	3.6
Normal weight	5-84.9 th	262	47.9	294	54.1	556	51.0
Overweight	85-94.9 th	113	20.7	108	19.9	221	20.3
Obese	>95 th	154	28.2	120	22.1	274	25.1
Total		547		543		1090	

Table 4.3: Descriptive Statistics: Percent Body Fat Percentiles by Age and Sex Compared to Nationally Representative Sample from NHANES (Laurson et al., 2011)

Sex	Age	N	Mean (SD)	Percentiles									
				2nd	5th	10th	25th	50th	75th	85th	90th	95th	98th
Boys	9	54	22.5 (9.4)	10.1	10.5	12.3	15.6	20.1	28.8	33.7	39.2	42.3	45.6
			<i>NHANES sample</i>	<i>8.1</i>	<i>9.2</i>	<i>10.4</i>	<i>12.9</i>	<i>16.8</i>	<i>22.5</i>	<i>26.6</i>	<i>30.1</i>	<i>36.4</i>	<i>46.0</i>
	10	342	23.8 (9.0)	10.4	12.3	13.0	16.1	23.1	30.6	34.2	36.8	40.4	44.6
			<i>NHANES sample</i>	<i>8.3</i>	<i>9.5</i>	<i>10.8</i>	<i>13.7</i>	<i>18.0</i>	<i>24.5</i>	<i>29.2</i>	<i>33.2</i>	<i>40.4</i>	<i>51.2</i>
	11	96	22.2 (9.5)	8.9	11.1	11.6	14.0	20.9	27.3	32.8	38.0	40.7	47.2
			<i>NHANES sample</i>	<i>8.2</i>	<i>9.5</i>	<i>10.9</i>	<i>14.0</i>	<i>18.8</i>	<i>25.8</i>	<i>31.0</i>	<i>35.4</i>	<i>43.3</i>	<i>55.1</i>
Girls	9	71	26.2 (9.3)	11.7	13.0	13.8	18.2	25.4	32.1	37.0	40.3	42.8	48.0
			<i>NHANES sample</i>	<i>10.4</i>	<i>11.7</i>	<i>13.0</i>	<i>15.6</i>	<i>19.4</i>	<i>24.5</i>	<i>28.0</i>	<i>30.8</i>	<i>35.6</i>	<i>42.3</i>
	10	360	26.0 (8.6)	9.9	12.4	15.4	19.4	25.0	31.6	36.7	38.2	40.8	43.7
			<i>NHANES sample</i>	<i>11.0</i>	<i>12.4</i>	<i>13.8</i>	<i>16.7</i>	<i>20.8</i>	<i>26.4</i>	<i>30.1</i>	<i>33.0</i>	<i>37.9</i>	<i>44.7</i>
	11	80	26.6 (9.9)	12.9	14.5	15.1	17.7	24.8	32.3	38.7	40.7	47.5	50.9
			<i>NHANES sample</i>	<i>11.5</i>	<i>13.0</i>	<i>14.5</i>	<i>17.6</i>	<i>22.0</i>	<i>27.8</i>	<i>31.6</i>	<i>34.5</i>	<i>39.4</i>	<i>46.0</i>

Figure 4.2: Boys: Percent Body Fat by BMI Percentile for Age

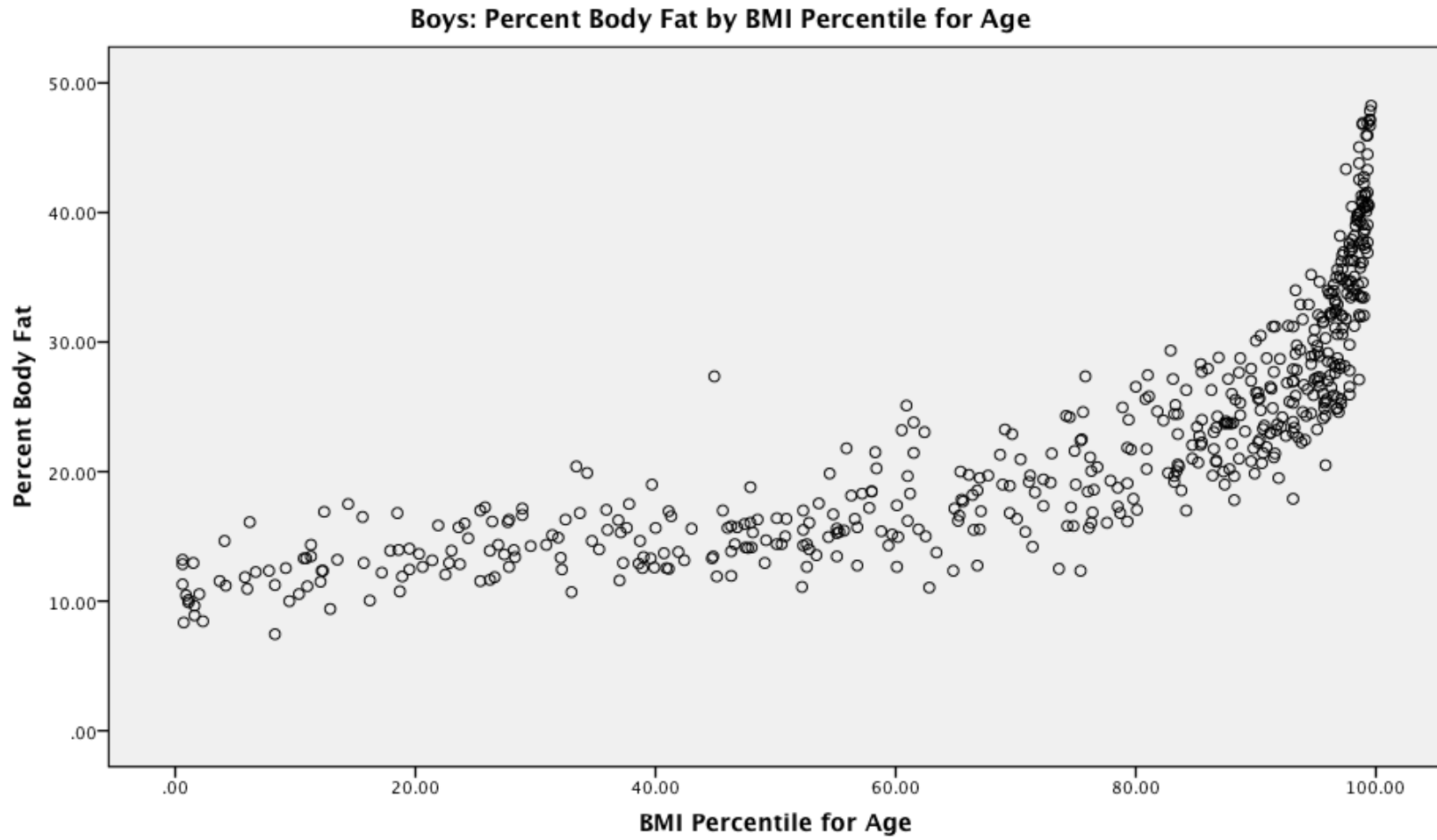


Figure 4.3: Girls: Percent Body Fat by BMI Percentile for Age

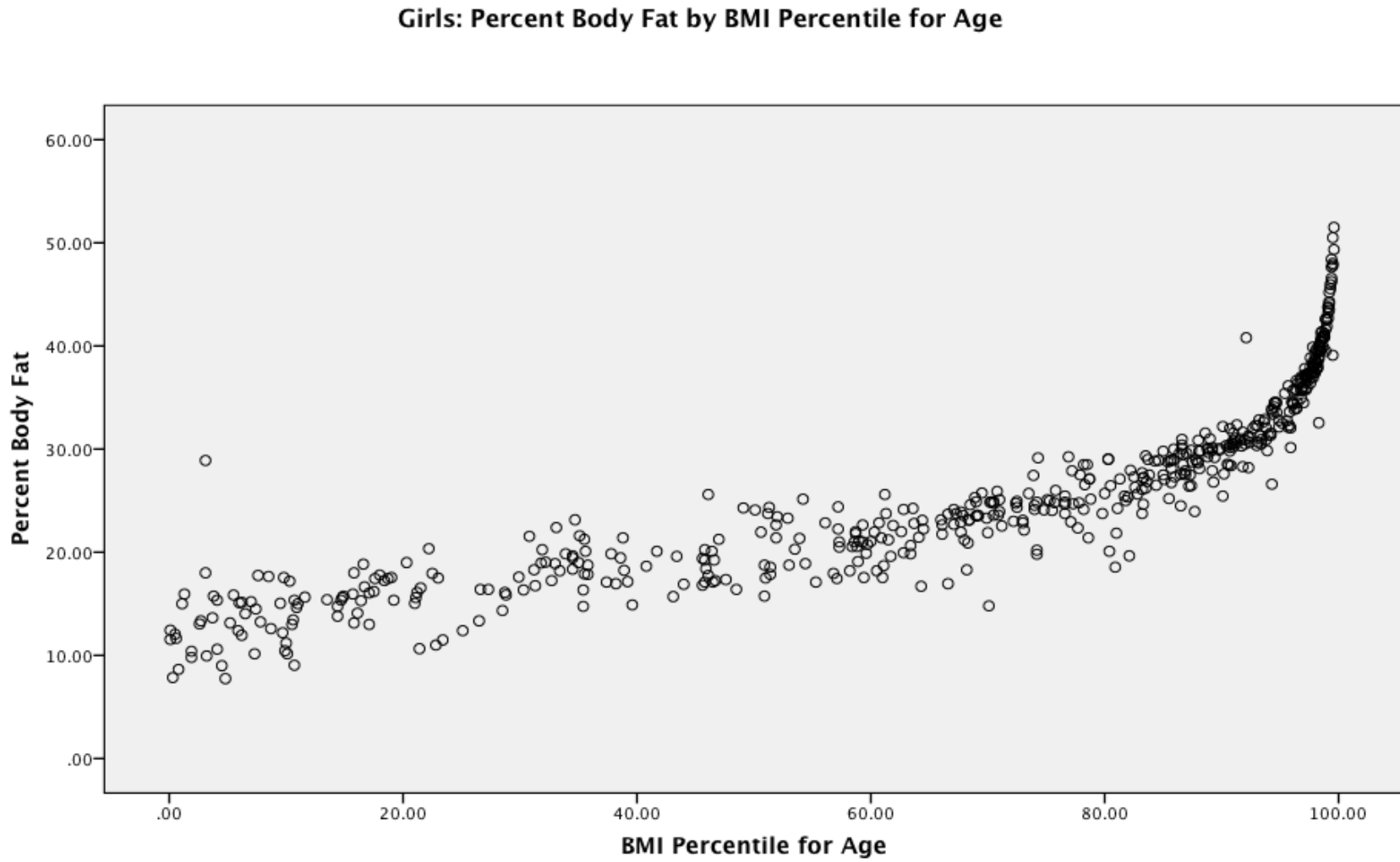


Table 4.4: BMI Percentile for Age and Percent Body Fat Correlations

		Boys	Girls	Both
		BMI	BMI	BMI
Boys %BF	Correlation coefficient	.913*		
	Sig. (2-tailed)	<.001		
	N	547		
Girls %BF	Correlation coefficient		.955*	
	Sig. (2-tailed)		<.001	
	N		543	
Total Sample %BF	Correlation coefficient			.915*
	Sig. (2-tailed)			<.001
	N			1090

*Significant at the 0.001 level (2-tailed)

Table 4.5: BMI Percentile for Age and Percent Body Fat Correlations by BMI Weight Status Category

Sex	Weight Status Category	BMI Percentile	N	Correlation with %BF	p-value
Boys	Underweight	<5 th	18	-.013	.963
	Normal Weight	5-84.99	262	.694*	<0.001
	Overweight	85-94.99	113	.431*	<0.001
	Obese	>95 th	154	.777*	<0.001
Girls	Underweight	<5 th	21	.104	.653
	Normal Weight	5-84.99	294	.852*	<0.001
	Overweight	85-94.99	108	.652*	<0.001
	Obese	>95 th	120	.901*	<0.001

*Significant at the 0.001 level (2-tailed)

Results for Research Question 1b: What is the Range of %BF for Each Weight Category as Defined by BMI: Underweight, Normal Weight, Overweight, and Obese (CDC, 2000)?

Figure 4.4 shows a graphical representation of the overlap in ranges of %BF for each weight status category for both boys and girls. The overlapped is more evident in boys. Table 4.6 describes the overlap in more detail. Percent body fat in boys ranged from 7.7%-48.3% and girls, 7.6%-51.5%. Excluding underweight children, differences between the minimum and maximum %BF (maximum %BF – minimum %BF within a category) ranged from 17.4-27.8 for boys and 16.9-21.4 for girls.

Table 4.7 compares of %BF and BMI group classifications. %BF group classification was defined as 1<75th percentile based on NHANES %BF by sex and year of age and 2≥75th percentile (Lamb et al., 2011). The cut point we used for analyses was based on the highest quality nationally representative data within the age group of our participants. This cut point, the 75th percentile, was based on the NHANES %BF reference sample (same data as Table 4.3) for children 8 to 19 years (Lamb et al., 2011). BMI classification was defined as 1=normal weight and 2=overweight/obese (CDC, 2000). Underweight children were not included. In boys, difference in classification was mostly due to %BF classifying cases lower than BMI (11.5%, 2.5% higher) and for girls, %BF classified cases mostly higher than BMI (5.7% higher, 1.1% lower).

Figure 4.4: Percent Body Fat by BMI Weight Status Categories

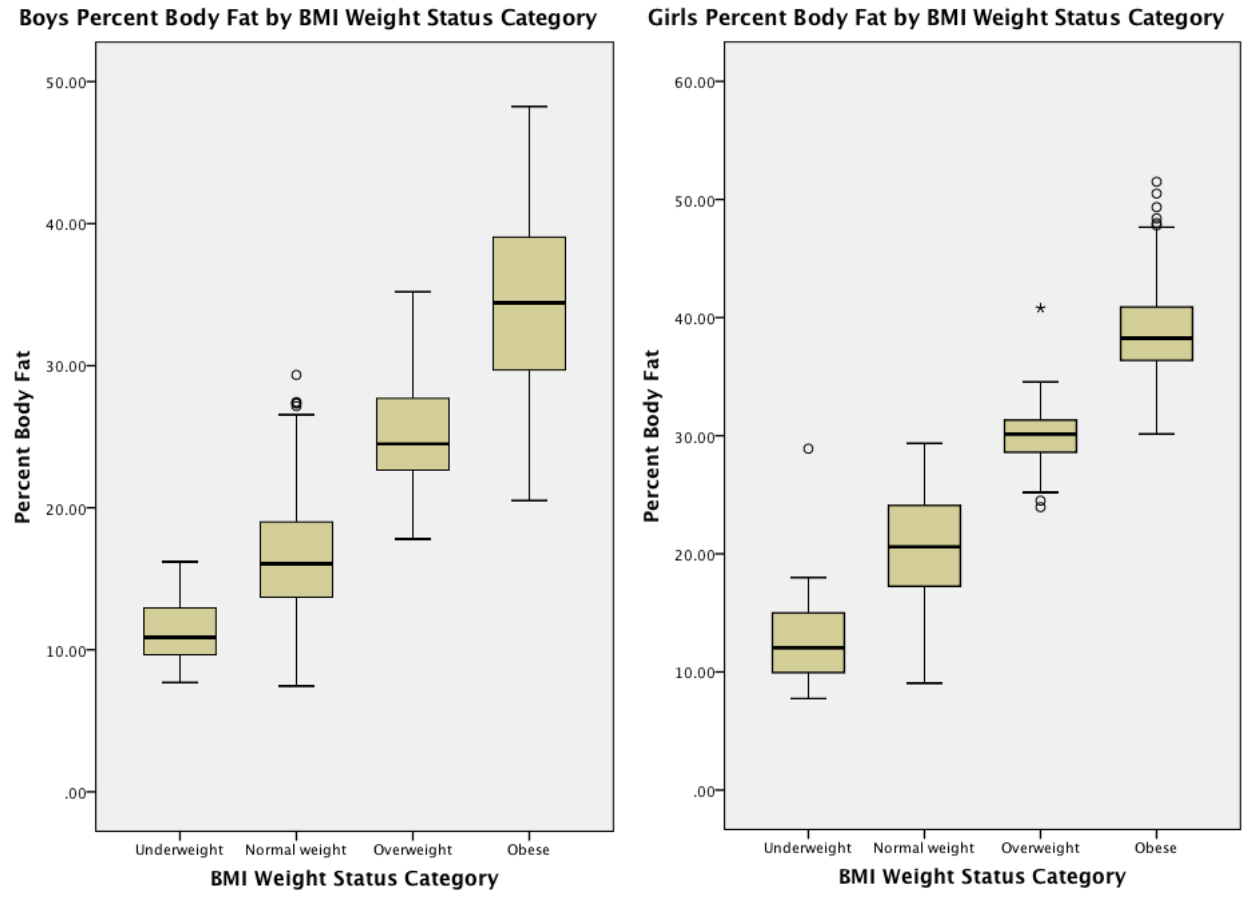


Table 4.6: Percent Body Fat Range by BMI Weight Status Categories

Sex	Weight Status Category	BMI Percentile for age	N	Mean %BF (SD)	Percent Body Fat		<i>Difference Max (-) Min</i>
					Min	Max	
Boys	Underweight	<5th	18	11.3 (2.4)	7.7	16.2	8.5
	Normal Weight	5-84.99	262	16.7 (4.0)	7.5	29.4	21.9
	Overweight	85-94.99	113	25.2 (3.6)	17.8	35.2	17.4
	Obese	>95th	154	34.5 (6.2)	20.5	48.3	27.8
Girls	Underweight	<5th	21	12.9 (4.6)	7.6	28.9	21.2
	Normal Weight	5-84.99	294	20.5 (4.5)	9.1	29.4	20.3
	Overweight	85-94.99	108	30.1 (2.4)	24.0	40.8	16.9
	Obese	>95th	120	38.9 (4.1)	30.2	51.5	21.4

Table 4.7: Comparison of Percent Body Fat Health Risk Group (Lamb et al., 2011) with Overweight/Obese BMI Group (CDC, 2000)

		<75th percentile %BF	>75th percentile %BF
Boys	Normal BMI	47.1%	2.5%
	Overweight/Obese BMI	11.5%	38.9%
Girls	Normal BMI	50.6%	5.7%
	Overweight/Obese BMI	1.1%	42.5%
Total	Normal BMI	48.8%	4.1%
	Overweight/Obese BMI	6.4%	40.7%

Note: Underweight children not included

Results for Research Question 2a: To What Extent are EBRB Associated with BMI and %BF?

Table 4.8 illustrates the EBRB of the participants in the study and compares this to recommendations from the Dietary Guidelines for Americans (2012), American Academy of Pediatrics (2001), and USDHHS Physical Activity Guidelines for Americans (2008), described in detail in Chapter II. All means were adjusted for social desirability, socioeconomic status, race, and reading level. Consumption of processed packaged snacks and sweetened beverages is very high while consumption of fruits and vegetables is very low. Frequency and duration of physical activity and recreational screen time is very high. Neither normal weight nor overweight/obese children were near meeting recommendations, besides that for physical activity. Tables 4.9 and 4.10 describe the responses from all participants per EBRB individual questions.

Tables 4.11 and 4.12 show correlations of EBRB with BMI and %BF for boys and girls, respectively. Unexpected inverse correlations were observed for processed packaged snack frequency in boys and girls (also size for boys) and sweetened beverage size (boys only), though these were all less than $r=.17$. Table 4.13 shows the regression analysis with dependent variable BMI and all behaviors, controlling for gender, social desirability, and all other behaviors. Processed packaged snack frequency, physical activity duration, and sweetened beverage size were significant predictors of BMI. However, this model only accounted for 4% of the variation in BMI. Table 4.14 shows the regression analysis with dependent variable %BF and all behaviors, controlling for gender, social desirability, and all other behaviors. Processed packaged snack frequency and physical activity duration were significant

predictors of %BF, though the model only accounted for 6% of the variation in %BF. Gender was a significant predictor in this model as well.

Table 4.8: Descriptive Statistics for Energy Balance Related Behavior[†] Frequency and Duration Combined Compared to Recommendations

	Fruits and vegetables	Physical activity	Sweetened beverages	Processed packaged snacks	Fast food	Rec. screen time
All Participants (N=710): Mean Consumption Frequency of Added Scale Items	1.3 +/- .9 times/day	1.0 +/- 0.7 times/day	2.6 +/- 2.1 times/day	4.4 +/- 3.6 times/day	.80 +/- .80 times/day	2.1 +/- 1.3 times/day
All Participants (N=710): Size/Duration Mean	.7 +/- .4 cups	127 +/- 78 minutes	11.6 +/- 7.0 ounces	“Medium” (Response option mean = 3.9 +/- 1.4)	“Medium” (Response option mean = 3.8 +/- 1.4)	125 +/- 72 minutes
All Participants (N=710): Combined Mean Freq./Size Per Day	.8 cups/day	130 minutes/day	30.0 ounces/day	4.3 medium snacks/day	1.6 medium items/day (if freq. = 2 items/visit)	257 minutes/day
Normal Weight (N=385): Combined Mean Freq./Size Per Day	.9 cups/day	125 minutes/day	33.4 ounces/day	4.8 medium snacks/day	1.8 medium items/day (if freq. = 2 items/visit)	278 minutes/day
Overweight/Obese (N=325): Combined Mean Freq./Size Per Day	.8 cups/day	132 minutes/day	27.3 ounces/day	3.9 medium snacks/day	1.4 medium items/day (if freq. = 2 items/visit)	237 minutes/day
<i>Recommendations^a</i>	<i>4 cups/day</i>	<i>> 60 minutes/day</i>	<i>< 8 ounces/day</i>	<i>< 1 small item/day</i>	<i>< 1 small item/day</i>	<i>< 60-120 minutes/day</i>

^aRecommendation based on Dietary Guidelines for Americans (2010), American Academy of Pediatrics (2001), & USDHHS Physical Activity Guidelines for Americans (2008)

[†]Adjusted for social desirability, socioeconomic status, race, and reading level

Table 4.9: Descriptive Statistics for Energy Balance Related Behavior Frequency Individual Items

	N	0 times/day (0 times per week)	.21 times/day (about 1-2 times per week)	.50 times/day (about 3-4 times per week)	.86 times/day (Almost everyday)	2 times/day (2 or more times everyday)
(Original Response Options)						
Fruit at breakfast	874	45%	23%	11%	21%	Option not applicable
Fruit at lunch	875	21%	27%	16%	36%	Option not applicable
Vegetables at lunch	855	45%	28%	11%	16%	Option not applicable
Vegetables at dinner	884	33%	26%	16%	25%	Option not applicable
Vigorous intensity physical activity	895	10%	19%	14%	22%	36%
Fruit drinks and sweetened iced teas	937	8%	19%	17%	20%	36%
Sodas	947	25%	26%	14%	14%	21%
Sports drinks	962	39%	18%	9%	13%	22%
Flavored water	953	53%	16%	8%	8%	14%
Chips	944	14%	24%	15%	16%	31%
Other salty snacks	981	39%	27%	11%	8%	15%
Candy	949	15%	21%	14%	14%	37%
Donuts and pastries	976	29%	24%	12%	9%	26%
Cookies, brownies, pies or cakes	966	23%	27%	13%	11%	26%
Ice cream	996	16%	24%	17%	14%	30%
Fast food	977	17%	25%	16%	11%	31%
Television	887	7%	13%	11%	26%	44%
Video games	885	18%	16%	10%	22%	34%

Table 4.10: Descriptive Statistics for Energy Balance Related Behavior Size/Duration Individual Items

	N	0 cups	.125 cup	.25 cup	.5 cup	1 cup	1.25 cups
(Original Response Options)		(I didn't eat this)	(less than small)	(small)	(medium)	(large)	(more than large)
Fruit	888	7%	3%	8%	20%	33%	28%
Vegetables	842	26%	9%	14%	23%	17%	11%
		0 ounces	4 ounces	8 ounces	12 ounces	20 ounces	24 ounces
(Original Response Options)		(I didn't eat this)	(less than small)	(small)	(medium)	(large)	(more than large)
Soda and fruit drinks	878	7%	7%	24%	24%	21%	17%
Sports drinks and flavored waters	902	27%	8%	12%	21%	19%	14%
		I didn't eat this	Less than small	Small	Medium	Large	Bigger than large
(Original Response Options)		(I didn't eat this)	(less than small)	(small)	(medium)	(large)	(more than large)
Chips and other salty snacks	961	11%	10%	15%	24%	20%	20%
Candy	944	13%	7%	13%	24%	19%	25%
Baked goods	973	15%	6%	14%	26%	17%	22%
Ice cream	967	13%	6%	17%	20%	18%	26%
Fast food burgers or sandwiches	954	16%	5%	21%	23%	16%	19%
Fast food French fries	964	12%	5%	13%	24%	23%	23%
Fast food fountain soda	942	14%	5%	17%	27%	19%	19%
		15 min	45 min	120 min	180 min	210 min	
(Original Response Options)		(0 times per week)	(about 1-2 times per week)	(about 3-4 times per week)	(Almost everyday)	(2 or more times everyday)	
Vigorous intensity physical activity	853	13%	23%	15%	11%	38%	
TV	857	17%	19%	12%	7%	45%	
Video games	853	24%	17%	13%	9%	38%	

Table 4.11: Boys Energy Balance Related Behavior Correlations[†] with BMI and %BF

		Frequency		Size	
		BMI	%BF	BMI	%BF
Fruits and vegetables	Pearson Correlation	-0.07	-0.07	-0.03	-0.05
	Sig. (2-tailed)	0.24	0.20	0.62	0.33
	N	325	328	327	330
Physical activity	Pearson Correlation	-0.03	-0.09	0.01	-0.03
	Sig. (2-tailed)	0.66	0.10	0.91	0.55
	N	310	313	312	315
Sweetened beverages	Pearson Correlation	-0.10	-0.10	-.12*	-.13*
	Sig. (2-tailed)	0.07	0.07	<.05	<.05
	N	315	318	311	314
Processed packaged snacks	Pearson Correlation	-.16**	-.17**	-.12*	-.12*
	Sig. (2-tailed)	<.01	<.01	<.05	<.05
	N	320	323	315	318
Fast food	Pearson Correlation	-0.10	-0.11	-0.10	-.12*
	Sig. (2-tailed)	0.08	0.05	0.06	<.05
	N	309	312	315	318
Recreational screen time	Pearson Correlation	-0.05	-0.02	-0.06	-0.01
	Sig. (2-tailed)	0.38	0.74	0.26	0.81
	N	324	327	329	332

*Significant at the 0.05 level (2-tailed)

**Significant at the 0.01 level (2-tailed)

[†]Control variables: social desirability, socioeconomic status, race, and reading level

Table 4.12: Girls Energy Balance Related Behavior Correlations[†] with BMI and %BF

		Frequency		Size	
		BMI	%BF	BMI	%BF
Fruits and vegetables	Pearson Correlation	-0.01	-0.02	-0.07	-0.07
	Sig. (2-tailed)	0.89	0.64	0.22	0.17
	N	354	357	350	353
Physical activity	Pearson Correlation	0.04	0.04	0.10	.12*
	Sig. (2-tailed)	0.41	0.45	0.08	<.05
	N	344	347	333	336
Sweetened beverages	Pearson Correlation	0.00	0.00	0.10	0.09
	Sig. (2-tailed)	0.95	0.97	0.08	0.11
	N	347	350	338	340
Processed packaged snacks	Pearson Correlation	-0.09	-.12*	-0.04	-0.03
	Sig. (2-tailed)	0.08	<.05	0.45	0.60
	N	349	352	345	347
Fast food	Pearson Correlation	-0.09	-0.09	0.00	0.01
	Sig. (2-tailed)	0.10	0.12	0.93	0.86
	N	332	334	342	344
Recreational screen time	Pearson Correlation	-0.02	-0.04	-0.01	-0.02
	Sig. (2-tailed)	0.77	0.40	0.80	0.76
	N	353	356	354	357

*Significant at the 0.05 level (2-tailed)

[†]Control variables: social desirability, socioeconomic status, race, and reading level

Table 4.13: Regression Analysis with Dependent Variable: BMI Rank

Predictors	Unstandardized β	Standard error	Standardized β	t	p	Adjusted R^2	F	p
(Constant)	539.05	161.53		3.34*	<.01	.04**	2.28	<.01
Gender	-39.97	28.72	-0.06	-1.39	0.16			
Socioeconomic status	-2.39	3.26	-0.13	-0.73	0.46			
Percent Black	2.57	3.67	0.16	0.70	0.48			
Percent Hispanic	4.39	3.89	0.32	1.13	0.26			
Reading level	0.08	1.06	0.00	0.08	0.94			
Social desirability	-7.64	6.97	-0.05	-1.10	0.27			
Fruit and vegetable frequency	-24.95	17.65	-0.07	-1.41	0.16			
Physical activity frequency	16.06	20.00	0.04	0.80	0.42			
Sweetened beverage frequency	1.44	9.61	0.01	0.15	0.88			
Processed packaged snack frequency	-15.23	6.46	-0.18	-2.36*	<.05			
Fast food frequency	-4.86	24.27	-0.01	-0.20	0.84			
Recreational screen time frequency	1.84	12.84	0.01	0.14	0.89			
Fruit and vegetable size	-58.82	42.89	-0.07	-1.37	0.17			
Physical activity duration	21.82	10.10	0.11	2.16*	<.05			
Sweetened beverage size	5.47	2.66	0.12	2.05*	<.05			
Processed packaged snack size	-7.48	15.43	-0.03	-0.49	0.63			
Fast food size	-8.16	15.92	-0.04	-0.51	0.61			
Recreational screen time duration	-0.22	0.24	-0.05	-0.93	0.35			

*Significant at the .05 level (2-tailed)

**Significant at the .01 level (2-tailed)

Table 4.14: Regression Analysis with Dependent Variable: Percent Body Fat

Predictors	Unstandardized β	Standard error	Standardized β	t	p	Adjusted R^2	F	p
(Constant)	20.50	4.64		4.42**	<.01	.06***	2.78	<.001
Gender	2.65	0.83	0.15	3.20**	<.01			
Socioeconomic status	0.02	0.09	0.03	0.18	0.85			
Percent Black	-0.03	0.11	-0.06	-0.26	0.80			
Percent Hispanic	0.03	0.11	0.07	0.25	0.81			
Reading level	-0.01	0.03	-0.01	-0.24	0.81			
Social desirability	-0.11	0.20	-0.02	-0.54	0.59			
Fruit and vegetable frequency	-0.72	0.51	-0.07	-1.41	0.16			
Physical activity frequency	-0.03	0.57	0.00	-0.05	0.96			
Sweetened beverage frequency	0.17	0.28	0.04	0.62	0.54			
Processed packaged snack frequency	-0.56	0.19	-0.23	-3.02**	<.01			
Fast food frequency	-0.02	0.70	0.00	-0.03	0.98			
Recreational screen time frequency	-0.01	0.37	0.00	-0.03	0.98			
Fruit and vegetable size	-1.85	1.24	-0.07	-1.49	0.14			
Physical activity duration	0.69	0.29	0.11	2.38*	<.05			
Sweetened beverage size	0.13	0.08	0.10	1.70	0.09			
Processed packaged snack size	-0.11	0.44	-0.02	-0.25	0.81			
Fast food size	-0.30	0.46	-0.04	-0.65	0.52			
Recreational screen time duration	0.00	0.01	0.00	-0.06	0.95			

*Significant at the .05 level (2-tailed)

**Significant at the .01 level (2-tailed)

***Significant at the .001 level (2-tailed)

Results for Research Question 2b: How do EBRB Differ with BMI and %BF?

Tables 4.15 and 4.16 show the differences in means for normal weight versus overweight/obese children. Means are based on the scale mean. These tables also show the differences in EBRB means by %BF using the 75th percentile as the cut point for groups 1 and 2 (Lamb et al., 2011). All means were adjusted for social desirability, socioeconomic status, race, and reading level.

Means were higher in normal weight boys for each behavior except physical activity for frequency scales. The processed packaged snack frequency scale indicated, for example, that these items were consumed 5.43 times a day by normal weight boys versus 3.99 times a day by overweight/obese boys. Means were also higher in normal weight boys for each behavior except physical activity and fruits and vegetables for size/duration scales.

In girls, means were higher in the normal weight group for each behavior except physical activity and sweetened beverages for frequency scales. Means were also higher in normal weight girls for each behavior except physical activity for size/duration scales.

Using the cut point of %BF=75th percentile to differentiate a group 1 and 2 by percent body fat, we did not observe any differences compared to the BMI groups for boys or girls.

Table 4.15: Boys: ANCOVA for Behavior Scales[†] by Weight Status (both BMI^a and %BF^b)

		N	Adjusted mean [†]	SE of mean	CI (Lower bound)	CI (Upper bound)	F	p	Summary	
Frequency (times per day)										
Fruits and vegetables	BMI	1	154	1.30	0.07	1.2	1.4	2.3	<.05	BMI=1 higher
		2	160	1.18	0.07	1.0	1.3			
%BF		1	184	1.29	0.06	1.2	1.4	2.3	<.05	%BF=1 higher
		2	130	1.16	0.08	1.0	1.3			
Physical activity	BMI	1	147	1.19	0.06	1.1	1.3	1.6	0.15	No difference
		2	152	1.12	0.06	1.0	1.2			
%BF		1	177	1.16	0.06	1.0	1.3	1.5	0.17	No difference
		2	122	1.14	0.07	1.0	1.3			
Sweetened beverages	BMI	1	151	3.40	0.18	3.0	3.7	3.3	<.01	BMI=1 higher
		2	154	2.73	0.18	2.4	3.1			
%BF		1	182	3.18	0.16	2.9	3.5	2.4	<.05	%BF=1 higher
		2	123	2.87	0.20	2.5	3.3			
Processed packaged snacks	BMI	1	153	5.43	0.29	4.8	6.0	7.4	<.01	BMI=1 higher
		2	157	3.99	0.29	3.4	4.6			
%BF		1	184	5.27	0.27	4.7	5.8	7.2	<.01	%BF=1 higher
		2	126	3.87	0.32	3.2	4.5			
Fast food	BMI	1	148	1.02	0.07	0.9	1.2	7.7	<.01	BMI=1 higher
		2	151	0.85	0.07	0.7	1.0			
%BF		1	178	1.02	0.06	0.9	1.1	7.9	<.01	%BF=1 higher
		2	121	0.82	0.07	0.7	1.0			
Recreational screen time	BMI	1	152	2.37	0.11	2.2	2.6	6.1	<.01	BMI=1 higher
		2	161	2.12	0.10	1.9	2.3			
%BF		1	182	2.25	0.10	2.1	2.4	5.5	<.01	%BF=1 higher
		2	131	2.23	0.12	2.0	2.5			
Size/Duration										
Fruits and vegetables (cups per item)	BMI	1	155	0.66	0.03	0.6	0.7	0.7	0.67	No difference
		2	161	0.61	0.03	0.6	0.7			
%BF		1	186	0.65	0.03	0.6	0.7	0.5	0.81	No difference
		2	130	0.62	0.03	0.6	0.7			
Physical activity (minutes per occasion)	BMI	1	145	147	6.30	135	160	1.7	0.11	No difference
		2	156	140	6.10	128	152			
%BF		1	175	145	5.70	134	156	1.7	0.13	No difference
		2	126	141	6.80	128	154			
Sweetened beverages (ounces per item)	BMI	1	151	14.17	0.53	13.1	15.2	4.5	<.01	BMI=1 higher
		2	151	11.95	0.53	10.9	13.0			
%BF		1	181	14.03	0.48	13.1	15.0	4.8	<.01	%BF=1 higher
		2	121	11.61	0.59	10.4	12.8			
Processed packaged snacks (size per item ^c)	BMI	1	152	4.20	0.11	4.0	4.4	3.6	<.01	BMI=1 higher
		2	153	3.82	0.11	3.6	4.0			
%BF		1	182	4.24	0.10	4.0	4.4	4.8	<.01	%BF=1 higher
		2	123	3.67	0.12	3.4	3.9			
Fast food (size per item ^c)	BMI	1	152	4.19	0.12	4.0	4.4	4.9	<.01	BMI=1 higher
		2	153	3.87	0.12	3.6	4.1			
%BF		1	182	4.19	0.10	4.0	4.4	5.3	<.01	%BF=1 higher
		2	123	3.79	0.13	3.5	4.0			
Recreational screen time (minutes per occasion)	BMI	1	156	144	5.24	134	155	9.5	<.01	BMI=1 higher
		2	162	125	5.14	115	135			
%BF		1	187	137	4.81	127	146	8.2	<.01	%BF=1 higher
		2	131	131	5.76	120	142			

^aBMI: 1=normal weight, 2=overweight or obese

^b%BF: 1<75th percentile based on NHANES %BF by sex and year of age, 2≥75th percentile

^cScale: 1= I didn't eat this, 2=Less than small, 3=Small, 4=Medium, 5=Large, 6=Bigger than large

*Significant at the .05 level (2-tailed)

**Significant at the .01 level (2-tailed)

***Significant at the .001 level (2-tailed)

[†]Adjusted for social desirability, socioeconomic status, race, and reading level

Table 4.16: Girls: ANCOVA for Behavior Scales[†] by Weight Status (both BMI^a and %BF^b)

		N	Adjusted mean [†]		CI (Lower bound)	CI (Upper bound)	F	p	Summary	
Frequency (times per day)										
Fruits and vegetables	BMI	1	191	1.30	0.06	1.2	1.4	2.6*	<.05	BMI=1 higher
		2	147	1.28	0.07	1.1	1.4			
%BF		1	175	1.31	0.06	1.2	1.4	2.6*	<.05	%BF=1 higher
		2	163	1.27	0.07	1.1	1.4			
Physical activity	BMI	1	187	0.86	0.05	0.7	1.0	1.4	0.23	No difference
		2	141	0.90	0.06	0.8	1.0			
%BF		1	171	0.86	0.06	0.7	1.0	1.3	0.24	No difference
		2	157	0.89	0.06	0.8	1.0			
Sweetened beverages	BMI	1	188	2.27	0.14	2.0	2.6	0.8	0.58	No difference
		2	143	2.08	0.16	1.8	2.4			
%BF		1	171	2.26	0.15	2.0	2.6	0.7	0.63	No difference
		2	160	2.12	0.15	1.8	2.4			
Processed packaged snacks	BMI	1	189	4.21	0.24	3.7	4.7	3.1*	<.05	BMI=1 higher
		2	144	3.46	0.28	2.9	4.0			
%BF		1	172	4.32	0.25	3.8	4.8	3.5**	<.01	%BF=1 higher
		2	161	3.41	0.26	2.9	3.9			
Fast food	BMI	1	178	0.76	0.05	0.7	0.9	3.3**	<.01	BMI=1 higher
		2	139	0.58	0.06	0.5	0.7			
%BF		1	162	0.76	0.06	0.6	0.9	3.1**	<.01	%BF=1 higher
		2	155	0.60	0.06	0.5	0.7			
Recreational screen time	BMI	1	191	1.92	0.09	1.7	2.1	3.0*	<.05	BMI=1 higher
		2	146	1.85	0.11	1.6	2.1			
%BF		1	174	1.88	0.10	1.7	2.1	2.9*	<.05	%BF=1 higher
		2	163	1.89	0.10	1.7	2.1			
Size/Duration										
Fruits and vegetables (cups per item)	BMI	1	189	0.70	0.02	0.6	0.7	4.9**	<.01	BMI=1 higher
		2	145	0.64	0.03	0.6	0.7			
%BF		1	173	0.69	0.03	0.6	0.7	4.7**	<.01	%BF=1 higher
		2	161	0.65	0.03	0.6	0.7			
Physical activity (minutes per occasion)	BMI	1	185	106	5.80	95	117	1.5	0.19	No difference
		2	132	125	6.80	111	138			
%BF		1	170	108	6.00	96	120	1.1	0.38	No difference
		2	147	120	6.50	108	133			
Sweetened beverages (ounces per item)	BMI	1	186	10.17	0.50	9.2	11.2	2.3*	<.05	BMI=1 higher
		2	137	10.78	0.59	9.6	11.9			
%BF		1	168	10.11	0.53	9.1	11.2	2.3*	<.05	%BF=1 higher
		2	155	10.77	0.55	9.7	11.9			
Processed packaged snacks (size per item ^c)	BMI	1	188	3.93	0.09	3.7	4.1	4.3**	<.01	BMI=1 higher
		2	142	3.69	0.11	3.5	3.9			
%BF		1	171	3.89	0.10	3.7	4.1	4.0**	<.01	%BF=1 higher
		2	159	3.75	0.10	3.6	4.0			
Fast food (size per item ^c)	BMI	1	186	3.65	0.09	3.5	3.8	6.0**	<.01	BMI=1 higher
		2	141	3.56	0.10	3.4	3.8			
%BF		1	169	3.63	0.09	3.4	3.8	6.0**	<.01	%BF=1 higher
		2	158	3.59	0.10	3.4	3.8			
Recreational screen time (minutes per occasion)	BMI	1	191	121	4.93	112	131	9.1**	<.01	BMI=1 higher
		2	147	112	5.62	101	123			
%BF		1	175	119	5.16	109	129	8.9**	<.01	%BF=1 higher
		2	163	115	5.34	105	126			

^aBMI: 1=normal weight, 2=overweight or obese

^b%BF: 1<75th percentile based on NHANES %BF by sex and year of age, 2≥75th percentile

^cScale: 1= I didn't eat this, 2=Less than small, 3=Small, 4=Medium, 5=Large, 6=Bigger than large

*Significant at the 0.05 level (2-tailed)

**Significant at the 0.01 level (2-tailed)

[†]Adjusted for social desirability, socioeconomic status, race, and reading level

Results for Research Question 2c: To What Extent are EBRB Associated with Each Other?

As mentioned previously, behaviors were categorized into “choose more” and “choose less” groups. “Choose more” behaviors include healthful food and activity behaviors: fruit and vegetable intake and physical activity. The “choose less” group includes: recreational screen time, intake of sweetened beverages, processed package snacks, and fast food. Correlations between behaviors in these groups are listed in Tables 4.17 and 4.18. All correlations were adjusted for social desirability, socioeconomic status, race, and reading level.

“Choose more” behavior frequency and size/duration scales (physical activity and fruits/vegetables) were significantly correlated with each other for both boys (frequency: .157, $p < .05$, size/duration: .122, $p < .05$) and girls (frequency: .227, $p < .01$, size/duration: .124, $p < .05$) (Table 4.17 and 4.18).

“Choose less” behavior frequency and size/duration scales (recreational screen time, intake of sweetened beverages, processed package snacks, and fast food) were significantly correlated with each other for both boys and girls. The highest correlations were observed between processed packaged snacks and sweetened beverage frequency (boys: .669, $p < .01$, girls: .687, $p < .01$). The highest correlation between “choose less” size scales was between processed packaged snacks and fast food size (boys: .629, $p < .01$, girls: .607, $p < .01$).

Some slight correlations were observed among “choose more” and “choose less” behaviors, but were relatively small ($< .25$) and mostly with physical activity, which was high for all participants regardless of weight status.

Table 4.17: Boys Energy Balance Related Behavior Correlations[†]

Frequency		Fruits and vegetables	Physical activity	Sweetened beverages	Processed packaged snacks	Fast food	Recreational screen time
Fruits and vegetables	Pearson Corr. Sig. (2-tailed) N	1.00 328					
Physical activity	Pearson Corr. Sig. (2-tailed) N	.157** <.05 311	1.00 313				
Sweetened beverages	Pearson Corr. Sig. (2-tailed) N	0.05 0.42 306	.217** 0.00 293	1.00 318			
Processed packaged snacks	Pearson Corr. Sig. (2-tailed) N	-0.05 0.41 311	.241** <.01 297	.669** <.01 318	1.00 323		
Fast food	Pearson Corr. Sig. (2-tailed) N	0.01 0.93 301	.198** <.01 287	.518** <.01 306	.629** <.01 311	1.00 312	
Recreational screen time	Pearson Corr. Sig. (2-tailed) N	-0.05 0.34 326	.185** <.01 312	.335** <.01 305	.325** <.01 310	.336** <.01 300	1.00 327
Size		Fruits and vegetables	Physical activity	Sweetened beverages	Processed packaged snacks	Fast food	Recreational screen time
Fruits and vegetables	Pearson Corr. Sig. (2-tailed) N	1.00 330					
Physical activity	Pearson Corr. Sig. (2-tailed) N	.122* <.05 313	1.00 315				
Sweetened beverages	Pearson Corr. Sig. (2-tailed) N	0.07 0.22 305	.182** <.01 292	1.00 314			
Processed packaged snacks	Pearson Corr. Sig. (2-tailed) N	-0.02 0.73 309	.159* <.05 296	.581** <.01 314	1.00 318		
Fast food	Pearson Corr. Sig. (2-tailed) N	0.02 0.69 309	.185** <.01 296	.582** <.01 314	.685** <.01 318	1.00 318	
Recreational screen time	Pearson Corr. Sig. (2-tailed) N	-0.01 0.93 330	.174** <.01 315	.299** <.01 307	.283** <.01 311	.328** <.01 311	1.00 332

*Significant at the 0.05 level (2-tailed)

**Significant at the 0.01 level (2-tailed)

[†]Control variables: social desirability, socioeconomic status, race, and reading level

Table 4.18: Girls Energy Balance Related Behavior Correlations[†]

Frequency		Fruits and vegetables	Physical activity	Sweetened beverages	Processed packaged snacks	Fast food	Recreational screen time
Fruits and vegetables	Pearson Corr.	1.00					
	Sig. (2-tailed)						
	N	357					
Physical activity	Pearson Corr.	.227**	1.00				
	Sig. (2-tailed)	<.01					
	N	346	347				
Sweetened beverages	Pearson Corr.	.110*	0.09	1.00			
	Sig. (2-tailed)	<.05	0.10				
	N	334	324	350			
Processed packaged snacks	Pearson Corr.	0.05	.145*	.687**	1.00		
	Sig. (2-tailed)	0.38	<.05	<.01			
	N	336	326	350	352		
Fast food	Pearson Corr.	0.05	.121*	.456**	.607**	1.00	
	Sig. (2-tailed)	0.39	<.05	<.01	<.01		
	N	320	311	332	334	334	
Recreational screen time	Pearson Corr.	0.00	.186**	.404**	.390**	.378**	1.00
	Sig. (2-tailed)	0.99	<.01	<.01	<.01	<.01	
	N	355	346	333	335	319	356
Size		Fruits and vegetables	Physical activity	Sweetened beverages	Processed packaged snacks	Fast food	Recreational screen time
Fruits and vegetables	Pearson Corr.	1.00					
	Sig. (2-tailed)						
	N	353					
Physical activity	Pearson Corr.	.124*	1.00				
	Sig. (2-tailed)	<.05					
	N	329	336				
Sweetened beverages	Pearson Corr.	0.05	.141*	1.00			
	Sig. (2-tailed)	0.39	<.05				
	N	321	304	340			
Processed packaged snacks	Pearson Corr.	0.03	0.09	.458**	1.00		
	Sig. (2-tailed)	0.63	0.13	<.01			
	N	328	311	340	347		
Fast food	Pearson Corr.	0.04	.125*	.492**	.667**	1.00	
	Sig. (2-tailed)	0.52	<.05	<.01	<.01		
	N	325	308	338	344	344	
Recreational screen time	Pearson Corr.	0.00	.140*	.234**	.274**	.317**	1.00
	Sig. (2-tailed)	0.97	<.05	<.01	<.01	<.01	
	N	350	335	324	331	328	357

*Significant at the 0.05 level (2-tailed)

**Significant at the 0.01 level (2-tailed)

[†]Control variables: social desirability, socioeconomic status, race, and reading level

Results for Research Questions 3a: Which Psychosocial Variables are Most Predictive of EBRB?

Table 4.19 presents the means for each mediator scale, adjusted for social desirability. Range of response options were either: 1=Not at all true for me, 2=not true for me, 3=neutral, 4=somewhat true for me, 5=very true for me, or 1=Not at all sure, 2=a little sure, 3=neutral, 4=sure, 5=very sure. Higher psychosocial mediator response option value was coded to correspond to a healthier response. All analyses were adjusted for social desirability, socioeconomic status, race, and reading level.

Table 4.20 is a summary of significant regression analyses from behavior frequency regression models built with all possible mediators. Habit strength was found to be predictive of all behaviors except physical activity frequency. Psychosocial mediators predicted 22% of the variance for fruits and vegetables, 22% for sweetened beverages, 34% for processed packaged snacks, 25% for fast food, 8% for physical activity, and 30% for recreational screen time.

Table 4.21 is a summary of significant regression analyses from behavior size/duration regression models built with all possible mediators. Habit strength was found to be a predictive mediator for most study behaviors. Psychosocial mediators predicted 19% of the variance for fruits and vegetables, 22% for sweetened beverages, 48% for processed packaged snacks, 39% for fast food, 11% for physical activity, and 44% for recreational screen time.

Table 4.19: Psychosocial Mediator Scale Means

Mediators	N	Adj. Mean [†]	Standard Error of the Mean	Confidence Interval (Lower bound)	Confidence Interval (Upper bound)
<u>General Mediators (Range: 1-5^a)</u>					
Goal setting skills	932	4.2	0.03	4.1	4.2
Autonomous motivation	1014	4.1	0.04	4.0	4.2
Controlled motivation	1015	3.1	0.04	3.0	3.2
Amotivation	1014	3.4	0.04	3.3	3.5
Competence	1018	3.9	0.04	3.8	4.0
<u>Combined for all Behaviors</u>					
Behavioral intention (Range: 1-5 ^a)	1055	3.3	0.03	3.2	3.3
Habit strength (Range: 1-5 ^a)	1101	3.5	0.03	3.4	3.5
Knowledge (Range ^c)	1074	0.2	0.01	0.2	0.2
<u>Outcome expectations (Range: 1-5^a)</u>					
Fruit and vegetables outcome expectations	932	3.9	0.03	3.8	3.9
Physical activity outcome expectations	933	4.2	0.03	4.1	4.2
Sweetened beverages outcome expectations	1019	3.1	0.04	3.0	3.2
Processed packaged snacks outcome expectations	1016	3.5	0.04	3.4	3.5
Recreational screen time outcome expectations	931	3.2	0.05	3.1	3.3
<u>Self-efficacy (Range: 1-5^b)</u>					
Fruit and vegetables self-efficacy	915	3.5	0.03	3.4	3.6
Physical activity self-efficacy	942	4.4	0.03	4.3	4.4
Sweetened beverages self-efficacy	1003	3.3	0.04	3.2	3.4
Processed packaged snacks self-efficacy	1000	3.3	0.04	3.2	3.4
Fast food self-efficacy	978	3.2	0.05	3.1	3.3
Recreational screen time self-efficacy	936	3.1	0.04	3.0	3.2

^a= Range of response options: 1=Not at all true for me, 2=not true for me, 3=neutral, 4=somewhat true for me, 5=very true for me

^b= Range of response options: 1=Not at all sure, 2=a little sure, 3=neutral, 4=sure, 5=very sure

^c= See response options for individual items in scale in Appendix A

[†]Adjusted for social desirability, socioeconomic status, race, and reading level

Table 4.20: Regression Summaries: Predictive Mediators^a for Each Behavior (Frequency) with Behavior as Dependent Variable and Mediators as Predictors

	Fruits and Vegetables	Sweetened Beverages	Processed Packaged Snacks	Fast Food	Physical Activity	Recreational Screen Time
Model Summary	R ² = .22 F= 10.0 p< .001	R ² = .22 F= 9.09 p< .001	R ² = .34 F= 15.78 p< .001	R ² = .25 F= 11.33 p< .001	R ² = .08 F= 4.78 p< .001	R ² = .30 F= 14.34 p< .001
Autonomous Motivation						
Controlled Motivation		β= -.12 t= -2.38 p< .05				
Amotivation				β= -.10 t= -2.32 p< .05		
Competence						
Goal Setting Skills						
Habit Strength (Behavior specific)	β= .22 t= 4.76 p< .001	β= -.19 t= -3.69 p< .001	β= -.20 t= -4.21 p< .001	β= -.27 t= -6.01 p< .001		β= -.22 t= -4.41 p< .001
Intention (Behavior specific)		β= -.13 t= -2.81 p< .01	β= -.17 t= -3.58 p< .001	β= -.14 t= -2.94 p< .01		
Outcome Expectations (Behavior specific)		β= -.18 t= -3.67 p< .001	β= -.30 t= -6.21 p< .001			β= -.25 t= -4.90 p< .001
Self Efficacy (Behavior specific)	β= .36 t= 7.88 p< .001				β= .15 t= 3.05 p< .01	β= -.18 t= -3.91 p< .001

^aMediators coded so that higher is equivalent to "healthier"

Control variables: gender, social desirability, socioeconomic status, race, and reading level

Table 4.21: Regression Summaries: Predictive Mediators^a for Each Behavior (Size/Duration) with Behavior as Dependent Variable and Mediators as Predictors

	Fruits and Vegetables	Sweetened Beverages	Processed Packaged Snacks	Fast Food	Physical Activity	Recreational Screen Time
Model Summary	R ² = .19 F= 8.05 p< .001	R ² = .22 F= 8.92 p< .001	R ² = .48 F= 27.78 p< .001	R ² = .39 F= 21.57 p< .001	R ² = .11 F= 4.92 p< .001	R ² = .44 F= 23.61 p< .001
Autonomous Motivation						
Controlled Motivation						
Amotivation				β= -.10 t= -2.54 p< .05		
Competence					β= .12 t= 2.23 p< .05	
Goal Setting Skills			β= .15 t= 3.72 p< .001	β= .10 t= 2.42 p< .05		β= .11 t= 2.85 p< .01
Habit Strength (Behavior specific)	β= .11 t= 2.31 p< .05	β= -.18 t= -3.50 p< .01	β= -.27 t= -6.34 p< .001	β= -.27 t= -6.76 p< .001	β= .11 t= 2.18 p< .05	β= -.23 t= -5.2 p< .001
Intention (Behavior specific)		β= -.09 t= -2.00 p< .05				
Outcome Expectations (Behavior specific)		β= -.17 t= -3.42 p< .01	β= -.27 t= -6.38 p< .001			β= -.27 t= -5.90 p< .001
Self Efficacy (Behavior specific)	β= .38 t= 8.13 p< .001		β= -.11 t= -2.65 p< .01	β= -.18 t= -3.91 p< .001	β= .18 t= 3.79 p< .001	β= -.22 t= -5.38 p< .001

^aMediators coded so that higher is equivalent to "healthier"

Control variables: gender, social desirability, socioeconomic status, race, and reading level

Results for Research Questions 3b: How do Psychosocial Variables Differ with BMI and %BF?

All differences in means for psychosocial mediator scales are listed in Tables 4.22 and 4.23. All significant differences between the BMI and %BF groups indicated higher means in overweight/obese children except for controlled motivation in boys when compared by %BF group. Higher psychosocial mediator value (range 1-5) corresponded to healthier as mentioned previously.

Differences in mediator scale means for boys indicated that means were higher for heavier boys for goal setting skills, autonomous motivation (BMI only), controlled motivation (%BF only), competence (BMI only), behavioral intention, outcome expectations (specifically fruits/vegetables, physical activity (BMI only), sweetened beverages, and recreational screen time), and processed packaged snacks self-efficacy (BMI only).

Differences in mediator scale means for girls indicated that means were higher for heavier girls for autonomous motivation (BMI only), controlled motivation, competence (BMI only), behavioral intention, habit strength (BMI only), processed packaged snacks self-efficacy (BMI only), and fast food self-efficacy (BMI only). All means were adjusted for social desirability, socioeconomic status, race, and reading level.

Table 4.22: Boys: ANCOVA for Mediator Scales^c by Weight Status (both BMI^a and %BF^b)

			N	Adj. Mean [†]	CI (Lower bound)	CI (Upper bound)	t	p	Summary
Goal setting skills	BMI	1	163	4.0	3.9	4.1	7.14**	<.01	BMI=2 Higher
	BMI	2	166	4.3	4.1	4.4			
	%BF	1	195	4.0	3.9	4.2	5.62*	<.05	BMI=2 Higher
	%BF	2	134	4.3	4.1	4.4			
Autonomous motivation	BMI	1	157	3.9	3.7	4.1	4.34*	<.05	BMI=2 Higher
	BMI	2	162	4.1	4.0	4.3			
	%BF	1	189	4.0	3.8	4.1	1.56	.212	No difference
	%BF	2	130	4.1	3.9	4.3			
Controlled motivation	BMI	1	159	3.4	3.2	3.6	2.51	.114	No difference
	BMI	2	160	3.2	3.0	3.3			
	%BF	1	190	3.4	3.2	3.6	5.06*	<.05	BMI=1 Higher
	%BF	2	129	3.1	2.9	3.3			
Amotivation	BMI	1	157	3.3	3.1	3.5	0.00	.990	No difference
	BMI	2	160	3.3	3.1	3.5			
	%BF	1	188	3.4	3.2	3.5	0.75	.388	No difference
	%BF	2	129	3.2	3.0	3.4			
Competence	BMI	1	159	3.6	3.5	3.8	4.21*	<.05	BMI=2 Higher
	BMI	2	161	3.9	3.7	4.1			
	%BF	1	190	3.7	3.5	3.9	2.98	.085	No difference
	%BF	2	130	3.9	3.7	4.1			
Knowledge	BMI	1	164	0.1	0.1	0.2	2.85	.092	No difference
	BMI	2	176	0.2	0.2	0.2			
	%BF	1	197	0.2	0.1	0.2	2.48	.116	No difference
	%BF	2	143	0.2	0.2	0.2			
Behavioral intention	BMI	1	158	2.9	2.8	3.1	8.55**	<.01	BMI=2 Higher
	BMI	2	167	3.2	3.1	3.4			
	%BF	1	191	3.0	2.8	3.1	9.70*	<.01	BMI=2 Higher
	%BF	2	134	3.3	3.1	3.4			
Habit strength	BMI	1	165	3.3	3.2	3.4	2.67	.103	No difference
	BMI	2	173	3.4	3.3	3.5			
	%BF	1	198	3.3	3.2	3.4	2.13	.145	No difference
	%BF	2	140	3.4	3.3	3.6			

^aBMI: 1=normal weight, 2=overweight or obese

^b%BF: 1<75th percentile based on NHANES %BF by sex and year of age, 2≥75th percentile

^cScale: 1=Not at all true for me, 2=not true for me, 3=neutral, 4=somewhat true for me, 5=very true for me, or 1=Not at all sure, 2=a little sure, 3=neutral, 4=sure, 5=very sure

*Significant at the .05 level (2-tailed)

**Significant at the .01 level (2-tailed)

[†]Adjusted for social desirability, socioeconomic status, race, and reading level

Table 4.22 (continued): Boys: ANCOVA for Mediator Scales^c by Weight Status (both BMI^a and %BF^b)

		N	Adj. Mean [†]	CI (Lower bound)	CI (Upper bound)	t	p	Summary
Fruit and vegetables outcome expectations	BMI 1	163	3.5	3.4	3.7	7.61**	<.01	BMI=2 Higher
	BMI 2	167	3.9	3.7	4.0			
	%BF 1	194	3.6	3.4	3.7	7.09**	<.01	BMI=2 Higher
	%BF 2	136	3.9	3.7	4.1			
Physical activity outcome expectations	BMI 1	162	4.0	3.9	4.2	3.60	.059	No difference
	BMI 2	166	4.2	4.1	4.4			
	%BF 1	193	4.0	3.9	4.2	6.36**	<.01	BMI=2 Higher
	%BF 2	135	4.3	4.1	4.5			
Sweetened beverages outcome expectations	BMI 1	159	2.8	2.6	3.0	2.10	.148	No difference
	BMI 2	160	3.0	2.8	3.2			
	%BF 1	190	2.8	2.7	3.0	0.93	.335	No difference
	%BF 2	129	3.0	2.8	3.2			
Processed packaged snacks outcome expectations	BMI 1	158	3.0	2.8	3.2	11.15**	<.01	BMI=2 Higher
	BMI 2	160	3.5	3.3	3.7			
	%BF 1	190	3.1	2.9	3.3	5.47*	<.05	BMI=2 Higher
	%BF 2	128	3.5	3.2	3.7			
Recreational screen time outcome expectations	BMI 1	163	2.7	2.5	2.9	6.30**	<.01	BMI=2 Higher
	BMI 2	166	3.1	2.9	3.3			
	%BF 1	194	2.8	2.6	3.0	4.14*	<.05	BMI=2 Higher
	%BF 2	135	3.1	2.8	3.3			
Fruit and vegetables self-efficacy	BMI 1	164	3.4	3.2	3.6	0.78	.379	No difference
	BMI 2	168	3.5	3.3	3.7			
	%BF 1	196	3.4	3.2	3.5	2.22	.137	No difference
	%BF 2	136	3.6	3.4	3.7			
Physical activity self-efficacy	BMI 1	164	4.3	4.2	4.5	1.11	.293	No difference
	BMI 2	176	4.4	4.3	4.5			
	%BF 1	198	4.3	4.2	4.4	1.70	.193	No difference
	%BF 2	142	4.4	4.3	4.6			
Sweetened beverages self-efficacy	BMI 1	154	3.2	3.0	3.4	0.09	.759	No difference
	BMI 2	159	3.2	3.0	3.4			
	%BF 1	185	3.2	3.0	3.4	0.10	.747	No difference
	%BF 2	128	3.2	3.0	3.4			
Processed packaged snacks self-efficacy	BMI 1	152	3.1	2.9	3.3	2.34	.127	No difference
	BMI 2	158	3.3	3.1	3.5			
	%BF 1	183	3.1	2.9	3.3	6.09**	<.01	BMI=2 Higher
	%BF 2	127	3.4	3.2	3.7			
Fast food self-efficacy	BMI 1	152	3.0	2.8	3.2	0.30	.587	No difference
	BMI 2	154	3.1	2.9	3.3			
	%BF 1	181	3.0	2.8	3.2	1.38	.240	No difference
	%BF 2	125	3.2	2.9	3.4			
Recreational screen time self-efficacy	BMI 1	163	2.8	2.6	3.0	2.16	.142	No difference
	BMI 2	175	3.0	2.8	3.2			
	%BF 1	197	2.9	2.7	3.1	0.16	.687	No difference
	%BF 2	141	3.0	2.8	3.2			

^aBMI: 1=normal weight, 2=overweight or obese ^b%BF: 1<75th percentile based on NHANES %BF by sex and year of age, 2≥75th percentile
^cScale: 1=Not at all true for me, 2=not true for me, 3=neutral, 4=somewhat true for me, 5=very true for me, or 1=Not at all sure, 2=a little sure, 3=neutral, 4=sure, 5=very sure

*Significant at the .05 level (2-tailed)**Significant at the .01 level (2-tailed)

[†]Adjusted for social desirability, socioeconomic status, race, and reading level

Table 4.23: Girls: ANCOVA for Mediator Scales^c by Weight Status (both BMI^a and %BF^b)

			N	Adj. Mean [†]	CI (Lower bound)	CI (Upper bound)	t	p	Summary
Goal setting skills	BMI	1	193	4.2	4.1	4.3	0.38	.537	No difference
	BMI	2	149	4.3	4.1	4.4			
	%BF	1	176	4.2	4.1	4.3	0.08	.773	No difference
	%BF	2	166	4.2	4.1	4.4			
Autonomous motivation	BMI	1	187	4.2	4.0	4.3	4.96*	<.05	BMI=2 Higher
	BMI	2	145	4.4	4.2	4.5			
	%BF	1	170	4.2	4.1	4.3	0.89	.347	No difference
	%BF	2	162	4.3	4.2	4.4			
Controlled motivation	BMI	1	186	3.2	3.0	3.3	5.58*	<.05	BMI=2 Higher
	BMI	2	145	2.9	2.7	3.1			
	%BF	1	169	3.2	3.0	3.4	6.29*	<.05	BMI=2 Higher
	%BF	2	162	2.9	2.7	3.1			
Amotivation	BMI	1	189	3.5	3.4	3.7	0.12	.733	No difference
	BMI	2	145	3.5	3.3	3.7			
	%BF	1	172	3.5	3.4	3.7	0.18	.670	No difference
	%BF	2	162	3.5	3.3	3.7			
Competence	BMI	1	189	3.9	3.8	4.1	4.03*	<.05	BMI=2 Higher
	BMI	2	146	4.1	4.0	4.3			
	%BF	1	172	4.0	3.8	4.1	1.21	.272	No difference
	%BF	2	163	4.1	3.9	4.2			
Knowledge	BMI	1	198	0.2	0.2	0.3	0.08	.771	No difference
	BMI	2	154	0.2	0.2	0.3			
	%BF	1	181	0.2	0.2	0.3	0.76	.384	No difference
	%BF	2	171	0.2	0.2	0.3			
Behavioral intention	BMI	1	191	3.3	3.2	3.4	9.87**	<.01	BMI=2 Higher
	BMI	2	146	3.6	3.5	3.7			
	%BF	1	174	3.3	3.2	3.4	8.14*	.005	BMI=2 Higher
	%BF	2	163	3.6	3.4	3.7			
Habit strength	BMI	1	201	3.5	3.4	3.6	6.27*	<.05	BMI=2 Higher
	BMI	2	156	3.7	3.6	3.8			
	%BF	1	184	3.5	3.4	3.6	3.53	.061	No difference
	%BF	2	173	3.7	3.5	3.8			

^aBMI: 1=normal weight, 2=overweight or obese

^b%BF: 1<75th percentile based on NHANES %BF by sex and year of age, 2≥75th percentile

^cScale: 1=Not at all true for me, 2=not true for me, 3=neutral, 4=somewhat true for me, 5=very true for me, or 1=Not at all sure, 2=a little sure, 3=neutral, 4=sure, 5=very sure

*Significant at the .05 level (2-tailed)

**Significant at the .01 level (2-tailed)

[†]Adjusted for social desirability, socioeconomic status, race, and reading level

Table 4.23 (continued): Girls: ANCOVA for Mediator Scales^c by Weight Status (both BMI^a and %BF^b)

		N	Adj. Mean [†]	CI (Lower bound)	CI (Upper bound)	t	p	Summary
Fruit and vegetables outcome expectations	BMI 1	193	3.9	3.8	4.1	1.05	.307	No difference
	BMI 2	149	4.1	3.9	4.2			
	%BF 1	176	4.0	3.8	4.1	0.63	.428	No difference
	%BF 2	166	4.0	3.9	4.2			
Physical activity outcome expectations	BMI 1	194	4.2	4.0	4.3	0.81	.368	No difference
	BMI 2	150	4.3	4.1	4.4			
	%BF 1	177	4.1	4.0	4.3	1.89	.170	No difference
	%BF 2	167	4.3	4.1	4.4			
Sweetened beverages outcome expectations	BMI 1	189	3.3	3.1	3.5	0.27	.603	No difference
	BMI 2	146	3.4	3.2	3.6			
	%BF 1	172	3.3	3.1	3.5	0.02	.897	No difference
	%BF 2	163	3.3	3.1	3.5			
Processed packaged snacks outcome expectations	BMI 1	188	3.6	3.4	3.7	1.26	.262	No difference
	BMI 2	146	3.7	3.5	3.9			
	%BF 1	171	3.6	3.4	3.8	0.06	.804	No difference
	%BF 2	163	3.7	3.5	3.8			
Recreational screen time outcome expectations	BMI 1	193	3.5	3.3	3.7	1.20	.274	No difference
	BMI 2	150	3.6	3.4	3.8			
	%BF 1	177	3.5	3.3	3.7	0.01	.930	No difference
	%BF 2	166	3.5	3.3	3.7			
Fruit and vegetables self-efficacy	BMI 1	193	3.5	3.3	3.6	2.96	.086	No difference
	BMI 2	151	3.7	3.5	3.8			
	%BF 1	177	3.5	3.3	3.6	2.35	.126	No difference
	%BF 2	167	3.6	3.5	3.8			
Physical activity self-efficacy	BMI 1	201	4.3	4.2	4.4	1.05	.307	No difference
	BMI 2	156	4.4	4.3	4.5			
	%BF 1	184	4.3	4.2	4.4	1.67	.197	No difference
	%BF 2	173	4.4	4.3	4.5			
Sweetened beverages self-efficacy	BMI 1	184	3.3	3.1	3.5	1.69	.194	No difference
	BMI 2	142	3.5	3.3	3.7			
	%BF 1	167	3.3	3.2	3.5	0.11	.736	No difference
	%BF 2	159	3.4	3.2	3.6			
Processed packaged snacks self-efficacy	BMI 1	185	3.3	3.1	3.5	7.38**	<.01	BMI=2 Higher
	BMI 2	141	3.7	3.5	3.9			
	%BF 1	168	3.4	3.2	3.6	2.30	.131	No difference
	%BF 2	158	3.6	3.4	3.8			
Fast food self-efficacy	BMI 1	179	3.3	3.2	3.5	4.25*	<.05	BMI=2 Higher
	BMI 2	138	3.6	3.4	3.8			
	%BF 1	162	3.4	3.2	3.6	2.09	.150	No difference
	%BF 2	155	3.6	3.4	3.8			
Recreational screen time self-efficacy	BMI 1	201	3.2	3.0	3.4	0.49	.485	No difference
	BMI 2	154	3.3	3.1	3.5			
	%BF 1	184	3.2	3.0	3.4	0.23	.631	No difference
	%BF 2	141	3.0	2.8	3.2			

^aBMI: 1=normal weight, 2=overweight or obese ^b%BF: 1<75th percentile based on NHANES %BF by sex and year of age, 2≥75th percentile

^cScale: 1=Not at all true for me, 2=not true for me, 3=neutral, 4=somewhat true for me, 5=very true for me, or 1=Not at all sure, 2=a little sure, 3=neutral, 4=sure, 5=very sure

*Significant at the .05 level (2-tailed)**Significant at the .01 level (2-tailed)

[†]Adjusted for social desirability, socioeconomic status, race, and reading level

Summary of Key Study Findings

BMI classified 45.4% of the children in the study as overweight or obese. The data in our population are the same or higher than the nationally representative data for %BF percentile when compared to nationally representative %BF percentiles (Laurson et al., 2011).

A high correlation between BMI and %BF was observed, slightly higher for girls (.913 $p < .001$ for boys and .955 $p < .001$ for girls). Correlations within the categories of overweight, and obese were not as strong and were lowest in the overweight category (.431 $p < .001$ for boys and .652 $p < .001$ for girls). The sample size of underweight children was too small to analyze.

The average body fat percentage for children was 24.7% (SD 9.2%). Percent body fat in boys ranged from 7.7%-48.3% and girls, 7.6%-51.5%. There is an overlap in ranges of %BF for each weight status category for both boys and girls, though it is more evident in boys. Excluding underweight children, differences between the minimum and maximum %BF (maximum %BF – minimum %BF within a category) ranged from 17.4-27.8 for boys and 16.9-21.4 for girls.

%BF groups were defined based on a cut point from Lamb and colleagues (2011). %BF group 1 was defined as <75th percentile based on NHANES %BF by sex and year of age and group 2 was \geq 75th percentile. BMI classification was defined as 1=normal weight and 2=overweight/obese (CDC, 2000). Underweight children were not included in any analyses using the BMI groups 1 and 2 and %BF groups 1 and 2.

If the 75th percentile was used as a cut point for overweight/obesity, it would classify 11.5% of normal weight boys (by BMI) as overweight/obese and 2.5% of overweight/obese

boys (by BMI) as normal weight. For girls, the percentages of misclassifications by BMI compared to %BF are 1.1% and 5.7%, respectively.

Compared to the recommendations from the Dietary Guidelines for Americans (2012), American Academy of Pediatrics (2001), and USDHHS Physical Activity Guidelines for Americans (2008), described in detail in Chapter II, consumption of processed packaged snacks, fast food and sweetened beverages is very high while consumption of fruits and vegetables is very low. Recreational screen time is also very high. Neither normal weight nor overweight/obese children are meeting recommendations, besides that for physical activity. All analyses based on survey data were adjusted for social desirability, socioeconomic status, race, and reading level.

Correlations of EBRB with BMI and %BF reveal a slight inverse correlation between physical activity frequency and %BF in boys. Unexpected inverse correlations were observed for processed packaged snack frequency in boys and girls, though these were all less than $r=.17$. Similar correlations were observed for processed packaged snack and sweetened beverage size/duration scales, but only in boys.

Regression analysis with dependent variable %BF and all behaviors, controlling for gender, social desirability, and all other behaviors found that processed packaged snack frequency, physical activity duration, and sweetened beverage size were significant predictors of %BF, though the model only accounts for 6% of the variation. Regression analysis with dependent variable BMI showed processed packaged snack frequency and sweetened beverage size were significant predictors of BMI; this model accounted for 4% of the variation in BMI.

Behaviors were categorized into “choose more” and “choose less” groups. “Choose more” behaviors included healthful food and activity behaviors: fruit and vegetable intake and

physical activity. The “choose less” group included: recreational screen time, intake of sweetened beverages, processed package snacks, and fast food.

Means were higher in normal weight boys for each behavior except physical activity for frequency scales. The processed packaged snack frequency scale indicated, for example, that these items were consumed 5.43 times a day by normal weight boys versus 3.99 times a day by overweight/obese boys. Means were also higher in normal weight boys for each behavior except physical activity and fruits and vegetables for size/duration scales. In girls, means were higher in the normal weight group for each behavior except physical activity and sweetened beverages for frequency scales. Means were also higher in normal weight girls for each behavior except physical activity for size/duration scales. Using the cut point of %BF=75th percentile to differentiate a group 1 and 2 by percent body fat, we did not observe any differences compared to the BMI groups for normal weight versus overweight/obese boys and girls.

“Choose less” behavior frequency and size/duration scales (recreational screen time, intake of sweetened beverages, processed package snacks, and fast food) were significantly correlated with each other for both boys and girls. The highest correlations were observed between processed packaged snacks and sweetened beverage frequency (boys: .669, $p < .01$, girls: .687, $p < .01$). The highest correlation between “choose less” size scales was between processed packaged snacks and fast food size (boys: .629, $p < .01$, girls: .607, $p < .01$).

Higher psychosocial mediator values corresponded to healthier attitudes and beliefs. All significant differences between the BMI and %BF groups indicated higher means in overweight/obese children except for controlled motivation in boys when compared by %BF group. Psychosocial mediators predicted 19-44% of the variance in EBRB, with the exception

of physical activity (mediators predicted 8 and 11% of variance for frequency and duration, respectively). Habit strength was found to be predictive of all behaviors except physical activity frequency.

Summary

This cross-sectional analysis of weight status, EBRB, and psychosocial mediators in primarily Hispanic and Black, low-income, upper elementary school children revealed overlap in %BF by BMI weight status category, and differences in EBRB and psychosocial mediator means between weight status groups. Heavier children reported healthier behaviors, especially within the “choose less” category of behaviors. Heavier children also reported healthier psychosocial mediators. Overall, children do not seem to be meeting healthful dietary and activity recommendations. The next chapter will discuss these findings.

Chapter V

DISCUSSION

This chapter provides a discussion of the findings from this study of the relationships among two measures of weight status, energy balance related behaviors (EBRB), and psychosocial mediators in urban, Hispanic and Black, upper elementary school children. Following this discussion, study strengths, limitations, and future directions are addressed.

Discussion of Study Findings

This was one of the first studies to examine the relationship between BMI and %BF in a large sample of Hispanic and Black children. This was also one of the first studies to describe such a large range of EBRB and psychosocial mediators in low-income, urban, upper elementary school children and to analyze these relationships in the context of childhood obesity. Furthermore, this study is unique in the collection of survey data via audience response system (ARS).

45.4% of the children in our study are defined as overweight or obese by BMI and the average body fat percentage for children was 24.7% (SD 9.2%). The suggested %BF cut point at the 75th percentile classified children only slightly differently – fewer boys, but more girls would be considered overweight/obese if the suggested %BF cut point was used as a measure of weight status as opposed to BMI. Since there are no widely accepted %BF cut points for children, this should be interpreted with caution. However, this is evidence to warrant the

development of such standards. Additionally, the analysis of EBRB and psychosocial mediators by BMI and %BF cut points revealed no major differences in the two measures of weight status.

Means for “choose less” behaviors were lower (healthier) in heavier children when analyzed by both BMI and %BF. The largest difference was in processed packaged snacks. Normal weight children reported consuming almost one more processed packaged snack, such as a single-serving bag of chips or an individually wrapped pastry, per day than heavier children. Means for psychosocial mediators, such as behavioral intention, were also significantly higher (healthier) in heavier children.

Several explanations exist for the nature of our results. First, an overweight or obese child tends to remain overweight or obese throughout childhood and into adulthood. This may not require continuous energy intake exceeding energy expenditure. Hence, childhood obesity is a self-perpetuating issue even if a child maintains energy balance.

A second explanation is that degree of physical activity and overall energy expenditure can offset any excess dietary calorie intake. However, our study showed no differences in moderate to vigorous physical activity and increased reported recreational screen time (a sedentary behavior) in normal weight children compared to overweight/obese children.

Another explanation for our results is that reporting bias, due to social norms regarding EBRB and weight status, is strong. However, the *Food, Health & Choices* Questionnaire (FHC-Q) showed acceptable validity and reliability and included a measure of social desirability bias, which was controlled for in the analyses. Although controlling for social desirability may not cover the entire spectrum of bias, the control of this variable is a major strength when compared to other EBRB surveys. The use of ARS for survey administration

was also thoroughly tested against standard methods and showed no difference in reliability of results. In fact, it was observed that social desirability bias was significantly less in the ARS administration of the FHC-Q.

Finally, it is possible that current obesity prevention/reduction campaigns and programs may be having an impact on children, specifically heavier children, such that they are actually trying to eat and be healthier. New York City Department of Health and Mental Hygiene ran a campaign against sweetened beverages during the time of the data collection and New York City Department of Education has been increasingly implementing school wellness initiatives, creating healthier school environments, in the recent past.

Despite differences in EBRB and psychosocial mediators, children, overall, were far under recommendations for the “choose more” behavior of fruit and vegetables intake and far over recommendations for “choose less” behaviors: sweetened beverages, processed packaged snacks, fast food, and recreational screen time. These results and more are discussed in further detail below.

Weight Status

25.1% of the children in the study were obese compared to 18.0% nationally and 20.7% in New York City. After BMI was transformed into a rank variable for boys and girls separately, a high correlation between BMI and %BF was observed (0.913 $p < 0.001$ for boys and 0.955 $p < 0.001$ for girls) while the correlations within the categories of normal weight, overweight, and obese, correlations were not as strong and were lowest in the overweight category. A wide range of %BF was observed for each category of weight status. The range of %BF overlapped between categories of weight status, more so for boys. A possible

explanation for the greater overlap in boys is that boys tend to have a greater range of lean body mass (Freedman et al., 2004).

Data comparing BMI to %BF mirrors that of the current literature from different populations of children. Freedman and colleagues (2004) noted similar correlation differences between BMI and body fat, not %BF as was measured in this study, among the CDC weight status category groups. Pietrobelli and colleagues (1998) noted the same trend that individuals of similar BMI present with large differences in %BF.

Percent body fat percentiles can be compared to nationally representative data from NHANES (Laurson et al., 2011). The NHANES data is based on triceps skinfold measurements and not bioelectric impedance analysis (BIA), which was used in the current study. Keeping that in mind, the data in our population are the same or higher at every percentile listed except for the 98th percentiles for boys (ages 9, 10, and 11) and girls (age 10) as well as 11-year old boys in the 95th percentile.

The cut point we used for analyses was based on the highest quality nationally representative data within the age group of our participants. This cut point, the 75th percentile based on the NHANES %BF reference sample for children 8 to 19 years, was determined by researchers based on association with unhealthy lipid concentrations in youth (Lamb et al., 2011). Several cut points have been proposed based on various health risks, such as metabolic syndrome. However, these are typically in older children, 13-18 years. When it comes to health risk, a %BF cut point may be desirable over BMI. The suggested cut point at the 75th percentile for children in the study age range may be a reasonable standard.

Energy Balance Related Behaviors

It is quite surprising how far above the recommendations the children in this study are for the “choose less” behaviors. The recommendations are rather generous considering that those for sweetened beverages, processed packaged snacks, and fast food combined are based on the 140 empty calories per day – averaged from 120 calories for girls and 160 calories for boys – allotted for in the caloric requirement estimate for a child to maintain energy balance for normal growth.

Our data are not incredibly far off from current trends. Piernas and Popkin (2010) report snacking trends are moving towards 3 snacks per day, with desserts and sweetened beverages making up the majority of what they define as snacks. The data from this population exceed this national average, though the number of questions on processed packaged snacks and sweetened beverages, combined with differences in the definition of snack may account for some of the difference. New York City Department of Health and Mental Hygiene reported that children ages 6-12 years consumed at least one 12 ounce sweetened beverage per day (Alberti & Noyes, 2011). The children in our study report consuming about three times this amount of sweetened beverages per day. However, they were at the upper end of this age category. The low-income, non-White demographic of the population may explain some of this difference. This may also have something to do with the proximity, availability, variety, and high palatability of common sweetened beverages. In a study using Geographic Information Systems (GIS), Laska and colleagues (2010) found that adolescents’ intake of sweetened beverages was associated with living within 800 or 1600 meters of a fast food restaurant or convenience store after adjusting for sex, age and socio-economic status.

Another important item to look at is vegetables. Despite the fact that vegetables are served every day at school lunch, and sometimes there is an additional salad bar, almost half of the children in the study reported not eating vegetables at lunch in the previous week. Based on the size FHC-Q item, 26% of children reported consuming no vegetables in the past week at all.

We were surprised to find significant inverse correlations with BMI and/or %BF with frequency of sweetened beverages and processed packaged snacks, however, these were rather small. Regression analyses, controlling for all other behaviors revealed the following as predictors of increased weight status: decreased processed packaged snack intake, increased physical activity duration, and increased sweetened beverage size, though these accounted for 4-6% of the variance in BMI and %BF, respectively.

Differences in EBRB frequency scale means by weight status (normal weight versus overweight/obese and less than 75th %BF percentile versus ≥ 75 th percentile) revealed significantly lower frequency of sweetened beverages, processed packaged snacks and fast food in overweight/obese children and those with higher percent body fat.

Skinner and colleagues (2012) found similar results from the NHANES data collected between 2001 and 2008 (N=12,648). These authors were able to compare age groups and reported that overweight and obese girls older than seven and boys older than ten reported consuming significantly fewer calories than normal weight children of the same age. The authors offer similar explanations to those discussed in this chapter. First, it is possible that the current weight status of a child may be the result of obesity onset at an earlier age and the current status is simply maintenance of obesity as opposed to becoming more obese. Second, overweight and obese children may have significantly lower levels of physical activity. And last, there may be significant under reporting of dietary intake by heavier children due to

weight-related stigma. The authors concluded that obesity prevention and reduction might be most effective in very early childhood and possibly a focus on physical activity interventions are best suited for children, adolescents, and teens since calories seem to already be reduced in those that are overweight or obese.

Research does support the idea that obesity in late childhood can be predicted by energy intake in infants as young as four months (Ong, Emmett, Noble, Ness, & Dunger, 2006; Moreno & Rodríguez 2007). And, studies have found that heavier children perform less physical activity, or at least less intense physical activity (Belcher, Berrigan, Dodd, Emken, Chou, & Spuijt-Metz, 2010; Fulton, Dai, Steffen, Grunbaum, Shah, & Labarthe, 2009). The other concern regarding accuracy and bias of reporting one's own dietary intake, and physical activity expenditure, is a consistent limitation across all studies utilizing self-reported EBRB measurements (Black, Prentice, Goldberg, Jebb, Bingham, Livingstone, & Coward, 1993; Livingstone, Robson, & Wallace, 2004; Collins, Watson, & Burrows, 2009).

Similar to our study, Skinner and colleagues hypothesized that overweight and obese children would consume more calories than their normal weight peers. If it is truly the case that overweight and obese children consume significantly fewer calories, or even the same amount of calories than their normal weight counterparts, this may help explain some of the inconsistencies in the literature regarding energy balance related behaviors and obesity.

Additionally, our results revealed unhealthy behaviors were highly associated with other unhealthy behaviors, more so than healthy with healthy behaviors and healthy with unhealthy behaviors. The correlation coefficients between sweetened beverages, processed packaged snacks, and fast food were all above .46 with p-values <.001. The high frequency of

unhealthy food and activity behaviors in this population along with their correlation shows that there is significant room for improvement in EBRB in this population.

There was one very similar study to the current study, which was baseline analysis of the Health in Adolescents (HEIA) intervention in 1103 11-year old children from Norway by Grydeland and colleagues (2012). Researchers measured intake of sugar sweetened beverages, snacks, computer games, and television viewing. Between these variables and weight, the only association identified was television viewing. Boys had a doubled risk of being overweight for every additional hour of television viewed per week. Similar to our findings, authors were surprised by the lack of positive association between weight status and sweetened beverages as well as the other study variables.

Research shows there is stability in consumption patterns. In a Norwegian study by Lien and colleagues (2001), the proportion of teenagers that remained in the same tracking categories through age 21 for fruit, vegetables, high sugar foods, and sweetened beverages was 50-70%. For those who changed categories, intake of fruits and vegetables decreased and intake of sugary foods and drinks increased, though there were also a smaller amount of healthful changes. If this is the case in our population, even though some high consumers of unhealthy items may not be overweight or obese right now, they may be at risk of becoming overweight or obese in the near or distant future. Incorporating healthy food and physical activity habits at an early age may help mitigate obesity and related diseases later in life. Additionally, other health consequences besides weight status – heart disease and related conditions for example – are affected by EBRB and improvement in these behaviors can benefit overall health.

Psychosocial Mediators

Mediator analyses showed that means for many mediator scales were significantly higher (corresponding to healthier) for overweight/obese children. These results are consistent with EBRB data observed in this study. Overall, heavier children reported healthier EBRB and psychosocial mediators.

In line with other studies, the mediators predictive of the EBRB in this study were habit strength, intention, outcome expectations, and self-efficacy (van Stralen et al., 2011). Habit strength was the most common predictor of individual EBRB and this is not surprising as it is intuitive that habits, or typical behavior, might greatly influence reported behavior. The selected psychosocial mediators predicted a sizable portion of the variance in EBRB. Analyses of psychosocial mediators as predictors of EBRB is still a rather new field, especially in studies involving sedentary behaviors such as recreational screen time. Results from our study as well as others indicate need for further investigation of the links between childhood obesity, EBRB, and predictive mediators to determine appropriate target mediators for interventions.

Strengths

This study is one of the first to describe an array of EBRB, BMI, %BF, and psychosocial mediators in a large sample of low-income Hispanic and Black children. These children came from a very practical and real-world setting of New York City public schools. This study is replicable in New York City as well as other large urban areas with similar race distribution.

This study is one of the first of its kind to compare %BF and BMI in a large sample of urban children and to look at the associations among both measures of weight status with EBRB and psychosocial mediators. As a baseline analysis, this quality and quantity of data is

exciting, and as an intervention study it will be even more valuable once post-assessment analyses are completed.

This study demonstrated validation of a new instrument for measuring EBRB and psychosocial mediators. This instrument is particularly useful because of the very positive reception to the new method of administration by the school staff and students.

Also, the ability of the survey to create a variable for the purposes of adjusting for social desirability is rather innovative and much needed in the field of dietary and physical activity assessment. The ability to adjust results for social desirability allows us to interpret the results with less skepticism due to bias seen in many dietary studies.

Limitations

This study is limited in the conclusions we can draw from the results since we only have data for a single time point. The cross-sectional nature of this study does not allow us to make inferences regarding the causality or patterns over time among the variables. The cross-sectional nature of this study allowed for such a large sample size that might not otherwise be possible in longitudinal studies.

Dietary and physical activity measurement via self-reported surveys has limitations discussed in Chapter II as well as above in the discussion of the Skinner (2012) article. The current study attempted to mitigate this somewhat through the measurement and control of social desirability. The ARS also has potential, based on our validation data, to lower socially desirable response bias. It is possible that the heightened student engagement allows for more accurate and honest reporting.

The FHC-Q was not designed to measure total energy intake and therefore we cannot control for this variable. It is possible that although heavier children consume less of the

“choose less” items than normal weight children, their overall energy intake could be greater. The FHC-Q also did not capture information on regular meals and their quality and quantity. It is possible that the children consuming lots of processed packaged snacks, for example, do this in place of a meal and are then still technically in energy balance. Research is currently being conducted with the FHC-Q to capture more daily caloric intake and meal data to try and mitigate these issues.

While the Tanita SC331S is not validated in children, it is validated in adults and this particular model was designed for use in children, based on similar models validated in studies with children (Tanita Corporation, 2009). Along with this limitation come the inherent flaws in bioelectrical impedance analysis, which include altered measurement when children are improperly hydrated. To address this, researchers made all practical attempts to measure the children once they had gone to the bathroom, as early as possible in the morning, while also checking to make sure no strenuous exercise was done within 12 hours. Also, although children at this age are generally pre-pubescent, there may be some variation in the stage of puberty that was not captured by the data collected for this study due to practical limitations of research in the school setting.

Finally, due to confusion on the question of race during the survey administration, we were unfortunately unable to analyze the data by race. However, we were able to control for race at the school-level. This factor may be important since there may be differences between racial groups in our sample, specifically between Black and Hispanic children. Additionally, we controlled for socioeconomic status and reading level, but again, at the school level since this data was not available to us at the individual level.

Formative Evaluation Results

Recently analyzed, the data from the formative evaluation of the *Food, Health & Choices* study (N=66) showed significant reduction in BMI and %BF and a significant change in sweetened beverage and processed packaged snacks. EBRB in the formative evaluation of the *Food, Health & Choices* study were the same as those measured in this study. Participating classrooms were given the FHC-Q in the fall of 2011, followed by the *Food, Health & Choices* curriculum and wellness intervention over the course of the school year and then the FHC-Q post-test in the Spring of 2012.

Formative evaluation results showed BMI z-score went from: pre=0.98 (1.2) to post=0.81 (1.3) $p=.001$ and percent body fat from pre=26.1 (9.6) to post=24.3 (9.9) $p<.001$. The significant changes in behavior were a decrease in the “fruit drink and sweetened iced tea” item frequency (pre=3.06 +/- 1.4, post=2.66+/-1.2, $p=.028$) and “cookies, brownies, pies, or cakes” item (pre=2.33 +/- 1.3, post=2.00+/-1.3, $p=.049$). These data were based on the scale 1=0 times per week, 2=1-2 times per week, 3=3-4 times per week, 4=almost every day, and 5=two or more times every day.

The same psychosocial mediators measured in this study were tested in the formative evaluation. The following mediators improved from pre to post test: sweetened beverage outcome expectations and knowledge of physical activity recommendations.

Implications for Practice

This study does not necessarily downplay the targeting of these particular behaviors for intervention. Longitudinal data still support their importance for prevention of obesity and overall health.

One clear implication of the study is the use of another measure of weight status, such as percent body fat to at least verify study relationships, if not increase the chances of finding relationships between EBRB and weight status. Though the results of this study did not show major differences in comparisons of EBRB and psychosocial mediators based on BMI versus %BF, it is possible that forthcoming post-intervention data could show changes in one more than the other. BMI is a good first measure of weight status, but it may not tell the entire story.

Additionally, common and practical measurement instruments are always needed for research purposes and the FHC-Q is a promising tool for measurement of EBRB and psychosocial mediators, especially with administration via ARS. Ongoing improvements to the instrument were discussed in the previous section. This study warrants the possible use of ARS for application to other dietary and physical activity questionnaires as well.

Future Directions for Research

The overlapping and large ranges of %BF per BMI category reflect a need for further investigation. This research adds to the growing need to develop better weight classification standards for children to identify those most at risk for obesity and related diseases. Valid and reliable instruments are needed to expand research on body fat measurement, particularly those appropriate for real-world settings, such as the portable Tanita bioelectrical impedance body composition analyzer that was used in this study. Further research is needed in this area, especially with attention to racial differences and puberty status.

There remains a need for clear evidence identifying specific modifiable behaviors to prevent and reduce childhood obesity. The FHC-Q provides researchers with a practical instrument for measurement of EBRB in children, which can be developed to account for total

energy intake. With such instruments, the study of EBRB can progress. Then appropriate childhood obesity prevention interventions can be created targeting the most influential EBRB.

In response to this baseline data analysis, the *Food, Health & Choices* research team is currently testing questions measuring typical meals to test the hypothesis that children often substitute meals with high-calorie, nutrient-poor snacks such as chips and sweetened beverages, and this may be the reason that children eat unhealthful foods, but remain in energy balance. While it is not feasible to collect and analyze multiple 24-hour recalls from such a large sample, surrogate questions estimating typical meal size and composition may prove to be feasible estimates.

Once EBRB are identified in a population, interventions should focus on mediators most predictive of those behaviors. Though our EBRB were not highly correlated with weight status, the fact that habit strength was a mediator of all EBRB measured in our study suggests that this mediator may be important to any EBRB and focusing interventions on modifying habits may prove to be effective.

It goes without saying that childhood obesity prevention is of utmost importance to the future of our country in terms of health and economics. Though this study did not show strong relationships between the chosen EBRB and weight status as we had expected, it did show how poor the EBRB of this population are. This strengthens the need for further research into specific modifiable behaviors. Post-intervention results are forthcoming from this ongoing study and should give us more insight into the complex nature of EBRB, mediators, and weight status. There is still much work to do to improve the diet and physical activity patterns of children so they can remain healthy children and grow to become healthy adults.

Conclusion

This study sheds light on the complex relationships among body mass index percentile for age, percent body fat, energy balance related behaviors, and psychosocial mediators in primarily Hispanic and Black urban upper elementary school children. Heavier children exhibited more healthful behaviors as well as healthier psychosocial mediators. This is puzzling considering the abundance of evidence linking the study's chosen EBRB with increased weight status in other studies as well as the fact that these EBRB are addressed in childhood obesity prevention policy documents. However, despite differences in EBRB and psychosocial mediators, children, overall were far below recommendations for the "choose more" behavior of fruit and vegetables intake and far over recommendations for "choose less" behaviors: sweetened beverages, processed packaged snacks, fast food, and recreational screen time. Thus, the study should not be interpreted as providing evidence that these behaviors are not important to target in interventions, as longitudinal data still supports their importance for prevention of obesity as well as promotion of health in general. In addition, we do not have data on the children's overall energy intake and expenditure. This study does question the conventional assumption that overweight and obese children necessarily consume more unhealthful snacks and drinks, such as those measured in this study, as well as do less physical activity and more screen time compared to normal weight children. The findings of the current study, the baseline analysis of the *Food, Health & Choices* intervention study, will allow researchers to better understand the outcomes of the intervention. In conclusion, the results suggest need for further investigation of childhood obesity associations with EBRB and mediators as well as the development of percent body fat standards in children.

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APPENDIX A

Food, Health & Choices Questionnaire (FHC-Q)

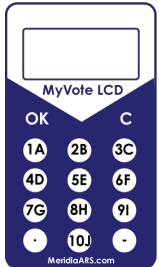
My Vote Survey

You have your **'My Vote LCD' keypad!**

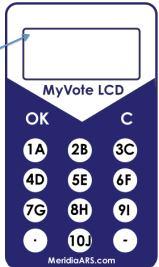
You will use this to enter your responses for this survey.




To turn on your keypad press "OK."




You will see a symbol appear in the corner.



To enter your response you will press the buttons on the keypad. You DO NOT need to hit "OK."



The response options will be at the bottom of the screen. For each question, choose the best response for you.



For this response, press:
1A

For this response, press:
2B

For this response, press:
3C

For this response, press:
4D

For this response, press:
5E

My Food and Activity Vote Survey

Please think about what you ate and drank **during the past week** as you complete this survey.

Some questions ask you about how often or how much you ate certain foods or did some physical activities. There are also some questions that ask for your opinions about foods and activities.

We will start with a few examples.

For each question, think about **how many times** you had this kind of food in the **past week**.

The past week includes...

For each question, think about **how many times** you had this kind of food in the **past week**.

0 times
1A

About 1-2 times
2B

About 3-4 times
3C

Almost everyday
4D

2 or more times every day
5E

Test

Click:2B

Test results

11%	1.	Red
11%	2.	Blue
11%	3.	Green
11%	4.	Yellow
11%	5.	Orange
11%	6.	Purple
11%	7.	Light Blue
11%	8.	Light Green
11%	9.	Light Orange

Your Answer: **2B**

Test 10

Click:8H

Test results

11%	1.	Red
11%	2.	Light Blue
11%	3.	Dark Blue
11%	4.	Light Purple
11%	5.	Light Green
11%	6.	Light Yellow
11%	7.	Light Orange
11%	8.	Light Pink
11%	9.	Light Cyan


Your Answer: **8H**

In the past **week** I ate... 10

Example 1: **pizza** 

0 times 1A	About 1-2 times 2B	About 3-4 times 3C	Almost everyday 4D	2 or more times every day 5E
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In the past **week** I ate... 07

Example 2: **breakfast cereal** 

0 times 1A	About 1-2 times 2B	About 3-4 times 3C	Almost everyday 4D	2 or more times every day 5E
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In the past **week** I ate... 5

Example 3: **sandwiches** 

0 times 1A	About 1-2 times 2B	About 3-4 times 3C	Almost everyday 4D	2 or more times every day 5E
----------------------	------------------------------	------------------------------	------------------------------	--


Say what
you really think.
Not what you think we want to hear.

In the past **week** I ate... 5

1. **apples** 


0 times 1A	About 1-2 times 2B	About 3-4 times 3C	Almost everyday 4D	2 or more times every day 5E
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In the past **week** I ate... 5

2. **grapes** 

0 times 1A	About 1-2 times 2B	About 3-4 times 3C	Almost everyday 4D	2 or more times every day 5E
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In the past **week** I ate... 5

3. **oranges** 

0 times 1A	About 1-2 times 2B	About 3-4 times 3C	Almost everyday 4D	2 or more times every day 5E
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In the past **week** I ate... 5

4. **bananas** 

0 times 1A	About 1-2 times 2B	About 3-4 times 3C	Almost everyday 4D	2 or more times every day 5E
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In the past week I ate... 5

5. fruits at breakfast


0 times	About 1-2 times	About 3-4 times	Almost everyday
1A	2B	3C	4D

In the past week I ate... 5

6. fruits at lunch


0 times	About 1-2 times	About 3-4 times	Almost everyday
1A	2B	3C	4D

In the past week I ate... 5

7. broccoli 


0 times	About 1-2 times	About 3-4 times	Almost everyday	2 or more times every day
1A	2B	3C	4D	5E

In the past week I ate... 5

8. carrots 

0 times	About 1-2 times	About 3-4 times	Almost everyday	2 or more times every day
1A	2B	3C	4D	5E

In the past week I ate... 5

9. dark green leafy vegetables 

0 times	About 1-2 times	About 3-4 times	Almost everyday	2 or more times every day
1A	2B	3C	4D	5E

In the past week I ate... 5

10. tomatoes 

0 times	About 1-2 times	About 3-4 times	Almost everyday	2 or more times every day
1A	2B	3C	4D	5E

In the past week I ate... 5

11. vegetables at lunch
(DO NOT count fried potatoes or French fries)

0 times	About 1-2 times	About 3-4 times	Almost everyday
1A	2B	3C	4D

In the past week I ate... 5

12. vegetables at dinner
(DO NOT count fried potatoes or French fries)

0 times	About 1-2 times	About 3-4 times	Almost everyday
1A	2B	3C	4D

For each question, think about **how many times** you did this kind of activity in the **past week**.

For each question, think about **how many times** you did this kind of **activity** in the **past week**.

0 times	About 1-2 times	About 3-4 times	Almost everyday	2 or more times every day
1A	2B	3C	4D	5E

In the past week I

13. sat and watched TV



0 times	About 1-2 times	About 3-4 times	Almost everyday	2 or more times every day
1A	2B	3C	4D	5E

In the past week I

14. sat and played video or computer games (DO NOT count Wii Fit or other fitness games)



0 times	About 1-2 times	About 3-4 times	Almost everyday	2 or more times every day
1A	2B	3C	4D	5E

For the next set of questions, we will ask you about **different kinds of activity**.

up and moving




Light

my heart beat **a little** faster

Medium


my heart beating **really** fast

Heavy

In the past week I

15. did things that got me **up and moving**



0 times	About 1-2 times	About 3-4 times	Almost everyday	2 or more times every day
1A	2B	3C	4D	5E

In the past week I

16. did things that made my heart beat **a little** faster



0 times	About 1-2 times	About 3-4 times	Almost everyday	2 or more times every day
1A	2B	3C	4D	5E

In the past week I

17. did things that got my heart beating **really** fast



0 times	About 1-2 times	About 3-4 times	Almost everyday	2 or more times every day
1A	2B	3C	4D	5E

How true is each statement for you?

How true is each statement for you?

Not at all true for me	Not true for me	Neither true or not true	Somewhat true for me	Very true for me
1A	2B	3C	4D	5E

Say what
you really think.
 Not what you think we
 want to hear.

I would like to... 5

18. eat more fruits and vegetables

Not at all true for me	Not true for me	Neither true or not true	Somewhat true for me	Very true for me
1A	2B	3C	4D	5E

I would like to... 5

19. do more physical activity

Not at all true for me	Not true for me	Neither true or not true	Somewhat true for me	Very true for me
1A	2B	3C	4D	5E

I would like to... 5

20. spend **less** time on computer games or watching TV

Not at all true for me	Not true for me	Neither true or not true	Somewhat true for me	Very true for me
1A	2B	3C	4D	5E

Eating fruits and vegetables 5

21. helps me do well at school

Not at all true for me	Not true for me	Neither true or not true	Somewhat true for me	Very true for me
1A	2B	3C	4D	5E

Eating fruits and vegetables 5

22. helps my body do what I want it to do

Not at all true for me	Not true for me	Neither true or not true	Somewhat true for me	Very true for me
1A	2B	3C	4D	5E

Eating fruits and vegetables 5

23. makes me feel good about myself

Not at all true for me	Not true for me	Neither true or not true	Somewhat true for me	Very true for me
1A	2B	3C	4D	5E

Eating fruits and vegetables 5

24. is part of my daily routine

Not at all true for me	Not true for me	Neither true or not true	Somewhat true for me	Very true for me
1A	2B	3C	4D	5E

Being physically active... 5

25. helps me do well at school

Not at all true for me	Not true for me	Neither true or not true	Somewhat true for me	Very true for me
1A	2B	3C	4D	5E

Being physically active... 5

26. helps me stay in energy balance

Not at all true for me	Not true for me	Neither true or not true	Somewhat true for me	Very true for me
1A	2B	3C	4D	5E

Being physically active... 5

27. makes me feel good about myself

Not at all true for me	Not true for me	Neither true or not true	Somewhat true for me	Very true for me
1A	2B	3C	4D	5E

Sitting and watching TV or playing video games... 5

28. helps me do well at school

Not at all true for me	Not true for me	Neither true or not true	Somewhat true for me	Very true for me
1A	2B	3C	4D	5E

Sitting and watching TV or playing video games... 5

29. helps me stay in energy balance

Not at all true for me	Not true for me	Neither true or not true	Somewhat true for me	Very true for me
1A	2B	3C	4D	5E

Sitting and watching TV or playing video games... 5

30. makes me feel good about myself

Not at all true for me	Not true for me	Neither true or not true	Somewhat true for me	Very true for me
1A	2B	3C	4D	5E

Say what
you really think.
 Not what you think we
 want to hear.

When I think about myself... 5

31. exercise is part of my daily routine

Not at all true for me	Not true for me	Neither true or not true	Somewhat true for me	Very true for me
1A	2B	3C	4D	5E

When I think about myself... 5

32. watching TV or playing video games is part of my daily routine

Not at all true for me	Not true for me	Neither true or not true	Somewhat true for me	Very true for me
1A	2B	3C	4D	5E

When I think about myself... 5

33. eating breakfast every morning is part of my routine

Not at all true for me	Not true for me	Neither true or not true	Somewhat true for me	Very true for me
1A	2B	3C	4D	5E

I believe that... 5

34. I can set a goal for healthy eating

Not at all true for me 1A	Not true for me 2B	Neither true or not true 3C	Somewhat true for me 4D	Very true for me 5E
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I believe that... 5

35. when I have a goal I can follow through with it pretty well

Not at all true for me 1A	Not true for me 2B	Neither true or not true 3C	Somewhat true for me 4D	Very true for me 5E
------------------------------	-----------------------	--------------------------------	----------------------------	------------------------

I believe that... 5

36. I know how to keep track of my food intake

Not at all true for me 1A	Not true for me 2B	Neither true or not true 3C	Somewhat true for me 4D	Very true for me 5E
------------------------------	-----------------------	--------------------------------	----------------------------	------------------------




For each food tell us **how much** you usually ate during the past week.

For each food tell us **how much** you usually ate during the past week.

I didn't eat this 1A	Less than small 2B	small 3C	medium 4D	large 5E	more than large 6F
-------------------------	-----------------------	-------------	--------------	-------------	-----------------------




How much did you usually eat at **one time**? 5

37. fruits
(such as apples, grapes, oranges, or bananas)

I didn't eat this 1A	Less than small 2B	 small 3C	 medium 4D	 large 5E	more than large 6F
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How much did you usually eat at **one time**? 5

38. vegetables
(such as green salad, broccoli, carrots, and tomatoes
DO NOT count fried potatoes or French fries)

I didn't eat this 1A	Less than small 2B	 small 3C	 medium 4D	 large 5E	more than large 6F
-------------------------	-----------------------	--	---	--	-----------------------

Time for a quick stretch break!


During the **past week** how long did **you usually** do these activities?

During the **past week** how long did **you usually** do these activities?

Less than half an hour	Half an hour to 1 hour	2 hours	3 hours	More than 3 hours
1A	2B	3C	4D	5E

How long each time did I...


39. sit and watch TV



Less than half an hour	Half an hour to 1 hour	2 hours	3 hours	More than 3 hours
1A	2B	3C	4D	5E

How long each time did I...

40. sit and play video or computer games (DO NOT count Wii Fit or other fitness games)



Less than half an hour	Half an hour to 1 hour	2 hours	3 hours	More than 3 hours
1A	2B	3C	4D	5E

For the next set of questions, we will ask you about **different kinds of activity.**

up and moving


Light

my heart beat **a little** faster

Medium


my heart beating **really** fast

Heavy



How long each time did I...


41. do things that got me **up and moving**



Less than half an hour	Half an hour to 1 hour	2 hours	3 hours	More than 3 hours
1A	2B	3C	4D	5E

How long each time did I...


42. do things that made my heart beat **a little** faster



Less than half an hour	Half an hour to 1 hour	2 hours	3 hours	More than 3 hours
1A	2B	3C	4D	5E

How long each time did I...

43. do things that got my heart beating **really** fast



Less than half an hour	Half an hour to 1 hour	2 hours	3 hours	More than 3 hours
1A	2B	3C	4D	5E

How sure are you that **you** can do the following activities?

How **sure** are you that **you** can do the following activities?

Not at all sure	A little sure	Neither sure or not sure	Sure	Very sure
1A	2B	3C	4D	5E

Say what
you really think.
 Not what you think we
 want to hear.

I am sure I can... 5

44. eat fruits at breakfast

Not at all sure	A little sure	Neither sure or not sure	Sure	Very sure
1A	2B	3C	4D	5E

I am sure I can... 5

45. eat fruits at school lunch

Not at all sure	A little sure	Neither sure or not sure	Sure	Very sure
1A	2B	3C	4D	5E

I am sure I can... 5

46. eat vegetables at school lunch

Not at all sure	A little sure	Neither sure or not sure	Sure	Very sure
1A	2B	3C	4D	5E

I am sure I can... 5

47. eat vegetables at dinner

Not at all sure	A little sure	Neither sure or not sure	Sure	Very sure
1A	2B	3C	4D	5E

I am sure I can... 5

48. eat fruits and vegetables for snacks

Not at all sure	A little sure	Neither sure or not sure	Sure	Very sure
1A	2B	3C	4D	5E

I am sure I can... 5

49. participate in sports or other exercise at school

Not at all sure	A little sure	Neither sure or not sure	Sure	Very sure
1A	2B	3C	4D	5E

I am sure I can... 5

50. walk to get exercise

Not at all sure	A little sure	Neither sure or not sure	Sure	Very sure
1A	2B	3C	4D	5E

I am sure I can... 0 5

51. **walk or bike to school instead of taking a car, bus, or subway**

Not at all sure	A little sure	Neither sure or not sure	Sure	Very sure
1A	2B	3C	4D	5E

I am sure I can... 0 5

52. **watch TV no more than 1 hour per day**

Not at all sure	A little sure	Neither sure or not sure	Sure	Very sure
1A	2B	3C	4D	5E

I am sure I can... 0 5

53. **play video games no more than 1 hour a day**

Not at all sure	A little sure	Neither sure or not sure	Sure	Very sure
1A	2B	3C	4D	5E

I am sure I can... 0 5

54. **do other things instead of watching TV or playing video games**

Not at all sure	A little sure	Neither sure or not sure	Sure	Very sure
1A	2B	3C	4D	5E

Think about **yourself** and your **daily routine** and mark 'yes' or 'no' for each statement.

Think about **yourself** and your **daily routine** and mark 'yes' or 'no' for each statement.

Yes	No
1A	2B

Say what **you really think.**
Not what you think we want to hear.

I ... 0 5

55. **always** wash my hands before every meal

Yes	No
1A	2B

I ... 0 5

56. **always** brush my teeth after every meal

Yes	No
1A	2B

I ... 5

57. am **always** polite, even to people who are not very nice

Yes	No
1A	2B

I ... 5

58. sometimes do things I have **been told not to do**

Yes	No
1A	2B

I ... 5

59. **always** listen to my parents

Yes	No
1A	2B

I ... 5

60. sometimes wish I could just play around instead of having to go to school

Yes	No
1A	2B

I ... 5

61. **always** do the right thing

Yes	No
1A	2B

I ... 5

62. sometimes feel angry when I don't get my way

Yes	No
1A	2B

I ... 5

63. sometimes feel like making fun of other people

Yes	No
1A	2B

Mark the response you think is **true**.

According to experts... 5

64. how many cups of fruit and vegetables should someone your age eat each day?
(one cup is about the size of your fist)

About 1 cup	About 2 cups	About 3 cups	About 4 cups	About 5 cups
1A	2B	3C	4D	5E

According to experts... 5

65. eating breakfast will help someone your age do better in school.

True	False
1A	2B


According to experts... 5

66. how long should someone your age do physical activity each day?

30 minutes	45 minutes	60 minutes	90 minutes
1A	2B	3C	4D

Thank you for taking My Vote Survey!

On the sheet of paper write your name and your My Vote LCD number




Date _____
First Name _____ Last Name _____
School _____ Class _____ My Vote LCD number _____

Food and Activity


My Vote Survey

You have your **My Vote keypad!**


You will use this to enter your responses for this survey.




To turn on your My Vote keypad press "OK."




You will see a symbol appear in the corner.



To enter your response you will press the buttons on the My Vote keypad. You DO NOT need to hit "OK."



The response options will be at the bottom of the screen. For each question, choose the best response for you.



For this response, press:	For this response, press:	For this response, press:	For this response, press:	For this response, press:
1A	2B	3C	4D	5E

My Drinks and Snacks Vote Survey

Please think about what you ate and drank **during the past week** as you complete this survey.

Some questions ask you about how often or how much you ate certain foods and drinks. There are also some questions that ask for your opinions about foods and drinks.

We will start with an example.

For each question, think about **how many times** you had this kind of food in the **past week**.

The past week includes...


For each question, think about **how many times** you had this kind of food in the **past week**.

0 times	About 1-2 times	About 3-4 times	Almost everyday	2 or more times every day
1A	2B	3C	4D	5E

For each question, think about **how many times** you had this kind of food in the **past week**.

0 times	About 1-2 times	About 3-4 times	Almost everyday	2 or more times every day
1A	2B	3C	4D	5E


In the past week I ate...

Example: **sandwiches** 

0 times 1A	About 1-2 times 2B	About 3-4 times 3C	Almost everyday 4D	2 or more times every day 5E
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Say what
you really think.
Not what you think we want to hear.

In the past week I drank...

1. fruit drinks & sweetened iced teas 

0 times 1A	About 1-2 times 2B	About 3-4 times 3C	Almost everyday 4D	2 or more times every day 5E
---------------	-----------------------	-----------------------	-----------------------	---------------------------------

In the past week I drank...

2. sodas 

0 times 1A	About 1-2 times 2B	About 3-4 times 3C	Almost everyday 4D	2 or more times every day 5E
---------------	-----------------------	-----------------------	-----------------------	---------------------------------

In the past week I drank...

3. sports drinks 

0 times 1A	About 1-2 times 2B	About 3-4 times 3C	Almost everyday 4D	2 or more times every day 5E
---------------	-----------------------	-----------------------	-----------------------	---------------------------------

In the past week I drank...

4. flavored water 


0 times 1A	About 1-2 times 2B	About 3-4 times 3C	Almost everyday 4D	2 or more times every day 5E
---------------	-----------------------	-----------------------	-----------------------	---------------------------------

In the past week I drank...

5. milk
(include white and flavored) 

0 times 1A	About 1-2 times 2B	About 3-4 times 3C	Almost everyday 4D	2 or more times every day 5E
---------------	-----------------------	-----------------------	-----------------------	---------------------------------

In the past week I ate...

6. potato chips, tortilla chips, corn chips and puffs 

0 times 1A	About 1-2 times 2B	About 3-4 times 3C	Almost everyday 4D	2 or more times every day 5E
---------------	-----------------------	-----------------------	-----------------------	---------------------------------

In the past week I ate...

7. other salty snacks
(such as Cheese Nips, Chex Mix, or pretzels) 

0 times 1A	About 1-2 times 2B	About 3-4 times 3C	Almost everyday 4D	2 or more times every day 5E
---------------	-----------------------	-----------------------	-----------------------	---------------------------------

In the past week I ate... 5

8. candy



0 times	About 1-2 times	About 3-4 times	Almost everyday	2 or more times every day
1A	2B	3C	4D	5E

In the past week I ate... 5


9. donuts and pastries



0 times	About 1-2 times	About 3-4 times	Almost everyday	2 or more times every day
1A	2B	3C	4D	5E

In the past week I ate... 5

10. cookies, brownies, pies, or cakes



0 times	About 1-2 times	About 3-4 times	Almost everyday	2 or more times every day
1A	2B	3C	4D	5E

In the past week I ate... 5


11. ice cream, milkshakes, or popsicles



0 times	About 1-2 times	About 3-4 times	Almost everyday	2 or more times every day
1A	2B	3C	4D	5E

In the past week I ate... 5

12. fast food



0 times	About 1-2 times	About 3-4 times	Almost everyday	2 or more times every day
1A	2B	3C	4D	5E

How true is each statement for **you**?

How true is each statement for **you**?

Not at all true for me	Not true for me	Neither true or not true	Somewhat true for me	Very true for me
1A	2B	3C	4D	5E

Say what
you really think.
Not what you think we want to hear.

Sweetened beverages are fruit drinks, iced-teas, sodas, and sports drinks.

I would like to... 5

13. drink **fewer** sweetened beverages

Not at all true for me 1A	Not true for me 2B	Neither true or not true 3C	Somewhat true for me 4D	Very true for me 5E
------------------------------	-----------------------	--------------------------------	----------------------------	------------------------

Packaged snacks are chips, candy, cookies, and popsicles.

I would like to... 5

14. eat **fewer** packaged snacks

Not at all true for me 1A	Not true for me 2B	Neither true or not true 3C	Somewhat true for me 4D	Very true for me 5E
------------------------------	-----------------------	--------------------------------	----------------------------	------------------------

Fast foods are foods from quick service, counter style restaurants such as **burgers, fries, fried chicken, pizza, tacos, burritos,** and **take-out Chinese food.**

I would like to... 5

15. eat **fewer** fast foods

Not at all true for me 1A	Not true for me 2B	Neither true or not true 3C	Somewhat true for me 4D	Very true for me 5E
------------------------------	-----------------------	--------------------------------	----------------------------	------------------------

Sweetened beverages are fruit drinks, iced-teas, sodas, and sports drinks.

Drinking lots of sweetened beverages... 5

16. helps me do well at school

Not at all true for me 1A	Not true for me 2B	Neither true or not true 3C	Somewhat true for me 4D	Very true for me 5E
------------------------------	-----------------------	--------------------------------	----------------------------	------------------------

Drinking lots of sweetened beverages... 5

17. helps me stay in energy balance

Not at all true for me 1A	Not true for me 2B	Neither true or not true 3C	Somewhat true for me 4D	Very true for me 5E
------------------------------	-----------------------	--------------------------------	----------------------------	------------------------

Drinking lots of sweetened beverages... 5

18. makes me feel good about myself

Not at all true for me 1A	Not true for me 2B	Neither true or not true 3C	Somewhat true for me 4D	Very true for me 5E
------------------------------	-----------------------	--------------------------------	----------------------------	------------------------

Packaged snacks are **chips, candy, cookies, and popsicles.**

Eating lots of packaged snacks... 5

19. helps me do well at school

Not at all true for me	Not true for me	Neither true or not true	Somewhat true for me	Very true for me
1A	2B	3C	4D	5E

Eating lots of packaged snacks... 5

20. helps me stay in energy balance

Not at all true for me	Not true for me	Neither true or not true	Somewhat true for me	Very true for me
1A	2B	3C	4D	5E

Eating lots of packaged snacks... 5

21. makes me feel good about myself

Not at all true for me	Not true for me	Neither true or not true	Somewhat true for me	Very true for me
1A	2B	3C	4D	5E

Say what
you really think.
 Not what you think we want to hear.

The reason I would eat healthy foods... 5

22. is because it fits in with what I want to do with my life

Not at all true for me	Not true for me	Neither true or not true	Somewhat true for me	Very true for me
1A	2B	3C	4D	5E

The reason I would eat healthy foods... 5

23. is because I personally believe it is the best thing for my health

Not at all true for me	Not true for me	Neither true or not true	Somewhat true for me	Very true for me
1A	2B	3C	4D	5E

The reason I would eat healthy foods... 5

24. I really don't think about eating healthy

Not at all true for me	Not true for me	Neither true or not true	Somewhat true for me	Very true for me
1A	2B	3C	4D	5E

The reason I would eat healthy foods... 5

25. is because others would be upset with me if I did not

Not at all true for me	Not true for me	Neither true or not true	Somewhat true for me	Very true for me
1A	2B	3C	4D	5E

The reason I would eat healthy foods... 5

26. is because it is what people tell me to do and I don't think about it

Not at all true for me	Not true for me	Neither true or not true	Somewhat true for me	Very true for me
1A	2B	3C	4D	5E

The reason I would eat healthy foods... 5

27. is because it is an important choice I really want to make

Not at all true for me	Not true for me	Neither true or not true	Somewhat true for me	Very true for me
1A	2B	3C	4D	5E

The reason I would eat healthy foods... 5

28. is because I would feel bad about myself if I did not eat healthy foods

Not at all true for me	Not true for me	Neither true or not true	Somewhat true for me	Very true for me
1A	2B	3C	4D	5E

The reason I would eat healthy foods... 5

29. is because I want others to see I can do it

Not at all true for me	Not true for me	Neither true or not true	Somewhat true for me	Very true for me
1A	2B	3C	4D	5E

The reason I would eat healthy foods... 5

30. I really don't know why I eat healthy foods

Not at all true for me	Not true for me	Neither true or not true	Somewhat true for me	Very true for me
1A	2B	3C	4D	5E

When I think about myself... 5

31. I feel confident in my ability to eat healthy regularly

Not at all true for me	Not true for me	Neither true or not true	Somewhat true for me	Very true for me
1A	2B	3C	4D	5E

When I think about myself... 5

32. I am capable of eating healthy regularly

Not at all true for me	Not true for me	Neither true or not true	Somewhat true for me	Very true for me
1A	2B	3C	4D	5E

When I think about myself... 5

33. I can keep eating healthy over the long-term

Not at all true for me	Not true for me	Neither true or not true	Somewhat true for me	Very true for me
1A	2B	3C	4D	5E

When I think about myself... 5

34. drinking water is part of my daily routine

Not at all true for me	Not true for me	Neither true or not true	Somewhat true for me	Very true for me
1A	2B	3C	4D	5E

When I think about myself... 5

35. drinking **sweetened beverages** is part of my daily routine

Not at all true for me	Not true for me	Neither true or not true	Somewhat true for me	Very true for me
1A	2B	3C	4D	5E

When I think about myself... 5

36. eating **packaged snacks** is part of my daily routine

Not at all true for me	Not true for me	Neither true or not true	Somewhat true for me	Very true for me
1A	2B	3C	4D	5E

When I think about myself... 5

37. eating **fast food** is part of my daily routine

Not at all true for me	Not true for me	Neither true or not true	Somewhat true for me	Very true for me
1A	2B	3C	4D	5E




Time for a quick stretch break!

For each food or drink tell us **how much** you usually ate during the past week.

For each food or drink tell us **how much** you usually ate during the past week.




How much did you usually drink at **one time**? 5

38. sodas, fruit drinks or iced-teas

I didn't eat this 1A	Less than small 2B	 small 3C	 medium 4D	 large 5E	more than large 6F
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How much did you usually drink at **one time**? 5

39. sports drinks or flavored waters

I didn't eat this 1A	Less than small 2B	 small 3C	 medium 4D	 large 5E	more than large 6F
--------------------------------	------------------------------	---	--	---	------------------------------




How much did you usually eat at **one time**? 5

40. chips and other salty snacks
(such as Ruffles, Cheese Nips, Chex Mix, or pretzels)

I didn't eat this 1A	Less than small 2B	 small 3C	 medium 4D	 large 5E	more than large 6F
--------------------------------	------------------------------	---	--	---	------------------------------




How much did you usually eat at **one time**? 5

41. candy
(such as lollipops, gummies, or chocolate bars)

I didn't eat this 1A	Less than small 2B	 small 3C	 medium 4D	 large 5E	more than large 6F
--------------------------------	------------------------------	---	--	---	------------------------------




How much did you usually eat at **one time**? 5

42. baked goods
(such as cookies, brownies, pies, or cakes)

I didn't eat this 1A	Less than small 2B	 small 3C	 medium 4D	 large 5E	more than large 6F
--------------------------------	------------------------------	---	--	---	------------------------------




How much did you usually eat at **one time**? 5

43. ice cream
(such as ice cream sandwiches, popsicles, or sundaes)

I didn't eat this 1A	Less than small 2B	 small 3C	 medium 4D	 large 5E	more than large 6F
--------------------------------	------------------------------	---	--	---	------------------------------

What **SIZE** did you usually have? 5

44. fast food burgers or sandwiches

I didn't eat this 1A	Less than small 2B	 small 3C	 medium 4D	 large 5E	more than large 6F
--------------------------------	------------------------------	---	--	---	------------------------------




What **SIZE** did you usually have? 5

45. French fries

I didn't eat this	Less than small	 small	 medium	 large	more than large
1A	2B	3C	4D	5E	6F

What **SIZE** did you usually have? 5

46. fountain soda

I didn't eat this	Less than small	 small	 medium	 large	more than large
1A	2B	3C	4D	5E	6F

How often did you choose **the following options** at fast food restaurants?
Think about what you ate during the **past week**.

How often did you choose **the following options** at fast food restaurants?
Think about what you ate during the **past week**.

Never	Rarely	Sometimes	Always
1A	2B	3C	4D

At fast food restaurants I had... 5

47. combo meals
(such as a burger with fries and drink)

Never	Rarely	Sometimes	Always
1A	2B	3C	4D

At fast food restaurants I had... 5

48. salad, apples, or a fruit cup

Never	Rarely	Sometimes	Always
1A	2B	3C	4D

At fast food restaurants I had... 5

49. baked or grilled options (such as baked potatoes or grilled chicken sandwiches)

Never	Rarely	Sometimes	Always
1A	2B	3C	4D

How sure are you that **you** can do the following activities?

How sure are you that **you** can do the following activities?

Not at all sure	A little sure	Neither sure or not sure	Sure	Very sure
1A	2B	3C	4D	5E

Say what
you really think.
Not what you think we
want to hear.

Sweetened beverages are fruit drinks,
iced-teas, sodas, and sports drinks.

I am sure I can... 5

50. drink **fewer** sweetened
beverages **after school**

Not at all sure	A little sure	Neither sure or not sure	Sure	Very sure
1A	2B	3C	4D	5E

I am sure I can... 5

51. bring **fewer** sweetened
beverages **to school**

Not at all sure	A little sure	Neither sure or not sure	Sure	Very sure
1A	2B	3C	4D	5E

I am sure I can... 5

52. drink **smaller** sizes of sweetened
beverages (for example: drink a 12 ounce can
instead of a 20 ounce bottle of soda)

Not at all sure	A little sure	Neither sure or not sure	Sure	Very sure
1A	2B	3C	4D	5E

Packaged snacks are chips, candy,
cookies, and popsicles.

I am sure I can... 5

53. eat **fewer** packaged snacks
at home

Not at all sure	A little sure	Neither sure or not sure	Sure	Very sure
1A	2B	3C	4D	5E

I am sure I can... 5

54. bring **fewer** packaged snacks
to school

Not at all sure	A little sure	Neither sure or not sure	Sure	Very sure
1A	2B	3C	4D	5E

I am sure I can... 5

55. eat **fewer** packaged snacks
when I'm **with my friends**

Not at all sure	A little sure	Neither sure or not sure	Sure	Very sure
1A	2B	3C	4D	5E

Fast foods are foods from quick service, counter style restaurants such as **burgers, fries, fried chicken, pizza, tacos, burritos,** and **take-out Chinese food.**

At fast food restaurants, I am sure I can... 5

56. eat only a **small** size of hamburger or French fries

Not at all sure	A little sure	Neither sure or not sure	Sure	Very sure
1A	2B	3C	4D	5E

At fast food restaurants, I am sure I can... 5

57. eat **healthier options**
(such as a grilled chicken sandwich or salad instead of a hamburger or French fries)

Not at all sure	A little sure	Neither sure or not sure	Sure	Very sure
1A	2B	3C	4D	5E

At fast food restaurants, I am sure I can... 5

58. eat combo meals **less often**

Not at all sure	A little sure	Neither sure or not sure	Sure	Very sure
1A	2B	3C	4D	5E

Mark the response you think is **true**.

According to experts... 5

59. what is the daily limit for watching TV or playing video games for someone your age?

1 hour	2 hours	3 hours	4 hours
1A	2B	3C	4D

According to experts... 5

60. how many glasses of water a day should someone your age drink?

4 glasses	6 glasses	8 glasses	10 glasses
1A	2B	3C	4D

According to experts... 5

61. what size of **packaged snacks** is the daily limit for someone your age?

small	medium	large	x-large (family size)
1A	2B	3C	4D

According to experts... 5

62. which size French fries should someone your age order?

small	medium	large	x-large
1A	2B	3C	4D

According to experts... 5

63. how many ounces of **sweetened beverages** is the daily limit for someone your age?

4 ounces 1A	6 ounces 2B	8 ounces 3C	12 ounces 4D
--------------------------	--------------------------	--------------------------	---------------------------

Tell us about you. 5

64. How old are you?

9 years old or younger 1A	10 years old 2B	11 years old 3C	12 years old or older 4D
---	------------------------------	------------------------------	--

Tell us about you. 5

65. Are you a boy or a girl?

Boy 1A	Girl 2B
------------------	-------------------


Tell us about you 5

66. What is your race?

Hispanic or Latino 1A	Black or African American 2B	White 3C	Asian 4D
American Indian or Alaska Native 5E	Native Hawaiian or other Pacific Islander 6F	More than one 7G	Other 8H

Thank you for taking My Vote Survey!

On the sheet of paper write your name and your My Vote LCD number



B1 or B2-100

MyVote LCD

OK C

1A 2B 3C

4D 5E 6F

7G 8H 9I

0 J

Date _____

First Name _____ Last Name _____

School _____ Class _____ My Vote LCD number _____

Drinks and Snacks

APPENDIX B

Food, Health & Choices Anthropometric Measurement Manual

Food, Health, and Choices

Height, Weight, and Percent Body Fat

Measurement Manual

Adapted from the National Institutes of Health Manual of Procedures:
Height and Weight Measures

Teachers College Columbia University
Center for Food & Environment

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1.0 Height, Weight, and Percent Body Fat

Children are anticipated to grow substantially over the course of the study. Since percent body fat is a primary outcome measure of utilizing bioelectrical impedance, it is necessary to obtain accurate measurements in a relative fasting state on children participating in the *Food, Health and Choices* study. In addition, children's heights and weights should be measured accurately to assess changes in growth.

1.1 Required Personnel

- At least four personnel are needed:
 - (1) **Session coordinator** to set up the measuring session at selected schools (can serve as one of on-site coordinators on day of measuring session).
 - (2-4) **On-site coordinators** (A, B, C, D) to coordinate with the teachers on the day of the measuring session, to retrieve participants from their classrooms, to complete the checklist with participants prior to measuring, to help guide participants through measuring stations and attend to any problems encountered during session, to check that all necessary data is collected and safeguarded, and to return participants back to their classrooms.
 - (1-2) **Height measuring specialist** trained in using the stadiometer (SECA 213) to measure height according to the study protocol.
 - (1-2) **Weight measuring specialist** trained in using the *Tanita* Body Composition Analyzer scale (SC-331S) to measure weight and percent body fat according to study protocol.

1.2 Equipment and Supplies Needed for Session

- 1-2 tables (at least 2' x 4')
 - (1) for Checklist Administration station (optional)
 - (1) for Measuring Weight station
- 3-8 chairs (to be distributed amongst personnel and participants waiting to be measured; height station does not require a chair)
- Privacy screen
- Laptop computer(s) with HealthWare Software installed
- Stadiometer(s) (SECA 213)
- *Tanita* Body Composition Analyzer scale(s) (SC-331S)
- Electrical extension cord
- Carpenters' level (at least 3' in length)
- Small stepstool (if designated staff is shorter than some of the participants)

- 12” clear ruler
- 6 pens
- Calculator
- Alcohol or disinfectant wipes to wipe off scale after each participant (2 per participant)
- 10-12 large plastic bins for participants’ extra clothing and other items
- 2-4 clipboards (one for each on-site coordinator)
- *Roster of participants*, with corresponding pre-assigned identification numbers (provide a copy for each of required personnel)
- Supplies checklist (Form S1) that has been filled out by session coordinator (provide a copy for each of required personnel)
- Copies of Participant Checklist and Height Log (Form H1) corresponding to the number of participants
- *Schedule of participating classes*, including times and room numbers (provide a copy for each of the on-site coordinators)
- 4 data collection envelopes (large manila envelopes that can be securely closed or sealed), marked with the letters A – D for each of the on-site coordinators

1.3 *Making Arrangements with Schools*

I. *Instructions for Session Coordinator*

1. Request a primary school contact person (school principal or other administrator) who will prepare a *roster of participants* for each of the selected classes in order to pre-assign identification numbers for individual participants prior to measuring session.
2. Interview primary contact person to assess school access and availability:
 - a. What time does the school open and what time do classes begin?
 - b. Is there an appropriate space available that could be set aside to conduct measuring session? (nurse’s office, gymnasium, etc).
 - c. Will personnel have access to the room where measuring will take place? What is the earliest time of day personnel can get into the room? Who has the key if the room is locked?
 - d. Can the school provide any of the necessary supplies or equipment? (use Form S1).
3. Communicate with the primary contact person to agree upon a date and time to conduct measuring session that is compatible with the schedules and needs of both parties.
4. Provide the primary contact person with a formal letter to be given to the appropriate teachers that explains the measuring session and provides the date and time interval (to be filled out by primary contact person) that the measuring session will take place.
5. Ask the primary contact person to provide schedule of participating classes, including time of day and room number. Organize this list into the *schedule of*

participating classes and give a copy to all personnel on the day of the measuring session.

6. Instruct On-Site Coordinators (A – D) to do the following:
 - a. Prepare all supplies and equipment needed for day of measuring session using Supplies Checklist (Form S1).
 - b. Organize a shelf space at Teachers College, Columbia University to store all supplies and equipment needed for measuring session in a “ready-to-go” supplies kit.

1.4 Instructions for the ‘Day Before’ the Session

I. Instructions for Session Coordinator

1. Contact the primary contact person to confirm the following:
 - a. Availability of selected classes (i.e. possible absence due to field trips or other coinciding school activities).
 - b. Time of arrival to school and start of measuring session.
 - c. Supplies or equipment that will be provided by school (use Form S1).
2. Send a reminder message to personnel, either by phone or email, regarding start time and location of measuring session.

II. Instructions for On-Site Coordinators (A – D)

1. Use the *schedule of participating classes* to divide all of the participating classes into four relatively equal-sized groups. Each on-site coordinator will be pre-assigned to one of these groups and will be responsible for the participants from those specific classrooms on the day of the measuring session. Each on-site coordinator will then divide the participants from each of their pre-assigned classrooms into groups of five. (It may be necessary to make larger groups of six or seven).
2. Prepare the “ready-to-go” supplies kit (refer to Form S1) and check that all equipment needed for day of measuring session is working properly. This includes organizing a clipboard for each of the four on-site coordinators, complete with:
 - a. a pen
 - b. a copy of the Supplies Checklist (Form S1),
 - c. a copy of the *roster of participants*,
 - d. a copy of the *schedule of participating classes*, and
 - e. a data collection envelope, marked with an “A”, “B”, “C”, or “D”.
3. Ensure that the supplies kit is ready for transportation and use (refer to Form S1).

1.5 Instructions for the ‘Day of’ the Session

1. Required personnel will arrive at Teachers College Columbia University to pick up the supplies kit. (Make sure to allow ample time for transportation to the school, keeping in mind its distance from Teachers College Columbia University).
2. Using Form S1, ensure that all items are accounted for and carefully load items into transportation vehicle (car or taxi).
3. Upon arrival at school, immediately notify appropriate personnel of arrival and take supplies and equipment to designated measuring area.

1.6 Procedures Prior to Taking Measurements

1.6.1 General Set-up and Session Logistics

I. Instructions for On-Site Coordinators (A – D)

1. Determine the most logical way to set up the measuring session area in the available space.
2. Set up tables and chairs for each of the three stations, place large plastic bins in a convenient location for participant use, and line up 5-7 chairs in close proximity to the plastic bins (if space allows).
3. Stack copies of Participant Checklist and Height Log (Form H1) onto the table designated for the Checklist Administration station.
4. Assist height measuring specialist and weight measuring specialist with set up of other supplies and equipment, as needed.
5. Once classes begin at that particular school, use the *roster of participants* and the *schedule of participating classes* to go to each of your pre-assigned classrooms, introduce yourself to the teacher, read off the names of the participating students, and inform the teacher of the session start time and what to expect.
6. Before returning to the measuring session area, locate the male and female restrooms nearest to the measuring session area.

1.6.2 Setting up the Stadiometer (SECA 213)

I. Instructions for Height Measuring Specialist

1. Position the stadiometer base vertically on the floor.
2. Make sure base is level using the carpenters' level.
3. Attach and secure all parts of the stadiometer and ensure that horizontal shaft moves up and down properly.

II. *Precautions*

1. Whenever possible, locate unit in a corner so that the chance of someone walking into the unit from either side is minimized. However, be sure that there is sufficient space for a participant to stand comfortably upright without touching either wall (at least 2 feet away from the lateral wall should be sufficient for even the largest participant).
2. Do not leave participant unattended around stadiometer unit in order to decrease likelihood of accident or physical injury.

1.6.3 **Setting up the *Tanita* Body Composition Analyzer scale (SC-331S)**

I. *Instructions for Weight Measuring Specialist*

1. Place both the laptop computer and the *Tanita* Control Box onto a table or steady surface that is near an electrical outlet and gently set the *Tanita* Platform onto the floor.
2. Make sure Platform is level using a carpenters' level. (If the Platform is not stable, there is risk of stumbling or inaccurate measurement).
3. Connect the laptop computer to the *Tanita* Control Box using the cord provided. Check that the *Tanita* Control Box is connected to the *Tanita* Platform. If it is not, connect them using the attachment provided.
4. Plug in both the laptop computer and *Tanita* Control Box into a power outlet using their respective power cords. (It may be necessary to use the electrical extension cord).
5. Turn on the laptop computer and launch the pre-installed HealthWare Software application.
6. Press 'On/Off' on the Control Box to turn on the power. Check that the body composition is selected and input clothes weight in kilograms by entering 0.5 kg. Then press 'Enter'.
7. Any time a mistake is made, press 'CE' (before pressing 'Enter') and the input will be deleted.

II. *Precautions*

1. Whenever possible, locate unit in a corner so that the chance of someone walking into the unit from either side is minimized. However, be sure that there is sufficient space for a participant to stand comfortably upright without touching either wall (at least 2 feet away from the lateral wall should be sufficient for even the largest participant).
2. Do not leave participant unattended around stadiometer unit in order to decrease likelihood of accident or physical injury.

1.6.4 **Preparing Participants for Measurement**

I. *Instructions for On-Site Coordinators A-D*

1. Use the *roster of participants* and the *schedule of participating classes* to retrieve appropriate participants from your pre-assigned classrooms in groups of five participants at a time. Once you have the group of five participants together, introduce yourself and explain that you will be assisting with the measuring session.
2. Before returning to the measuring session area, make a stop at the restrooms and ask each of the five participants to urinate before taking them to the measuring session.
3. Once you arrive at the measuring session area, explain to the five participants that in order to get accurate measures they will need to remove any excess articles of clothing. Ask the five participants to remove any excess outer clothing and accessories (sweatshirts, sweaters, jackets, belts, heavy jewelry), to remove shoes and socks, to empty pockets (wallet, coins, cell phone, mp3 player) and to place all items into one of the bins provided. (Although it is unlikely that participants will be wearing hats in school, if a participant is wearing a hat ask them to remove it).
4. When all excess clothing, etc. is removed, instruct the participants to form a line behind the height measuring station. Take a seat at the Checklist Administration station and follow the instructions in section 1.6.5.

Note:

- On-site coordinators will work in a rotating/cyclical manner, with each on-site coordinator staying with the same group of five participants until they have completed the measuring session, returning them to their classroom, and retrieving a new group of five participants.
- To start, once the first on-site coordinator has arrived at the measuring session area with his/her group of five participants, the second on-site coordinator should go retrieve his/her group of five participants from their classroom.

1.6.5 **Administering the Checklist (Form H1)**

II. *Instructions for On-Site Coordinators (A – D)*

1. Explain that you are going to ask a few questions to prepare them for being measured.
2. Ask the participant his or her name. Refer to the *roster of participants* to find the participants' identification number and record this number in the space provided on Form H1 (**Do NOT record the participant's name on Form H1**).

3. Using Form H1, ask 'checklist' questions 1-2 and place a check mark in the appropriate box based on the participant's response (Mark either 'Yes' or 'No' for each question).
4. Ask participant checklist question 3. Record the time of the prior meal in the space provided and circle either 'am' or 'pm' according to the participant's response. If the participant does not know or refuses to answer, indicate in the comment's box at the bottom of Form H1
5. Kindly thank the participant and direct them to get in line for the measuring height station.
6. If the participant has refused to remove any excess items, do step 2 *only*. Then, check the box at the bottom of Form H1 labeled: "A valid measurements is unavailable" and make note of the reason why in the comment log. ***No height or weight measurements will be taken for this participant.***
7. Escort the participant back to his or her classroom only when you have completed the checklist for the other participants in your group and have directed them to form a line behind the height measuring station. *Immediately* return to your group in the measuring session area once you have returned the participant to his/her classroom.

1.7 Procedures for Measuring Height

I. Procedure for Height Measurement Specialist

1. Introduce yourself and explain that you are going to take the participants' height.
2. If the participant refuses to comply with procedures, excuse him or her from the session. He/she is not measured and no height is recorded on Form H1. Check the box on Form H1 to indicate that a valid measurement is not available and make note of the reason why in the comment log.
3. When taking height measurements, refer to Figure 1 for standing position (from the National Health and Nutritional Examination Survey Anthropometry Procedures Manual, 2004). Have the participant stand erect perpendicular to the floor, weight distributed evenly on both feet, arms hanging freely by the sides of the body with the palms facing the thighs.
4. Ask the participant to place ankles or knees together, whichever come together first. If the child has knock-knees, the feet are separated so that the sides of the knees are in contact but not overlapping.
5. The shoulder blades and buttocks should be in contact with the vertical board if possible, or whichever part of the body touches the board first.
6. Verify position on the right side of the body. If the heels, buttocks, scapula, and posterior aspect of the head cannot be placed in one vertical place while maintaining a reasonable stance, position the participant so that only the buttocks and heels or the head are in contact with the vertical board. If the

participant's buttocks are large enough that sliding the heels all the way to vertical board causes irregular or very unnatural posture, allow participant to stand so that heels are not in contact with the vertical board.

7. Ask for permission to touch participant, and, if given, position the participant's head in the Frankfort horizontal plane (refer to Figure 1). In this position an imaginary line parallel to the floor can be drawn from the bottom of the eye socket (orbital margin) to the external opening of the ear (external auditory canal) – which is also equivalent to drawing a line from the corner of the eye where the upper and lower lid meet to the top of where the ear attaches to the head. If necessary, ask the participant's permission to reposition head. Reposition by gently placing one hand under the chin and the other on top of the head and tilt the head up or down until proper alignment is achieved with eyes looking straight ahead. If the participant does not give permission, then provide verbal instructions for the child to reposition his or her head.
8. Ask the participant to inhale deeply and maintain fully erect position without altering the load on the heels. Holding a deep breath makes the individual stand up straighter and taller, and allows for a more stable and reliable reading. If the participant is breathing heavily enough to cause oscillations in the level, you must wait until the participant settles down or ask the participant to exhale and hold his/her breath.
9. Position the headboard firmly on top of the head with sufficient pressure to compress the hair to the scalp.
10. Some participants may have hairstyles that interfere with measurement of height. In this circumstance there are two possible ways to deal, dependent on the participant's preference.
 - a. If the participant gives permission and the hairstyle is easy to modify, then make the modification (e.g. remove ponytails on top of head, compress hair).
 - b. If a hairstyle is not easy to undo (or the participant refuses to undo it), leave the hair as is and obtain the height as described (net height). Then ask the participant to be seated and using a small clear ruler measure the distance from the scalp to the top of the hairstyle (interference height). Note the interference height (in cm) in the margin of the form and subtract this value from the net height to get the actual height recorded.
11. Get eye-level with the headboard – stand on a stool or bend down as necessary.
12. Read from the side of stadiometer to the nearest 0.1 centimeter. Use the side measuring scale, not the front scale, so you are better able to judge the participant's posture.
13. Record height (to scalp, not to top of hair) to the nearest 0.1 centimeter on Form H1 under 'Height measurement 1'.
14. Have the participant step off the stadiometer. Repeat procedures in steps 4 through 13 immediately.

15. Record second height on Form H1 under 'Height measurement 2'. If the first two measurements are ≤ 1.0 cm of each other, stop and circle both measurements on Form H1.
16. If the first two measurements are not ≤ 1.0 cm of each other, repeat the procedures in steps 4-13, having the student step off the stadiometer between each measurement until two values are ≤ 1.0 cm of each other. Record and circle these two measurements on Form H1. Use a calculator to average the two measurements and record the resulting value on Form H1 under 'Average'.
17. Once height is measured and recorded the participant may want to know his/her value. Read off the 'feet-inches' side of the stadiometer or use a calculator to multiply (cm x .3932 – in.) or refer to a conversion chart. Use a low voice that cannot be overheard.
18. Take notes in the comments section of Form H1 with observations about participants whose height measure may come under review, for example, 'very tall and skinny male', 'short stocky female', 'female had recent growth spurt in height and has been on diet for weight'.
19. Use alcohol or disinfectant wipe to wipe off stadiometer after each participant.
20. Kindly thank the participant for partaking in the height measurement station. Return Form H1 to the participant and direct them to get in line for the percent body fat and weight measuring station.

1.8 Procedures for Measuring Weight and Percent Body Fat

Tanita SC-331S measures body composition by sending a safe, low electrical current through the body. The current passes freely through the fluids contained in the muscle tissue, but encounters greater resistance when it passes through fat tissue. This resistance of the fat tissue to the current is termed 'bioelectrical impedance', and is accurately measured by a body fat scale.

I. Procedure for Weight Measurement Specialist

1. Introduce yourself and explain that you are going to weigh the participant.
2. Check that the ID number already inputted in the HealthWare application on the laptop computer matches the ID number on Form H1 for that participant. Then, select that ID number and click on 'New Measure'.
3. On the *Tanita* Control Box, select 'Standard' for body type when prompted. When the body type is selected, the lamp flashes on 'Gender'.
4. Select gender by pressing the 'Male' or 'Female' key. When male or female is selected, the lamp flashes on 'Age'.
5. Input age in years by pressing 0-9. (The age can be inputted from 5-99). Then press 'Enter'.

6. Input height (obtained from Form H1 under 'Average') by pressing 0-9. (The height can be inputted from 90.0-249.9 cm). Then press 'Enter'.
7. Have the participant step up onto the Platform electrodes with *bare feet*. Make sure body weight is distributed evenly over both feet and that the participant is situated at the center of the Platform. Arms should hang freely by sides of the body, head held up and facing forward.
8. Make sure the subject is not leaning to one side or forward or backward, and that the head is held stationary, looking straight ahead.
9. Instruct the participant to stand still and wait until the measurement result and body fat percentage evaluation are displayed in the Control Box (measurements are automatically recorded into the HealthWare Software and do not need to be inputted manually).
10. Ask the participant to carefully step down from the Platform.
11. The participant may want to know his or her value. Read off the weight and body fat percentage from the display panel. You will have to convert the weight from kilograms to pounds (1 kg = 2.2 lbs). Use a low voice that cannot be overheard.
12. Use the laptop to type any notes into the comments log provided by the HealthWare Software. Include observations that might impact accurate measurement (i.e. something the person is wearing and refused to remove, participant has a prosthesis).
13. Immediately repeat steps 5 through 11 in order to obtain a second measurement recording.
14. Sanitize electrodes using alcohol or disinfectant wipes after each participant.
15. Kindly thank the participant for partaking in the percent body fat and weight station and direct them to an on-site coordinator.

1.9 Procedures After Completion of Measurements

I. Instructions for On-Site Coordinators (A – D)

1. As each participant in the group completes the weight measurement station and before they return to retrieve their items from the plastic bins, ***immediately*** take Form H1 from the participant and place it into your data collection envelope.
2. Have each participant retrieve his or her excess clothing and other items from the plastic bins. (Depending on space availability, either transfer the plastic bins for your group so that they are near the end of the weight measuring station OR take the participants back to the area where the plastic bins were located upon arrival). Then instruct the participant to wait until the rest of the group is ready.

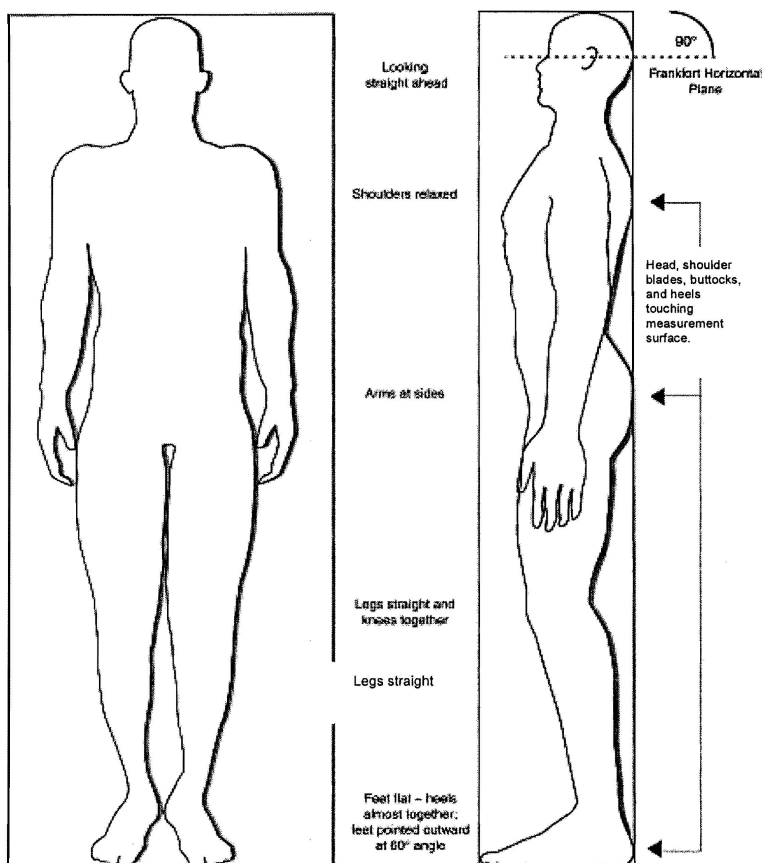
3. Once all participants are ready, escort them back to their classroom and retrieve the next group of five participants. Repeat procedures in section 1.5.3.

1.10 Instructions for End of Measuring Session

I. Instructions for All Required Personnel

1. Pack up all equipment and supplies brought to the site for transport back to Teachers College Columbia University. Use column titled 'Before Leaving' on Form S1 to check that nothing is forgotten at the site, including the data collection envelopes.
2. Clean the space and return equipment and supplies provided by the school to the proper locations. Ensure that space used for measuring session is left in the same condition as before start of measuring session.
3. Personally thank primary contact person and any other site administrators/school staff members involved in measuring session.
4. After arriving at Teachers College Columbia University, on-site coordinators must ***immediately*** return data collection envelopes to a secure, pre-designated location.
5. Store the stadiometer (SECA 213), laptop computer, and *Tanita* Body Composition Analyzer scale (SC-331S) in a safe and secure location, and return other supplies and equipment to their proper storage space.

Figure 1. Standing Position for Height



Form S1

To be used as Supplies Checklist

Items provided by:	Personnel	School	Not Available	Before Leaving
__ Table				
__ Chairs				
Privacy screen				
Stadiometer (SECA 213)				
Laptop computer				
<i>Tanita</i> (SC-331S)				
Electrical extension cord				
Carpenters' level				
Small stepstool				
12" clear ruler				
2 Pens				
Calculator				
Alcohol or disinfectant wipes				
__ Plastic bins (for extra clothing, etc.)				
4 clipboards, complete with:				
a. a pen				
b. a copy of the <i>roster of participants</i>				
c. a copy of the <i>schedule of participating classes</i>				
d. a data collection envelope				

Form H1

To be used in conjunction with SECA 213

School: _____ Class: _____ Teacher: _____

Participant name: first _____ last _____

D.O.B (mm/dd/yyyy) : ____ / ____ / _____

Checklist

1. Did you go to the bathroom right before attending this session? Yes No
2. Did you do any intense exercise in the past 12 hours? Yes No
3. When was the last time you ate or drank something ____ : ____ am/pm

Height Measurements

❖ Height measurement 1: _____ cm

❖ Height measurement 2: _____ cm

❖ Height measurement 3: _____ cm

❖ Height measurement 4: _____ cm Average: _____ cm

- Conversions:

___ cm x .3921 = _____ in (48 in = 4 ft / 60 in = 5 ft)

___ kg x 2.2 = _____ lb

A valid measurement is unavailable

Comments

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APPENDIX C

Internal Review Board Approval

TEACHERS COLLEGE
COLUMBIA UNIVERSITY
OFFICE OF SPONSORED PROGRAMS

Institutional Review Board

December 19, 2012

Lorraine Mull
614 West 114th Street
New York, NY 10025

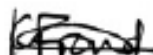
Dear Lorraine,

Thank you for submitting your study entitled, "*A correlation study comparing children's anthropometric measures (body mass index and body fat), reported food and activity behaviors and measures of theory-based mediators of behavior change (psychosocial variables)*;" the IRB has determined that your study is **Exempt** from review [Category 4].

Please keep in mind that the IRB Committee must be contacted if there are any changes to your research protocol. The number assigned to your protocol is 13-125. Feel free to contact the IRB Office [212-678-4105 or hersch@tc.edu] if you have any questions.

Best wishes for your research work.

Sincerely,



Karen Froud, Ph.D.
Associate Professor of Speech and Language Pathology
Chair, IRB

cc: File, OSP