UNDERSTANDING THE HEALTH AND ACADEMIC IMPACT OF THE FRESH FRUIT AND VEGETABLE PROGRAM ON GEORGIA'S ELEMENTARY STUDENTS

by

CHRISTY LYNN WESTMORELAND EPPS

(Under the Direction of Catherine C. Sielke)

ABSTRACT

The diets of young children have gained considerable attention in an era of epidemic obesity rates. Not only is the obesity rate alarming, but so is the proportion of children suffering from serious obesity-related conditions that, until now, have been concentrated in adults. The Fresh Fruit and Vegetable Program (FFVP) is a federally funded nutrition intervention aimed at increasing elementary student exposure to and consumption of fruits and vegetables in an effort to improve the diet and health of America's children. The research sought to determine if the FFVP significantly increased the fruit and vegetable consumption of participating fourth and fifth grade students in northeast Georgia. The research further sought to link participation in the FFVP to academic success as measured by daily attendance rate, discipline referrals, and scores on the CRCT in the subject areas of English, reading, and mathematics. Dietary data were analyzed with cross-tabs and T-tests; CRCT scores were analyzed with ANOVA, T-tests, and linear and multiple regression. Participation in the FFVP was not significantly related to increased fruit and vegetable consumption, CRCT success, or student attendance. However, FFVP participants as compared to non-participants are consuming significantly less sugar-sweetened beverages, sodas, and fried potato products and are consuming the school lunch and breakfast more frequently. CRCT scores were found to be most associated with race and free-and

reduced lunch percentage. Even as this research was unable to directly link two distinct areas of national interest—childhood health and academic achievement—support for the FFVP must continue. Any step that an administrator can take to positively impact the diet and well-being of students today is a step that must be taken for tomorrow.

INDEX WORDS: Fresh Fruit and Vegetable Program, fruit and vegetable consumption, childhood diet, academic achievement, Social Cognitive Theory, National School Lunch Program, National School Breakfast Program, dietary assessments, public policy, educational objectives

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DEDICATION

This work is dedicated to my loving, supportive husband and the precious daughter we share.

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The dissertation presented challenges unforeseen. I want to remember these challenges and the lessons learned. I want to remember the countless hours, many of which were found after all in the house had gone to bed, dedicated to the comprehensive exams, the prospectus, and the research; dedication is rewarding. I want to remember the challenging professors that prepared me for the work required to see the dissertation to completion; the more difficult the assignment, the more fulfilling the work. I want to remember the trials with the IRB regarding parental permission slips, the number of participants, and the *one* parental complaint; patience is a virtue. I want to remember the feeling of helplessness when I was unable to complete my own statistical analysis; the expertise of others is valuable. I want to remember the struggles of gaining school and student participation in the food frequency questionnaire; the present research would not exist without the willingness of others to support my endeavors. I want to look back on these challenges with a sense of accomplishment. But I have learned that I did not overcome these challenges alone.

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INTRODUCTION

Statement of the Problem

The diets of young children and adolescents have gathered considerable attention. The diets of young children and adolescent are of concern, first, because of the obesity epidemic currently plaguing the nation. Too many American children are burdened with the consequences of excess body fat. According to 2007 – 2008 data, 10% of 2 to 5 year olds, 20% of 6 to 11 year olds, and 18% of 12 to 19 year olds are obese. These rates have grown by staggering proportions since the 1970s (Health and Human Services [HHS], 2010, p. 10).

Childhood and adolescent diets are of concern, second, because the foods that are being consumed are doing more than adding pounds. Poor dietary habits in combination with limited physical activity have been linked to significant causes of morbidity and mortality, including heart disease, high blood pressure, type 2 diabetes, osteoporosis, and some forms of cancer (HHS, 2010, pp. 1 – 2). Weight-related conditions that were once considered to be adult diseases, such as high blood pressure and type 2 diabetes, are now being witnessed in overweight and obese children and adolescents.

Childhood and adolescent diets are of concern, third, because diet quality is related to cognitive functioning and academic achievement. The relationship between diet quality and cognitive functioning has received attention in the research, but far too many educational leaders have ignored the findings (Weaver-Hightower, 2011; Barnes, Robin, O'Toole, Dawkins, Khan, & Leviton, 2011). School cafeterias are filled with highly processed, fast-food type meals

and a la carte items (Poppendieck, 2010). School vending machines are filled with low-nutrient, high-calorie foods (Pasch, Lytle, Samuelson, Farbakhsh, Lubik, & Patnode, 2010). The presence of these foods negatively influences student diets and does little to improve their academic achievement (Kakarala, Keast, & Hoerr, 2010).

Actions must be taken to change the dietary habits of children. Data from the Healthy Eating Index strongly support the need for dietary improvements in young children and adolescents. Children aged 2 to 17 scored 55.9 on a scale of 100 for overall diet quality (Center for Nutrition Policy and Promotion [CNPP], 2009). The children scored 3.2 on a scale of 5 for total fruits and 2.3 on a scale of 5 for total vegetables (CNPP, 2009). It is imperative that the nutritional quality of children's diets improve. Without change, these children will not grow to live healthy and productive lives.

Dietary patterns must be addressed in childhood—the point at which dietary habits are established. A number of nutritional interventions, such as Eat Smart. Play Hard. and the HealthierUS Schools Challenge, have been developed with the overarching goal of improving the dietary status of young children and adolescents. These interventions are most often implemented in schools. Schools offer a unique setting for nutritional programs as they are already focused on educating students and have the opportunity to model healthy eating through the National School Lunch and Breakfast Programs. One nutritional program—the Fresh Fruit and Vegetable Program (FFVP)—attempts to provide students an additional opportunity for healthy eating. The FFVP was designed to introduce and encourage consumption of a variety of fruits and vegetables by providing a free fruit or vegetable snack each day to the students of participating elementary schools. The question remains as to the success of the FFVP in meeting its intended goal of improving the dietary habits of elementary students by increasing their consumption of fruits and vegetables. And even more interesting is

the question of an unintended consequence. Will healthier diets result in students that are not only well-nourished but also academically accomplished?

Purpose of the Study

The purpose of the study was to measure the nutritional and academic outcomes of participation in the FFVP. The nutritional research aim attempted to measure the consumption of fruits and vegetables by students in grades four and five. The academic research aim attempted to find a relationship between participation in the FFVP and the variables of student attendance, discipline referrals, and CRCT scores in the subject areas of English, reading and mathematics. Research findings have the potential to marry two distinct areas of national interest—childhood health and academic achievement—and to substantiate the role of schools in addressing the dietary habits of students.

Background

The FFVP began as a pilot project in 2002. The United States Department of Agriculture (USDA) was interested in understanding best practices for encouraging increased fruit and vegetable consumption in young children (Food and Nutrition Service [FNS], 2008). The FFVP provides all children of participating schools with fruit or vegetable snacks throughout the school year. Schools are strongly encouraged to incorporate nutrition education and to have teachers serve as models for healthy eating behaviors. The program does not dictate a planned curriculum, but allows schools to implement the program as administrators deem appropriate; the USDA is most concerned with the food environment that is created within a school, or the experienced curriculum of the students. Specific program goals include creating healthier school environments; increasing student exposure to a variety of fruits and vegetables; increasing fruit and vegetable consumption; and positively changing the eating habits of young children to impact their present and future health status. The USDA described the program as

an “important catalyst for change in efforts to combat childhood obesity by helping children learn more healthful eating habits” (FNS, 2010, p. 1).

The USDA’s Economic Research Service (2003) completed an evaluation of the FFVP pilot from the 2002 – 2003 school year. As encouraged by the FFVP, 93% of the participating schools provided nutrition education that coincided with the fruit and vegetable snacks. Sixty-five percent of schools incorporated nutrition education within the classroom; 34% incorporated nutrition education outside of the classroom environment, such as in school assemblies and health fairs. School staff perceived benefit in the FFVP:

> School staff believed that the pilot lessened the risk of obesity, increased attention in class, reduced consumption of less healthy food, reduced the number of unhealthy snacks brought from home, increased students’ awareness and preference for a variety of fruits and vegetables (particularly less familiar kinds, such as kiwis and fresh pears), helped children who would otherwise be hungry get more food, and increased students’ consumption of fruits and vegetables at lunch (Economic Research Service, 2003, p. *iv*).

While minor issues with implementation were addressed, 100 of the 105 participating schools reported it feasible to maintain implementation of the FFVP if funding was continued.

Research Aims

Because of the short duration of the USDA’s pilot evaluation and the evolving nature of the FFVP, the evaluation was not designed to determine the effects of the FFVP on a student’s overall dietary habits; individual intake of fruits and vegetables; displacement of less nutritious foods; effects on long-term dietary patterns; effects of nutrition education, independent of the free food; experience of pilot schools compared to all other participating schools; and the existence of more cost-effective alternatives to increase the consumption of fruits and vegetables in young children (FNS, 2008, pp. 4 – 5). The present research sought to examine some of these more specific areas of interest. Two research aims were identified:

1. To determine whether the dietary patterns, specifically fruit and vegetable consumption, of children participating in the FFVP differ from those not participating in the FFVP.
2. To determine whether the academic performance of children participating in the FFVP differs from those not participating in the FFVP.

Theoretical Framework

Traditional behavioral theorists, such as John B. Watson and B. F. Skinner, have attempted to understand how behavior is learned and modified through *direct experiences*. Believing these theoretical approaches too limited in perspective, Albert Bandura (1977) posited the Social Learning Theory as a unifying "framework for analyzing human *thought and behavior* [italics added]" (p. vi). Bandura's theory asserts cognition as the mediating factor between human action and the environment: "…most external influences affect behavior through intermediary cognitive processes…" (Bandura, 1977, p. 160). The role of cognition within Bandura's view of learning prompted him to change the name of his theory to Social Cognitive Theory (SCT) with the 1986 publishing of *Social Foundations of Thought and Action: A Social Cognitive Theory*. The name change reflected the fundamental principles of Bandura's view of learning. *Social* acknowledges the "social origin of much human thought and action" (Bandura, 1986, p. xii). *Cognitive* refers to the "influential causal contribution of thought processes to human motivation, affect, and action" (Bandura, 1986, p. xii).

Bandura's approach to human learning and behavior is more complex than a direct relationship between environmental stimuli and human response. SCT explains behavior as a triadic reciprocal relationship among cognitive and other personal factors, behavior, and environment (Bandura, 1977; Bandura 1986). This interactive process is known as reciprocal determinism. *Reciprocal* refers to "mutual action between causal factors" (Bandura, 1986, p.

23). Interaction between personal and environmental factors is an interdependent process. Likewise, people are not independent of their own behaviors. *Determinism* refers to the "production of effects by certain actors" (Bandura, 1986, p. 23). A person's actions influence his environment and the environment, in turn, influences his behavior. Accordingly then, an individual is neither powerless to the control of his environment nor an agent acting freely on his environment. Cognitive capabilities allow a person to both determine his behavior and consciously act on his environment; as outlined by Bandura, these cognitive capabilities include symbolism, vicarious learning, forethought, self-regulation, and self-reflection. Self-efficacy, or belief in one's capabilities, is a product of these cognitive capabilities and is a central component of SCT.

Many researchers and theorists have applied the tenets of SCT to a variety of fields. Bandura himself proved the wide applicability of SCT with his 1997 publication *Self-Efficacy: The Exercise of Control*. In this text Bandura devoted lengthy passages to the application of self-efficacy in the promotion of healthy lifestyle behaviors. The present research utilized SCT in its analysis of the FFVP.

Significance of the Study

An analysis of the impact of the FFVP upon nutritional and academic outcomes for students is imperative for our nation and our schools. Successful implementation of the FFVP will benefit the nation with healthier, more productive citizens. The obesity epidemic demands attention paid to the health of students; the obesity epidemic demands nutrition education offered in schools. It is believed that *successful* implementation of the FFVP will benefit students and schools with improved academic and behavioral outcomes. The FFVP represents a potential solution for the declining health of our nation and diminishing academic achievements. The FFVP has implications that parallel those of the National School Lunch and

Breakfast Programs; the FFVP can have a "major impact on children—on their health, their ability to learn, and on their potential for becoming healthy and productive adults" (USDA, 2001).

The relationship between a healthy body and a healthy mind is often disregarded (Weaver-Hightower, 2011). Physical activity and health education receive little attention in schools today. The demand for schools to achieve Annual Yearly Progress under No Child Left Behind leaves administrators pressured to increase student time in core subjects such as math and English at the expense of nutrition education and physical activity (Shilts, Lamp, Horowitz, & Townsend, 2009; Horowitz, Shilts, Lamp, & Townsend, 2008; Chomitz et al., 2009). However, schools would do better to recognize the relationship between wellness and academic achievement. Shilts, Lamp, Horowitz, and Townsend (2009) asserted that nutrition educators would do well to stress the academic benefits of wellness programs as measured by the achievement of curriculum standards and improved health behaviors. Nutritionists and researchers must prove to educational leaders the academic benefits of nutrition programs. Educational leaders must come to recognize the academic and behavioral outcomes of diet quality. Findings from the analysis of the FFVP have the potential to offer educational leaders the evidence needed to make the connection between nutrition and cognition. The analysis has the potential to offer educational leaders the evidence needed for nutrition education to be recognized as a vital component of the school day.

Definition of Key Terms

The following acronyms are defined within the context of the current research. The meanings of the acronyms are presented to better help the reader understand the key terms utilized through the dissertation text.

CRCT: Criterion-Reference Competency Tests. CRCT represents the abbreviated title for the Criterion-Reference Competency Tests, a series of subject-specific tests designed to measure the extent to which students have acquired the knowledge and skills outlined in the Georgia Performance Standards.

FFQ: Food Frequency Questionnaire. FFQ represents the abbreviated title for a Food Frequency Questionnaire, a dietary research instrument designed to collect data on the frequency of food consumption.

FFVP: Fresh Fruit and Vegetable Program. FFVP represents the abbreviated title of the school nutrition program under evaluation. The FFVP provides a free, fresh fruit or vegetable snack to elementary students attending schools meeting specified eligibility criteria.

FRL: Free- and Reduced-Lunch. FRL represents the abbreviated title used to describe the number of students qualifying for free- or reduced-price meals offered through the National School Lunch Program.

NSLP: National School Lunch Program. NSLP represents the abbreviated title used to describe the National School Lunch Program. The NSLP is a federally funded meal program that provides low-cost or free lunches to children in participating schools.

SCT: Social Cognitive Theory. SCT represents the abbreviated title for the theoretical framework utilized in the present research. SCT depicts behavior as the result of personal and cognitive factors, the environment, and behavior.

USDA: United States Department of Agriculture. The USDA is the governmental agency dedicated to providing leadership in, but not limited to, the areas of food, nutrition, and agriculture. The USDA is the umbrella governmental organization for numerous agencies including the Center for Nutrition Policy and Promotion, Economic Research Service, and Food Nutrition Service.

Overview of Research Methodology

The study used cross-tabs, T-tests, ANOVA, and linear and multiple regression to understand the health and academic impacts of participation in the FFVP. Nutritional data were collected from participating fourth and fifth grade students via an internet-based food frequency questionnaire. Academic data on the participating schools were collected from the Georgia Department of Education. The researcher expected to find a positive relationship between FFVP participation and increased fruit and vegetable consumption *and* improved academic outcomes.

Organization of the Dissertation

Chapter 1 provides a statement of the problem and the purpose, aims, and significance of the research; background information on the FFVP, theoretical framework and research methodology are also presented in the first chapter. The literature review is divided among three chapters, chapters 2, 3 and 4. Chapter 2 describes the expansion of educational objectives in schools during the first half of the twentieth century and provides a historical account of school nutrition programs that took shape during the same time period. Chapter 3 presents a review of the academic consequences of diet quality and the success of various school nutrition programs in improving the quality of childhood diets. As the last literature review chapter, chapter 4 discusses dietary assessment methodology while focusing closely on the use of dietary assessments with children. Chapter 5 describes methodology, including the theoretical framework, instrumentation, and research design and rationale; the chapter also provides information on data collection procedures, data analysis, and research limitations. The results of the data analysis, including a discussion of a pilot study, are provided in chapter 6. A discussion of the research findings and conclusions are presented in chapter 7.

CHAPTER 2

THE EXPANDING ROLES OF SCHOOLS

The purpose of this study was to examine the nutritional and academic outcomes of the Fresh Fruit and Vegetable Program (FFVP). The specific research aims were:

1. To determine whether the dietary patterns, specifically fruit and vegetable consumption, of children participating in the FFVP differ from those not participating in the FFVP.
2. To determine whether the academic performance of children participating in the FFVP differs from those not participating in the FFVP.

Before examining the results of the research, it is helpful to first understand how educational goals and school nutrition programs have grown during the twentieth century to include health specific objectives and curricular programs. By understanding the expanding roles of schools, the FFVP is provided a historical context that helps one appreciate the program's foundation in America's schools. The first section of the chapter describes the expansion of educational objectives during the early twentieth century, touching on the meaning of progressivism in education, the social conditions at the turn of the twentieth century, and the response of educational progressives as documented through curriculum proposals. As curricular objectives began to expand to better meet the educational needs of students, school cafeterias were becoming popular programs ready to meet the physical needs of students. Just as the curriculum proposals were responsive to the social context of the time, so too were the school nutrition programs. The second section of the chapter provides a

historical narrative of the National School Lunch Program, focusing upon the political contexts that shaped school nutrition programs and the lessons provided for current programs.

Expanding Educational Expectations during the Progressive Era

"Poverty, squalor, and disease were hardly new in the nineties. They date, after all, from the beginning of history," stated Lawrence A. Cremin (1961). Unique to the 1890s, however, was "an awakening of social conscience, a growing belief that the incredible suffering was neither the fault nor the inevitable lot of the sufferers, that it could be alleviated, and that the road to alleviation was neither charity nor revolution, but in the last analysis, education" (pp. 58 – 59). Characteristic of the progressive era, an unbreakable bond existed between education and social progress. However, the schools in America at the turn of the century were in a depressing state.

The poor quality of the traditional American school was brought into the public eye in the mid-nineteenth century by Herbert Spencer, an influential educational philosopher. Spencer (1864) believed the purpose of education was "to prepare [students] for complete living" (Cremin, 1961, p. 31). Spencer outlined these objectives of complete living in an essay entitled "What Knowledge Is of Most Worth?," perhaps his most famous essay. In answering his own question, Spencer identified the importance of *science*: "For the maintenance of health, for earning a living, for parenthood, for civic duty, for the perfect production and highest enjoyment of the arts, and for discipline in all its forms—intellectual, moral, and religious—science was the most efficient and economical study of all" (Cremin, 1961, p. 92). When the ideas of "complete living" and the importance of science were held against the conventional American schools, Spencer believed the curricular aims of American schools to be inferior. His ideology brought American education into serious question and gave credibility to a movement challenging the traditional curriculum of America's schools—educational progressivism.

According to Cremin (1961), to ignore the progressive movement "is to miss one whole facet of America's response to industrialism" (pp. ix – x), but to ignore the progressive movement's impact on education, is to miss a movement that "transformed the character of the American school" (p. 22). Because progressives believed education the key to improving the social conditions of the populace, the story is one of expanding educational expectations. This story is told, first, through an analysis of the curriculum proposals of the progressive era. Second, the impact of these curriculum proposals on the goals of the American high school is shared. What becomes apparent is the expansion of educational goals throughout the first half of the twentieth century. Considered in sequence, historical reports document the expansion of educational objectives. The growing educational objectives follow the changing needs of society. One societal need, however, did not change—the need for a healthy population. The final section describes the stability of health objectives through the curriculum proposals of the first half of the twentieth century.

The Expansion of Educational Objectives

From the middle of the nineteenth century to the middle of the twentieth, schools grew in more than just size. The expectations of schools expanded significantly. John Goodlad (1984) explained:

> Our school system grew phenomenally from soon after the middle of the nineteenth century to beyond the midpoint of the twentieth—in size, complexity, and even confidence. And as the school's role enlarged, the role of the other institutions in the traditional configuration declined and the school stood more and more alone….The school's enlarged role resulted, however, not just from its assuming more of what homes and churches once did but also from society's increased educational expectations (p. 43).

The expectations of schools in the early twentieth century were daunting. Schools were expected to alleviate the ills of an urban-industrialized nation, mass immigration, an economic

depression, and two world wars. Nevertheless, progressive educators, believing schools the key to social betterment, accepted the challenge.

By 1918 the progressives had become more progressive. The *Cardinal Principles* expanded educational goals significantly by recommending a curriculum beyond the traditional subjects. The seven principal aims of education included health, command of fundamental processes, worthy home-membership, vocation, citizenship, worthy use of leisure time, and ethical character. The changes suggested by the *Cardinal Principles* were so vastly different from those of the Committee of Ten that a new educational institution was needed—the comprehensive high school.

With sweeping changes to the purpose of schools, curricular aims, and educational organization, the *Cardinal Principles* became the standard model for all subsequent movements. In 1955 Cremin described the report's significance: "'Indeed, it does not seem amiss to argue that most of the important and influential movements in the field since 1918 have been footnotes to the classic itself'" (as cited in Wraga, 2001, p. 494). This however does not suggest that educational expectations have remained unchanged since 1918. *Education for ALL American Children* and *Education for ALL American Youth*, exemplify the influence of the *Cardinal Principles* on school reform three decades after the "classic," but the documents also illustrate the great expansion of educational goals in the mid-twentieth century. Similar to the *Cardinal Principles*, *Education for ALL American Children* spoke of the goals of education within the context of a democracy:

> …the school is maintained as an institution of the society for the purpose of improving the life of both the individual and the society, and that society has charged members of the teaching profession with the responsibility of guiding school learnings so that these goals may be realized (Educational Policies Commission, 1948, p. 100).

Likewise, *Education for ALL American Youth* described the purpose of educational reform in terms of the needs of a democratic society: "…[to] bring about a better basic accommodation

between the secondary school and the great amount and variety of contemporary social needs" (Educational Policies Commission, 1952, p. 1).

But it is the educational aims outlined by *Education for ALL American Youth* that most remarkably illustrate the growing expectations of schools. This expansion becomes apparent when the goals of each document are presented alongside each other (Table 1). *Education for ALL American Youth* suggests eight broad areas of personal growth: health of the body and mind; family life; recreational and leisurely activities and interests; understanding and appreciation for culture; intellectual achievement; character development; occupational proficiency; and civic competence (Educational Policies Commission, 1952 pp. 107 – 108).

Table 1

Educational Objectives of the *Cardinal Principles* and *Education for ALL American Youth Compared*

***Cardinal Principles*:** **Seven Principal Aims of Education**	***Education for ALL American Youth:*** **Imperative Educational Needs of Youth**
Health	Health
Command of Fundamental Processes	
Worthy Home-Membership	Family Life
Vocation	Occupational Proficiency
Civics	Culture
	Democracy
	Consumer Economics
	Science
	Literature and Art
Worthy use of Leisure Time	Leisure Time
Ethical Character	Ethics and Responsibility
	Intellectual Development

Cultural growth and understanding is divided further into the areas of democratic living, consumer economics, science, and an understanding and appreciation for literature and the arts. While all objectives presented by the Educational Policies Commission (1952) do fit neatly

under the broader objectives presented in the *Cardinal Principles*, the Educational Policies Commission brings attention to three objectives as their own separate areas of study—consumer economics, literature and the arts, and intellectual development. Of greatest interest is the explicit identification of intellectual development and its contrast to "command of fundamental processes" from the *Cardinal Principles*. Intellectual development is more than learning the basics of "reading, writing, arithmetical computations, and the elements of oral and written expression" (Commission on the Reorganization of Secondary Education, 1918, p. 5). Intellectual development does include a component of fundamental knowledge and skills, but it emphasizes the relationship of one subject of study to another and that which is purposeful and self-directed.

Education for ALL American Youth, together with *Education for ALL American Children* (1952) and the third volume of the Educational Policies Commission's report, highlight the growing expectations of schools, particularly the school's expanding consciousness of individual student characteristics and needs (Cremin, 1961, p. 329). As reported in *Education for ALL American Youth* (1944), students should be exposed to a curriculum that will

> 1) equip him to enter an occupation suited to his abilities and offering reasonable opportunity for personal growth and social usefulness; 2) prepare him to assume the full responsibilities of American citizenship; 3) give him a fair chance to exercise his right to the pursuit of happiness; 4) stimulate intellectual curiosity, engender satisfaction in intellectual achievement, and cultivate the ability to think rationally; and 5) help him to develop an appreciation of the ethical values which should undergird all life in a democratic society (Educational Policies Commission, 1944, pp. 21 – 22).

In comparison to the Classical, Latin Scientific, Modern Languages, and English programs of study recommended by Committee of Ten in 1893, these educational objectives illustrate the growth of the curriculum to include physical and mental health, vocational preparation, and the value of the arts, among others.

The vast expansion of educational expectations was confirmed by John Goodlad in 1984. In *A Place Called School*, Goodlad presented a review of historical and state documents and summarized the goals of American schools. Four broad goal areas were identified: academic; vocational; personal; and social, civic, and cultural goals. Ten objectives, with numerous standards under each, were created from the four general goal categories. As presented in Table 2, these ten educational objectives are of striking similarity to the educational principals recommended by the *Cardinal Principles.* But yet these goals do expand upon the *Cardinal Principals* and illustrate significant growth since the curricular programs recommended by the

Table 2

Educational Objectives of the *Cardinal Principles* and *A Place Called School Compared*

***Cardinal Principles*: Seven Principal Aims of Education**	***A Place Called School*: Goals for Schooling in the U.S.**
Health	Emotional and physical well-being
Command of fundamental processes	Mastery of the basic skills and fundamental processes Intellectual development
Worthy home-membership	Interpersonal understandings
Vocation	Career education—vocational education
Citizenship	Citizenship participation
Worthy use of leisure time	Enculturation Creativity and aesthetic expression
Ethical character	Moral and ethical character Self-Realization

Committee of Ten in 1893. Emphasizing the importance of each of the expanding educational objectives Goodlad summarized, “When it comes to education, it appears that most parents want their children to have it all” (Goodlad, 2004, p. 39).

Ernest Boyer (1983), relying partly on the work of Goodlad, came to the same conclusion in his review of American high school objectives: “We want it all” (p. 57). The high school at the time of Boyer’s publication was expected to offer student services and teach values that were many years prior the responsibility of the community, home, and church (Boyer, 1983, p. 57). The school was expected to teach a curriculum which included an emphasis on subjects outside of the traditional academic core. The core curriculum for Boyer included literature, history, mathematics, science, foreign language, art, civics, non-Western studies, technology, vocation, and health (p. 303). Further explained, the basic curriculum for all students included

> those consequential ideas, experiences, and traditions common to all of us by virtue of our membership in the human family at a particular moment in history. These shared experiences include our use of symbols, our sense of history, our membership in groups and institutions, our relationship to nature, our need for well-being, and our growing dependence on technology (Boyer, 1983, p. 95).

The breadth of Goodlad’s and Boyer’s objectives illustrates the extent to which educational expectations expanded in the first half of the twentieth century. Goodlad (2004) summarized the changing social conditions of the time and the resulting influence upon schools:

> Industrialization, accelerating immigration, and urbanization then changed these expectations rapidly. Parents were unable to teach the young many kinds of learning they appeared to require. Schools increasingly taught not just good work habits but also about the world of work; they even began to prepare deliberately for specific vocations. They were called upon not just to reinforce the values and attitudes of home and community, but to teach the ideas and ideals of political democracy. Many of the concepts to be learned were quite abstract. The subjects of the curriculum expanded. New kinds of textbooks were required for their teaching. The amount of schooling gained by the young steadily surpassed that of their parents. Each generation became more schooled than the previous one (pp. 43 – 44).

The Report of the Committee of Ten introduced a curriculum in 1893 that both diminished the importance of the classical subjects *and* introduced schooling as preparation for life after high school, not simply college attendance. The *Cardinal Principles* further expanded educational

expectations by focusing upon practical skills necessary for adulthood rather than the core academic subjects. Additional objectives were added to the seven *Cardinal Principles* by the Educational Policies Commission. These mid-twentieth century objectives emphasized critical thinking, the arts, and self-knowledge. As the needs of society changed, so did the curriculum; the "boundaries of life" were the "boundaries of the curriculum" (Tanner & Tanner, 1990, p.126). By the late twentieth century, the works of Boyer and Goodlad reflected the expansion of educational objectives.

The Stability of Health Objectives

Although the educational expectations for students and schools grew during the early twentieth century, health objectives remained constant. In the mid-nineteenth century Herbert Spencer (1864) identified science as the knowledge of most worth as it served to inform a number of adulthood activities. First on his list was the importance of science in the "maintenance of health" (Cremin, 1961, p. 92). In the early twentieth century the *Cardinal Principles* again identified health education as a "fundamental" course to be taken by all students. The *Cardinal Principles* recognized the nexus between the health of individuals and the health of the American democracy:

> To discharge the duties of life and to benefit from leisure, one must have good health. The health of the individual is essential also to the vitality of the race and to the national defense of the Nation. Health education is, therefore, fundamental (Commission on the Reorganization of Secondary Education, 1918, p. 10).

Health was viewed with such importance that the Commission called for a health director to serve on each school's administrative council. It was the responsibility of the health director to "ascertain whether the health needs of the pupils [were] adequately met" (p. 28), including the provision of the lunch meal and appropriate time for physical activity.

The Educational Policies Commission reiterated the importance of health objectives in the mid-twentieth century. In *Education for All American Children*, the objectives of the good

and efficient school included health, the "three-R's," and critical thinking (Educational Policies Commission, 1948). The Educational Policies Commission restated this objective as one of the ten *Imperative Educational Needs of Youth*: "All youth need to develop and maintain good health and physical fitness" (Educational Policies Commission, 1952, p. 216). Goodlad and Boyer spoke to the stability of health objectives in their works. Goodlad (2004), in his review of state and historical documents, included health and physical wellbeing as one of ten educational objectives for American schools. Likewise, Boyer (1983) identified the basic curriculum as being attentive to one's needs for well-being (p. 95). While the objectives of the American schools vastly expanded during the first decades of the twentieth century, one objective remained stable. Health remained a curricular constant. Health was, and is, a boundary of life and therefore it is a boundary of the curriculum (Tanner & Tanner, 1990, p. 126).

School Nutrition Programs

The Roots of the National School Lunch Program

The National School Lunch Program (NSLP) is traced to nutrition science and the works of early twentieth century social reformers. Rooted in the enthusiasm of the Progressive Era, nutrition science promised healthier eating for all, regardless of income. Ellen Richards, a prominent social reformer of the time, believed people of all economic backgrounds would benefit from nutrition education. After opening an experimental lunch program in the Boston public high schools at the end of the nineteenth century, Richards found the perfect environment in which to teach nutrition science—the school lunchroom.

Volunteer organizations administered the majority of cafeterias in the 1920s. However, with the onset of the Great Depression and the growing number of hungry children, state and federal support was necessary for the survival of school lunch programs. Aid came in the mid-

1930s as states relaxed laws allowing local boards of education to use tax money to help cover the costs of school meals. At the same time, the United States Department of Agriculture (USDA) worked with Franklin Roosevelt's New Deal programs to provide price supports to farmers through the purchase of surplus agricultural products. Interestingly, the price supports served a dual purpose; the USDA provided price supports to aid farmers, but the surplus commodities were in turn provided to cafeterias to support local school lunch programs. As described by Poppendieck (2010),

> The focus was on using the available foods, not on a balanced diet. The USDA staff who developed these regulations did not think they were setting up the parameters for a permanent national school food program. They had commodities; they needed a morally and politically acceptable outlet, and they established rules and procedures that reflected their farm income agenda (p. 49.)

The dual purpose of the USDA commodities would prove central to the tensions revolving around the administration of the school lunch program for many years to come.

By the end of the 1930s, the American population was very dependent on federal resources (Levine, 2008). The school cafeteria was no exception. In remembering the number of men too malnourished to serve in WWI and recognizing impending American involvement in WWII, nutritious meals became a matter of national defense. In 1943, as New Deal programs expired and federal support was no longer available for cafeterias, the USDA's Coordinating Committee on School Lunches organized a campaign to save the school lunch program. The campaign was very successful. Congress not only increased funding, but also consolidated a number of federal programs to establish the Community School Lunch Program.

The Community School Lunch Program created federal contracts to govern school cafeterias. Congress intended the contracts to standardize the services available to children across the nation. Schools were first required to serve meals meeting minimal nutritional standards. To ensure that meals were nutritious, the contracts required cafeterias to be staffed

by professionals, not volunteers, and restricted the use of federal aid to only the purchase of food or nutritionist services; schools were responsible for funds needed to pay cafeteria employees and to build or expand facilities. Only those schools with sufficient supplementary revenue raised at the local level could meet these demands. Additionally, schools were required to serve all children equally and provide free meals to low-income students without discrimination. School lunch administrators spoke of equality, but in actuality, the programs maintained the inequalities of the local community. Ironically, with no viable enforcement mechanism, "the contracts that were intended to establish equity and standardization in children's lunches in effect ensured deep inequalities in the program" (Levine, 2008, p. 59).

Many schools did not participate in the Community School Lunch Program because they were unable to raise the necessary revenue at the local level. Recognizing the financial resources needed by schools to participate in the school lunch program, Congress passed the National School Lunch Act of 1946 to officially create the NSLP. The Act provided schools assurance of yearly federal financial support to operate their programs. As Congress began drafting legislation for the National School Lunch Act in the early 1940s, "children's meals became part of a larger struggle over states' rights, federal power and racial equality" (Levine, 2008, p. 78). The program was touted a success by nutritionists, home economists, and child advocates. But in actuality, the interests of Southern Democrats and agricultural lobbyists were more influential than the issues of health and nutrition education. Through the Steagall provisions, the federal government was required to support surplus agricultural commodities. Without the school lunch program as a disposal site, the government was left with the question of what to do with the excess farm products. It was irrational to not provide these commodities to school lunch programs when the "nation's defense depended upon a healthy, well-fed citizenry" (Poppendieck, 2010, p. 51). Although efforts were made for the school lunch program

to fall under the direction of the Bureau of Education, the program was essentially seen as an extension of agricultural policy. The language of the National School Lunch Act of 1946 speaks to this fact:

> It is hereby declared to be the policy of Congress, as a measure of national security*, to safeguard the health and wellbeing of the Nation's children and to encourage the domestic consumption of nutritious agricultural commodities* (italics added) and other food, by assisting the State through grants-in-aid and other means, in providing an adequate supply of foods and other facilities for the establishment, maintenance, operation, and expansion of nonprofit school lunch programs (Section 2, 42 U.S.C. 1751).

Despite the fact that many viewed the program a success for the nation's children, the NSLP had fundamental problems. The program was unable to reach the neediest children because local schools could not raise sufficient revenue to comply with the federal funds matching requirement; schools that were able to match federal funds often used money initially designated for academic expenses. Furthermore, no enforcement mechanisms were in place to ensure that the program's anti-discrimination amendment was upheld and that all needy children were fed at no charge. Predictably then, the American public had an "idealism" of the NSLP "that far outreached its capacities" (Levine, 2008, p. 89). The school cafeteria, in reality, was still a dumping ground for agricultural commodities; only one-third of school children had access to the NSLP; and local, not federal, officials managed federal funds and determined student eligibility for free meals (Levine, 2008).

War on Poverty. For the fifteen years following the passing of the National School Lunch Act, little concern was voiced regarding poor students in the school cafeteria. Most NSLP participants were paying students. Only a handful of students were selected by school officials to receive a free meal. A survey commissioned by the USDA found that "poor children were almost entirely excluded from school lunchrooms" (Levine, 2008, p. 110). Orville Freeman,

Secretary of Agriculture appointed by John F. Kennedy, reported that over half a million needy children attended schools that did not offer free meals as part of their school lunch program. Additionally, nine million children attended schools with no lunch program; one million of those students were thought to be living in poverty (Levine, 2008, p. 110). Freeman was uncomfortable targeting the NSLP toward needy children; he believed the NSLP to be a program for *all* children. Moreover, Freeman believed the USDA and its programs existed for the benefit of farmers.

Pressures built, however, in the 1960s for the provision of free meals for needy children. The fundamental mission of the NSLP came into question. Why do agricultural commodities determine the school menu? How are students identified for the receipt of free meals? And, most importantly, can the NSLP serve as a both a universal program and provide free meals to poor children (Levine, 2008, p. 110)? It was clear that the NSLP had ignored the neediest children. Although a movement was made to move the administration of the NSLP to a federal department other than that of the USDA, the USDA maintained authority over the program. In 1962 Congress demanded that the USDA enforce the provision of free meals for needy children. Nevertheless, by not providing any funding, the provision was void.

Another four years passed before Congress actually apportioned money to cover the costs of free meals for low-income children. Congress allocated funds for free meals with the Child Nutrition Act of 1966. The Child Nutrition Act also provided for a pilot school breakfast program targeting poor children and incorporated the Special Milk Program. The stated purpose of the Act, however, changed very little from that used with the National School Lunch Act twenty years earlier:

> In recognition of the demonstrated relationship between food and good nutrition and the capacity of children to develop and learn, based on the years of cumulative successful experience under the National School Lunch Program with its significant contributions in the field of applied nutrition research, it is hereby declared to be the

> policy of Congress that these efforts shall be extended, expanded, and strengthened under the authority of the Secretary of Agriculture as a measure *to safeguard the health and well-being of the Nation's children, and to encourage the domestic consumption of agricultural and other foods* [italic added], by assisting States, through grants-in-aid and other means, to meet more effectively the nutritional needs of our children (42 U.S.C. § 1771).

Although Levine (2008) referred to the Child Nutrition Act as a milestone in the NSLP's transformation from a farm subsidy to a welfare program (p. 113), the financial and administrative structures did not change and inequalities continued to exist. There was much pressure to establish eligibility standards, but the federal government was unwilling to "alter unspoken rules of local control" (Levine, 2008, p. 118). Children continued to suffer as local administrators subjectively decided eligibility and did little to protect those who qualified for free lunch from mistreatment and embarrassment. The tensions surrounding eligibility standards and the provision of free lunch for children "revealed a fundamental ambivalence about food, family responsibility and social policy" (Levine, 2008, p. 125) in the American society. For a program that was initially intended, although not necessarily practiced, to be a program for *all* children, the NSLP was becoming a "poverty program" in the midst of the "social crisis" (Levine, 2008, p. 125 – 126) of the 1960s.

War on Hunger. The anti-poverty and anti-hunger movements merged in the mid-1960s. Hunger, while it would seem to be an inherent concern of the anti-poverty movement, did not gather attention until 1967. "In 1966 domestic hunger was not an issue; by 1967 it had become a matter of public issue and concern….What transformed hunger from a problem to an issue in its own right was the series of dramatic field investigations and reports of malnutrition that occurred in 1967 and 1968" (Eisinger, 1998, p. 76). Two such reports were *Hunger U.S.A*. and *Their Daily Bread*. These reports highlighted the poverty of children in America and the inability of the NSLP to reach those in greatest need. Another report from the Committee on School Lunch Participation described the desperation of schools and students:

> It is when a large number of needy students attend a school that the system of providing free lunches for them collapses. It is in these schools that the stopgap measures noted in the above examples are employed—rotating the free lunches, or having the teacher buy the children lunch, or hoping the others will share, or having the children stand at the end of the line to see whether any food is left over. It is in these schools where the problem is so overwhelming that principals cannot cope with it, and the hungry children just sit and watch their classmates eat while they go hungry (as cited in Poppendieck, 2010, p. 60).

Hungry children were unacceptable. The NSLP promised to feed the nation's poor and impoverished children but was not meeting its goal. The funding structure had to be changed. In 1970, with the passing of Public Law 91 – 248, uniform eligibility standards were established for free and reduced rates for participants in both the NSLP and SBP. As increasing numbers of children qualified, schools were financially unable to support large-scale cafeterias. Administrators attempted to raise revenue by increasing the price of meals for paying children. The participation of these children consequently dwindled and cafeterias "became racially and economically segregated zones" (Levine, 2008, p. 156). The paying students took their dollars with them and a huge budget shortfall hit the school cafeterias. Although the NSLP and SBP were seemingly received with great public approval, neither states nor local communities were willing to provide the necessary resources. Administrators and liberal reformers began to look to private contractors to keep their school cafeterias afloat. The American School Food Service Association was outraged by the idea of contracting out NSLP services, but anti-hunger advocates viewed private contracting as a means of overcoming the infrastructure problems of many schools. By the end of the 1970s, many school cafeterias resembled fast food establishments. Nutritionists and health professionals were disgusted by privatization of the cafeteria, but others were willing to accept the trade-off if it meant that hungry children were being fed.

War on Waste. A rapid expansion of the NSLP occurred in the late 1960s and 1970s. The average daily participation in the NSLP in 1969 was 19.4 million. This number had grown by

over five million in 1975 (FNS, 2011). New challenges confronted the growing program—the nutritional quality of the school meal and plate waste. The problems of poor meal quality were often trumped by concerns of hunger and program access. But concerns of *inedible* meals gathered considerable attention. Mimi Sheraton, acclaimed restaurant critic and food journalist, commented negatively on the food served to students. Regarding the all too common frozen meals being heated onsite, she stated,

> If these packs often are short in nutrients and in protein weight, they are almost always unappetizing. The instant mashed potatoes are caked into the compartments like library paste, carrots are waterlogged, shriveled peas are often burned black, the corn kernels are almost empty, the string beans are brownish and the baked beans are mushy (as cited in Poppendieck, 2010, p. 65).

Sheraton's descriptions of meals prepared onsite or in a central kitchen were no more appetizing. In a similar fashion, the *Chicago Tribune* ran a series of articles in 1977 describing the food and plate waste of schools in and around the Chicago area. The meals were called a "Prescription for Malnutrition" (Poppendieck, 2010, p. 66). The series estimated that almost 50 million tons of food were thrown away each school day—an amount costing $19.5 million dollars in one year for Illinois (Poppendieck, 2010, p. 66). Plate waste at the high school level had been addressed in 1975 with the introduction of an "offer versus serve option." This option allowed schools to receive reimbursement on a school meal if students selected at least three of five reimbursable meal components. With the *Tribune* series of 1977, the offer versus serve option gained popularity and became available in younger grades.

Perhaps as a way of reducing plate waste, school cafeterias began to view students as customers with food preferences. Student preferences, however, were for fast food items. "It was in the 1970s that schools began the long march to its current heavy reliance on pizza, tacos, and chicken nuggets" (Poppendieck, 2010, p. 68). It was not enough for cafeterias to mimic these items—fast food companies were allowed into the schools. The USDA allowed school

lunch officials to contract with private food industries as early as 1972 and thereby opened the school environment to fast food, soft drink, and vending companies. In effect, the financial health of the school cafeteria undermined the health of the students it served. The original, *stated* intention of the NSLP was to provide nutritious food and nutrition education to all students; under the new provisions, foods of minimal nutritional value were available to students who were essentially a captive audience within a nutritionally poor environment.

War on Spending. When Ronald Reagan took office in 1980 he "promised to 'downsize' government and eliminate waste in public programs" (Levine, 2008, p. 174). One of the first and hardest hit programs was the NSLP. Between the budget cuts of 1980 and those of 1981, the NSLP lost approximately one-quarter of its funding. The Reagan administration wished to focus specifically on those children that were needy, not those children that could afford to pay for their lunch. The popularity of the NSLP and Congress' refusal to limit the provision of reimbursable meals to only low-income students, however, meant that at least minimal federal support for the NSLP was maintained in the face of an "all out assault on domestic social spending" (Poppendieck, 2010,p. 72).

In 1981, Reagan's Secretary of Agriculture approved new nutritional guidelines for use in the NSLP. The guidelines, although purposed to improve the health of student meals, were focused on saving money. The most infamous of the new guidelines was the classification of ketchup as a vegetable. The guidelines also allowed jam to count towards a serving of fruit and cake, because of its egg content, to count as a meat. Public outcry mounted. The USDA, facing a major budget crisis, decided to reduce the size of the school lunch. No longer did the school meal have to supply one-third of children's nutritional requirements across one week—nutritional requirements were decreased to one-quarter of a child's requirements. These

changes were made to reduce the cost of each lunch and ensure that funds were available to provide meals to low-income children.

The budget crunch of the Reagan administration escalated the cafeteria trends that had begun in the 1970s. School food service directors, mandated to maintain a balanced cafeteria budget, "adopted an 'if you can't beat 'em, join 'em' attitude" (Poppendieck, 2010, p. 75). Food service directors were essentially pushed to accept the use of fast food items and to sell competitive foods. The directors were also forced to approach the student as a paying customer with defined preferences.

War on Fat. The war on fat dates back to the early 1980s. At this time the NSLP was criticized for the high fat content of its meals, particularly the dairy and beef commodities. Between 1981 and 1987, schools could order unlimited amounts of dairy products as bonus commodities. Enormous supplies of cheese, butter, and dried milk were available to schools because the government was purchasing these products as price supports for dairy farmers. In the mid-1980s Congress reduced the surplus dairy supply by paying farmers to sell out their whole herd. It was no surprise that the red meat found its way into the school cafeteria. It was during this decade that the first *Dietary Guidelines for Americans* were issued. These guidelines encouraged decreased consumption of saturated fat, sodium, and cholesterol. The milk and meat commodities provided to students through the NSLP were inconsistent with national dietary recommendations.

Secretary of Agriculture Edwin Madigan called for a large-scale study of school meals to determine the extent to which the foods met the *Dietary Guidelines for Americans 1990*. At this point, however, school meals were not required to comply with the guidelines. This study was to be the first in a series of studies titled the School Nutrition Dietary Assessment Study (SNDAS). The findings were alarming. The school meal, on average, was found to contain 38%

of its calories from fat and 15% of its calories from saturated fat. Recommendations were for no more than 30% of total calories from fat and no more than 10% from saturated fat. A new Secretary of Agriculture, Mike Espy, was in office when the results of the SNDAS were published. Concerning the results, Espy wrote "we cannot continue to deep fry our children's health" (as cited in Poppendieck, 1990, p. 79). One year later, Congress passed the Healthy Meals for Healthy Kids Act and required both school breakfasts and school lunches to meet the *Dietary Guidelines for Americans*. Two additional SNDAS have been published, one collecting data in 1998 – 1999 and the other in 2004 – 2005. The second and third SNDAS reiterated the findings of the first SNDAS—school meals were falling short of the national nutritional recommendations.

Privatization of the school cafeteria is one explanation for the nutritionally poor meals receiving attention through the SNDAS. By the 1990s, the NSLP had shifted from an agricultural commodity outlet to a major market for the food service industry (Levine, 2008, p. 180). While fast food companies attempted to meet the nutritional guidelines required of the school meals, most were unsuccessful. The private companies found that by offering low fat side dishes, they could still offer the highly popular high fat items, such as fried chicken sandwiches, hamburgers, and tacos. There was no guarantee, however, that students would select the healthier options as components of their meal.

Nutritionally poor meals were only one battle in the War on Fat. Another battle—the Junk Food Wars—was being waged on competitive foods. As defined by the USDA, competitive foods are foods sold in competition with the NSLP and include foods and beverages sold in vending machines, school stores and as a la carte cafeteria items. The Junk Food Wars is a battle against the very elements that saved the NSLP from budgetary demise in the 1980s. The irony of the situation was explained by Levine (2008):

> Termed the "Junk Food Wars" by the American School Food Service Association, children's nutrition once again took center stage in the media as well as in the halls of Congress. This time around, a new culprit threatened children's nutritional choices. The very measures that schools had introduced in the 1980s to solve the lunchroom financial crisis—fast food and vending machines—now loomed as major obstacles to nutrition education and good eating habits (p. 189).

Ellen Hass, USDA official, "predicted that allowing private companies into the school lunchroom would lead to 'short-term malnutrition and a lifetime of serious and costly healthy problem'" (Levine, 2008, p. 187). Hass was correct in her prediction.

Challenged for Success

The historical account of the major school nutrition programs—NSLP, School Breakfast Program (SBP) and the special milk program—has hinted at the fundamental problems of federal nutrition programs. The first issue—the most elemental issue—is that of purpose. As stated in the National School Lunch Act of 1946, the school lunch program was intended to "safeguard the health and wellbeing of the Nation's children and to encourage the domestic consumption of nutritious agricultural commodities" (Section 2, 42 U.S.C. 1751). But the agricultural purposes of the school nutrition programs were emphasized with the special milk program in 1954. According to the Committee on Agriculture, Nutrition, and Forestry (1983), the milk program was originally intended to "alleviate the increasing stockpiles of Government-purchased dairy products" (p. 58). Agricultural and nutritional provisions continued to fight for priority with the Child Nutrition Act of 1966. The Child Nutrition Act of 1966 shared the same purpose as the NSLP, to "safeguard the health and wellbeing of the Nation's children and to encourage the domestic consumption of nutritious agricultural commodities" (42 U.S.C. § 1771). It is difficult for both nutritional and agricultural goals to be achieved, particularly when the administration of the program falls under an organization designed to support agriculture. In 1977, the Departments of Agriculture and Health, Education, Welfare (1977) completed a study

of the NSLP. A conflict between the agricultural and nutritional provisions of the NSLP was noted. The Departments recommended that Congress create policy guidance on the specific purposes of the NSLP and establish the priority of these purposes. The specific purpose of NSLP, however, remained in question. Just a few years following the 1977 recommendations, the USDA used the school cafeterias as disposal sites for dairy products and red meat—commodities that were nutritionally inconsistent with the recommendations of the NSLP. The school nutrition programs have a history of conflicting actions that question the intentions of the programs—to feed the nation's children or to provide price supports for agricultural products. The purpose of the school nutrition programs have also been clouded by the fact that the school cafeteria has been used as a tool for social reform movements:

> [At the] beginning of the twenty-first century, school food is simultaneously tasked with alleviating poverty, ending hunger, reducing waste, controlling spending, and overcoming childhood obesity, along with its original goals of safeguarding the health and well-being of the nation's children and encouraging the domestic consumption of nutritious agricultural commodities (Poppendieck, 2010, p. 83).

With conflicting and often unclear legislative purposes, it is difficult to determine the success of the school nutrition programs. If the purpose of the program is to support agriculture, school nutrition programs have been successful. The USDA has done well in advancing the needs of farmers through NSLP commodities. Poppendieck (2010) stated, "Ironically it was surplus, not need, that prompted the federal government to get involved and that fundamentally shaped its role in school food" (p. 48). During the 1920s large quantities of agricultural products accumulated as farmers attempted to compensate for dropping prices by increasing production. President Roosevelt responded by creating the Federal Surplus Relief Corporation charged with purchasing surplus products and distributing them to those in need. Because the school cafeteria had to operate on a balanced budget and was required to feed low-income children with little, or no, financial support, these commodity products were

welcomed: “The focus was on using the available foods, not on a balanced diet” (Poppendieck, 2010, p.49). This story has been repeated throughout history with the school cafeteria serving as a dumping ground for agricultural commodities.

If the purpose of the school nutrition programs is to feed the nation’s children, the USDA has been successful. The average daily participation rate for the NSLP in 1969 was 19.4 million; by 2010, the average daily participation was 31.7 million (FNS, 2011). But two related, more significant, questions must be asked. The first question looks beyond the millions of meals served and asks how many of those meals have been provided for America’s neediest children. The second question asks the extent to which participation in the school nutrition programs has improved the nutritional status of all students. The answers to these questions were addressed by the Departments of Agriculture and Health, Education, Welfare in 1977: “The school lunch program provides adequately for the large-scale feeding of children, but it could be much more effective and efficient than it is” (p. i). The effectiveness and efficiency of the program has been hampered by the need to maintain a balanced budget; the provision of nutritionally-poor foods; problems of program participation and access; and the three-tier payment structure.

Lessons Learned from the School Nutrition Programs

It is difficult to label school nutrition programs, such as the NSLP and SBP, which have been integral components of the nation’s schools as failures. But the NSLP and the SBP have failed America’s children. Both programs, held under the authority of the USDA, were designed to be outlets for surplus agricultural commodities. The programs have been successful at providing school cafeterias with commodities. However, to diminish the intended agricultural purposes of the program, the National School Lunch Act of 1946 and the Child Nutrition Act of 1966 stated health and well-being goals for the nation’s children. It is clear that throughout the twentieth century the nutritional quality of school meals was less than perfect.

The greatest failure of the school *nutrition* programs is nutrition. Whether the result of agricultural commodities, limited budgets, or fast food menus, the nutritional quality of school meals has been less than that desired of a nutrition program. This is partly to blame on the conflicting history of the school nutrition programs:

> We have never tried to design a school food program with our children's health, both immediate and long-term, as its central goal, its clear priority. The well-being of children has always had to compete with other agendas: the disposal of farm commodities or the maintenance of segregation or the reduction of the federal budget deficit. It's time to see what we can do if we put children first (Poppendieck, 2010, p. 60).

The time has come to put the health of children first. The battle has been waged against the obesity epidemic. New initiatives are being made to tackle the dietary habits of children and the traditional school nutrition programs are being perfected to better meet the health needs of students.

One such "improved" program, the Fresh Fruit and Vegetable Program (FFVP), "is seen as an important catalyst for change in efforts to combat childhood obesity by helping children learn more healthful eating habits" (FNS, 2010, p.1). The FFVP has three goals. The first two aim to introduce students to and increase student consumption of fruits and vegetables. The third goal mirrors that of other school nutrition program—to improve student diets. This program must be successful—the health of today's youth, tomorrow's adults, demands it.

The FFVP will have to overcome challenges, not unlike those of the NSLP and the SBP, if it is to be successful. The FFVP began as a pilot project in the 2002-2003 school year for a number of schools from four states. In 2004, under the Child Nutrition and WIC Reauthorization Act, the program was expanded to four additional states and made a permanent program under the National School Lunch Act. Six states were added for participation in 2006. In 2008 the Farm Bill permanently authorized the FFVP under the National School Lunch Act. At this time $40 million dollars was allotted for implementation costs in fiscal year 2009 with the provision

of up to $150,000,000 for program expansion. These figures suggest that ample funding is available for the FFVP. This is not the truth. The federal government has provided a specified amount of money which is allotted to provide fresh fruits and vegetables to students from the elementary schools with the highest percentages of free- and reduce-price (FRL) students. As a parallel to the NSLP and SBP, access is a problem. A stated purpose of the FFVP is to "[ensure] that the Program benefits low-income children that generally have fewer opportunities to consume fresh fruits and vegetables on a regular basis" (FNS, 2010, p. 4). While it is true that low-income families may not have the resources to provide fresh foods for their children, there is no guarantee that families with greater resources are purchasing these items either. As stated by Senator Schweiker in 1973, we live in a "nation of nutritional illiterates" (p. 597). Money does not necessarily equate to healthier food choices. All students deserve to participate and experience the benefits of the FFVP.

Where the NSLP and SBP had issues with stigmatized participation and nutritionally poor meals, the FFVP is succeeding. All students of a participating school share in the benefits of the FFVP. There are no forms to complete and no embarrassing eligibility classifications. Every student, in every classroom is provided the opportunity to partake in a universally free program. The nutritional quality of snacks administered through the program is addressed in detail. *Fresh* produce is to be served at all possible occasions—produce in its natural state with no additives. The program is very specific regarding the foods that are not allowed. Unallowable foods, among others, include processed or preserved fruits or vegetables; fruit and vegetable juices; fruit strips; trail mix; and fruit pizza (FNS, 2010, pp. 14 – 15). The program specifically recognizes the nutritional value of fruits and vegetables in an individual's diet. The nutritional integrity of the program will only be upheld if the snacks served are healthy foods. Where the NSLP and SBP spoke of healthy meals for students, the FFVP is following through.

Summary

Chapter 2 has reviewed the growth of educational goals and school nutrition programs during the twentieth century. The discussion of the expansion of educational objectives included an analysis of the meaning of progressivism in education and the response of educational progressives as documented through curriculum proposals. Just as the political context shaped the expansion of educational objectives, so did the political context shape the school nutrition programs. Nevertheless, even as health objectives remained a fundamental component of the curriculum throughout the changing educational expectations, the school nutrition programs have struggled to feed healthy food to America's school children.

The subsequent chapter describes the relationship between academics and vitamin and mineral deficiencies, food insufficiency, and breakfast consumption. Chapter 4 reviews the dietary assessment instruments used to gather food consumption data. Chapter 5 presents the methodology of the research and chapter 6 presents the findings. Discussions and conclusions are found in chapter 7.

CHAPTER 3

THE ROLE OF DIET IN ACADEMIC ACHIEVEMENT

The purpose of this study was to examine the nutritional and academic outcomes of the Fresh Fruit and Vegetable Program (FFVP). The specific research aims were:

1. To determine whether the dietary patterns, specifically fruit and vegetable consumption, of children participating in the FFVP differ from those not participating in the FFVP.
2. To determine whether the academic performance of children participating in the FFVP differs from those not participating in the FFVP.

Before examining the results of the research, it is helpful to understand literature concerning the relationship between nutrition and school performance and the outcome of school nutrition programs with goals similar to the FFVP. The present literature review is divided into two overarching sections. The first section discusses the academic consequences of diet quality, elaborating upon the academic implications of nutrient supplementation, iron deficiency, food insufficiency, and breakfast consumption. Brief dietary characteristics of American children are interwoven within this discussion. The second section describes nutrition interventions, looking at both the success of programs designed to increase consumption of fruits and vegetables and the findings of research studies utilizing Social Cognitive Theory.

Academic Consequences of Diet Quality

The founders of the Child Nutrition Act spoke of a direct relationship between nutrition and student achievement in 1966; support for this relationship extends into the present as

research findings continue to conclude that healthy eating is essential for proper cognitive functioning. However, the demand for schools to achieve Annual Yearly Progress under No Child Left Behind leaves administrators feeling pressured to increase student time in core subjects such as math and English at the expense of nutrition education and physical activity (Shilts, Lamp, Horowitz, & Townsend, 2009; Horowitz, Shilts, Lamp, & Townsend, 2008; Chomitz et al., 2009). Schools would do better to recognize the relationship between wellness and academic achievement. Educational leaders must be aware of the nutritional status of their students and the nutritional quality of the foods they consume. Attention is paid in this section to the relationship between student wellness and academic achievement; emphasis is placed upon the academic implications of nutritional supplementation, iron deficiency, food insufficiency, and breakfast consumption.

Vitamin and Mineral Supplementation

Nutritional status plays a significant role in the educational attainment of students (Ivanovic et al., 2004; Taras, 2005; Weaver-Hightower, 2011). Vitamin and mineral supplements are often given to children to improve their nutritional status. However, the effects of vitamin and mineral supplementation on academic achievement and intelligence levels are not definitive. Studies of children outside of the Unites States have shown some success with nutritional supplementation. South African students receiving biscuits fortified with iron, iodine, and beta-carotene demonstrated significant improvement in cognitive functioning (van Stuijvenberg et al., 1999). Zinc supplementation in Chinese children was found to significantly improve motor skills, attention, and concept and abstract reasoning (Sandstead et al., 1998). Bolivian children demonstrated increasing IQ scores with diminishing goiters (Bautista, Barker, Dunn, Sanchez, & Kaiser, 1982). United Kingdom students demonstrated a significant increase in nonverbal intelligence after eight months of a multivitamin/mineral supplement (Benton &

Roberts, 1988). But conversely, two additional United Kingdom studies found no significant relationship between vitamin and mineral supplementation and academic achievement (Crombie et al., 1990; Neslon, Naismith, Burley, Gatenby, & Geddes, 1990).

Students from the United States have also benefitted from vitamin and mineral supplementation. Children receiving supplementation of a variety of vitamins and minerals at 50% of the daily recommended allowance had a statistically significant net gain in total points on the Wechsler Intelligence Scale for Children (Schoenthaler, Dier, Young, Nichols, & Jansenn, 2000). In a similar study by Schoenthaler, Amos, Eysenck, Peritz, and Yudkin (1991), significant improvements were seen in supplemented children on the nonverbal section of the Wechsler Intelligence Scale for Children-Revised, but not on the verbal section. However, two additional supplementation studies provide contradictory results. The first found only limited improvements on IQ tests (Schoenthaler et al., 1991) and the second found improvement in academic achievement but not in intelligence (Carlton et al., 2000). Nevertheless, the academic advantages of mass supplementation for children in the United States are unclear; there is no evidence that deficiencies in micronutrients such as zinc and iodine are at levels that would negatively impact school performance (Taras, 2005, p. 213).

Iron Deficiency and Supplementation

The relationship between academic achievement and iron status has received considerable attention. Iron deficiency and impaired cognition is a relationship that cannot be overlooked. Over 1.6 billion people worldwide are anemic. Young children are of special concern as 47.4% of preschool children and 25.4% of school age children are identified as anemic (World Health Organization, 2008). Iron deficiency anemia is an issue in the United States. According to data from the 1999 – 2000 National Health and Nutrition Examination Survey (NHANES), iron deficiency is most common in very young children and females; 7% of

children between the ages of 1 and 2 and at least 9% of females between the ages of 12 and 49 are iron deficient (Department of Health and Human Services & Centers for Disease Control and Prevention, 2008).

Many researchers make a clear distinction between iron deficient children *with* anemia and iron deficient children *without* anemia. Poorer academic outcomes, particularly in mathematics, have been found in iron deficient students without anemia (Taras, 2005). For those students with iron deficiency anemia, a "preponderance of evidence" exists to describe their poor cognition and lower academic achievement (Taras, 2005, p.206). Halterman, Kaczorowski, Aligne, Auinger, and Szilagyi (2001) completed a research study of students in the United States. Halterman et al. (2001) examined the relationship between iron deficiency and achievement on cognitive tests among a nationally representative sample of school-aged children and adolescents. A participant was placed into the nutritional classifications of normal, iron deficient without anemia, or iron deficient with anemia as determined by data collected from the Healthy Eating Index between 1988 and 1994. Regression analysis was used to examine the relationship between nutritional status and test scores. Math scores for iron deficient children with anemia (86.4) and without anemia (87.4) were significantly poorer than for those children without iron deficiency (93.7, $p < 0.05$). Iron deficient students with anemia did significantly worse in a block design test than those with no deficiency (8.0 compared to 9.5, $p < .05$). No significant differences were found in reading and verbal scores.

In contrast to the preponderance of research supporting the relationship between academic achievement and iron status, more current findings diminish the relationship between iron and academic achievement in *adolescents*. Dissanayake, Kumarasiri, Nugegoda, and Dissanayake (2009) examined 13 – 15 year old Sri Lankan students in a cross-sectional comparative study for differences in intelligence and academic performance in relation to

nutritional iron status. The authors concluded that iron status does not significantly impact intelligence or achievement. Similarly, a metaanalysis of students from the United States and other countries found limited evidence for increased attention and concentration for students receiving iron supplementation (Falkingham et al., 2010).

Nevertheless, more conclusive evidence does exist on the detrimental effects of iron deficiency in the early years of life. Lozoff (2007) found "compelling evidence that 6 to 24 month-old infants with iron-deficiency anemia are at risk for poorer cognitive, motor, social-emotional, and neurophysiological development" both in the short- and long-term time frames (p. S657). Thomas, Grant, and Aubuchon-Endsley (2009) supported the idea of a critical developmental age and duration period for understanding the impact of iron deficiency on cognitive functioning. Cognitive functioning of the formerly iron deficiency infant is difficult to correct (Thomas, Grant, & Aubuchon-Endsley, 2009) and iron supplementation in later years does not correct the resulting cognitive limitations (Beard & Connor, 2003; McCann & Ames, 2007; Lozoff, 2007). The effects of iron deficiency in the preschool years, however, can be reversed with iron supplementation (Beard & Connor, 2003; Lozoff, 2007).

Food Insufficiency

It has been argued that food insufficiency is the most serious nutrition-related condition facing the United States today (Fiese, Gundersen, Koester, & Washington, 2011). Food insufficiency is the uncertainty of having or being able to attain sufficient food for all members of a household. In 2010, 17.2 million households, or 14.5%, were identified as food insecure. When considering only those households with children, 9.8% of households, or 3.9 million households, were food insecure (Economic Research Service, 2011).

Hunger has academic consequences. In a nation-wide representative sample of United States children, food insufficiency was found to have a significant impact on the education of

school-aged children (Alaimo, Olson, & Frongillo, 2001). For 6 to 11 year old children, food insufficiency was significantly related to poorer mathematics scores and positively associated with having repeated a grade in school and having seen a psychologist. Food insufficiency was not significantly related to cognitive outcomes, reading scores or other psychosocial measures, including suspensions, getting along with others, and developing new friendships. For 12 to 18 year old adolescents, food insufficiency was significantly related to psychological visits, school suspensions, and difficulty getting along with others. No significant relationships existed for any cognitive or academic measures for the 12 to 18 year olds.

Jyoti, Jones and Frongillo (2005) completed a nationally representative study examining the nexus between food insecurity and measures of academic achievement in mathematics and reading, social skills, and physical development (body mass index and weight). With a longitudinal design, researchers compared the food security status of participating students as kindergarteners to their third grade data measures. Food insecurity in kindergarten was significantly related to poorer reading and math scores for boys and girls, a greater decline in social skills for boys, and greater weight and body mass index gains for girls.

Breakfast Consumption

While the nutritional value of school meals is not perfect, participants do consume higher average intakes of key nutrients. School breakfast program participants are more likely than nonparticipants to consume milk and fruit at breakfast. School breakfast participants are also more likely than nonparticipants to have adequate intakes of vitamin A and phosphorus (Gordon, Crepinsek, Briefel, Clark, & Fox, 2009). Participating students have been found to have higher test scores, rates of attendance and classroom participation and fewer tardies. "Both parents and teachers report that students participating in these breakfast programs are calmer in class and have more energy for studying" (Action for Healthy Kids, 2004, p. 14). Overall, the

nutrition of school meals has a "major impact on children—on their health, their ability to learn, and on their potential for becoming healthy and productive adults" (USDA, 2001). Breakfast consumption by United States children, however, is poor. The average daily participation rate in the school breakfast program is 10.1 million children or 24% of students from participating schools (Story, 2009; FNS, 2011). NHANES data from 1999-2000 reported that 6.5% of 4 to 8 year olds, 20.5% of 9 to 13 year olds, and 36.1% of 14 to 18 year olds do not consume breakfast (as cited in Song et al., 2006).

The benefit of school breakfast participation was noted as early as 1978. Pollitt, Gersovitz, and Gargiulo (1978) reviewed the literature to–date for positive effects of participation in the school breakfast program. While conclusions were not drawn regarding long-term implications for breakfast program participation due to issues in the study design, the short-term benefits of participation were made clear: "[T]he studies that focused on the short term effects of hunger or morning feeding suggest that the provision of breakfast may both benefit the student emotionally and enhance his/her capacity to work on school-type tasks" (p. 481).

Years of research since 1978 have confirmed the benefits identified by Pollitt, Gersovitz, and Gargiulo (1978). School breakfast program participation in the United States has been related to significant improvements in attendance (Meyers, Sampson, Weitzman, & Kayne, 1989; Murphy et al., 1998; Kleinman et al., 2002; Huang, Kueil, & Shanklin, 2006) and tardies (Meyers et al., 1989; Murphy et al., 1998). Significant improvements have also been demonstrated on achievement tests (Meyers et al., 1989), including those in language (Meyers et al., 1989) and mathematics (Murphy et al., 1998; Kleinman et al., 2002). And significant improvements in student behaviors as measured by a pediatric checklist have also been found (Murphy et al., 1998; Kleinman et al., 2002).

Skipping breakfast also has implications for student performance. Data strongly suggest that skipping breakfast impedes student cognition and learning, particularly in children at nutritional risk, and breakfast consumption at a minimum improves school attendance and the quality of student diet (Pollitt & Matthews, 1998; Murphy, 2007). Students that regularly consume breakfast have significantly better academic outcomes than those that do not (Murphy, 2007). While Murphy (2007) did not draw conclusions about the impact of consuming breakfast in the short term, he did conclude that the evidence for the "connection between breakfast eating and both academic and health outcomes is now very strong" (p. 31).

School Nutrition Interventions

It is difficult to label school nutrition programs, such as the National School Lunch Program and the School Breakfast Program, as failures. It is ironic that the greatest failure of the federal school nutrition programs has been *nutrition*. A myriad of food and fitness programs and legislation currently being implemented in the nation's schools speaks to the failure of the federal nutrition programs thus far to improve the dietary habits of students—Team Nutrition, Let's Move, Play 60, and the Healthy, Hunger-Free Kids Act. If school breakfasts and school lunches had modeled and educated students about healthy food choices, perhaps these initiatives would not be necessary. The FFVP, one such nutritional initiative, "is seen as an important catalyst for change in efforts to combat childhood obesity by helping children learn more healthful eating habits" (FNS, 2010, p.1). The FFVP has three goals. The first two aim to introduce students to and increase consumption of fruits and vegetables. The third goal mirrors that of other school nutrition programs—to improve student diets. These goals mirror the aims of the research. To better understand the success of the FFVP in obtaining these objectives, a discussion follows of interventions designed to increase student consumption of fruits and

vegetables. The discussion also looks specifically at interventions that have been examined through Social Cognitive Theory, the theoretical framework of choice for the present research.

Fruit and Vegetable Interventions

Knai, Pomerleau, Lock and McKee (2006) completed the first systematic review of interventions designed to increase the consumption of fresh fruit and vegetables in children. The review included 15 studies, 11 examining elementary schools and four examining secondary schools. Each study had to meet specific criteria, including either an individual- or population-based intervention designed to encourage consumption of fruit and vegetables; measurable objectives (quantitative methodology); and a follow-up period of at least three months. Eighty percent of the final studies were from the United States; the follow up period ranged from three months to four years.

Nine of the 11 primary school studies revealed a significant positive effect on fruit and vegetable consumption. Seven of these studies found greater consumption of fruit and vegetable servings each day than the control group upon follow-up, ranging from +0.3 to 0.99 (Knai, Pomerleau, Lock, & McKee, 2006). Two additional studies are noteworthy; one intervention had a net effect of +0.7 servings each day while the second prevented a decrease in consumption witnessed in the control group. One of the four high school studies reported positive results, but these results only held for female students, +0.32 servings a day. The intervention components most associated with the successful programs included a specific focus on fruits and vegetables, hands-on exposure to fruits and vegetables, teacher training, peer leaders, food service staff participation, parent and community involvement, a school nutrition policy, and a longer follow-up period. The three most effective interventions had intensive student exposure to fruits and vegetables in the school, home, and community and lasted at least one year (Knai et al., 2006).

More recently, Wang et al. (2010) conducted a longitudinal study to examine the effects of a school-based nutrition program on nutrition-related outcomes, academic achievement, and physical fitness. Regarding the nutrition-related outcomes, the authors hypothesized that the students with the most exposure to the program would 1) show greater increases in nutritional knowledge, 2) show positive changes in attitudes toward healthy eating behaviors and sustainable ways of gathering food, 3) eat more fruits and vegetables while at school, and 4) eat more fruits and vegetables outside of the school environment. Data for the four hypotheses were collected during the first two years of a three year study with over 400 fourth and fifth grade students. The study design took advantage of the variability of program implementation among participating schools; student data could be compared based upon variable levels of implementation (high, medium, or low) and cumulative effects of exposure could be assessed. In the baseline year, nutrition knowledge scores were highest for those students attending the highest implementing schools; however, the mean changes between the first and second years did not differ significantly by intervention level. Considering fruit and vegetable consumption, no difference was present in year one among the different intervention levels; by year two a notable increase in fruits and vegetable consumption was present for those students attending the high intervention schools.

Food and Nutrition Service Evaluation of the FFVP. The preliminary report of the USDA's review of the FFVP found an increase in fruit and vegetable consumption by participating students (Olsho, Klernman, & Bartlett, 2011). The research compared students (grades four through six) attending schools participating in the FFVP to students in those schools that had applied for participation in the program but were denied; schools considered in the data analysis had a FRL percentage within 2.5% of the state funding cutoff percentage for participation. Students reported their diet through both food diaries and a food frequency

questionnaire. Students from the participating schools increased their fruit and vegetable consumption by 0.24 cups ($p<0.0001$), or half a serving, each day. As the total caloric intake between participating and non-participating students did not increase, the data suggest that students are eating fruits and vegetables in place of other foods in their diet, *not* in addition to those foods. Although more detailed findings await publication, the preliminary findings do support the success of the FFVP in improving the diet quality of young children.

Understanding Fruit and Vegetable Consumption through Social Cognitive Theory. Social Cognitive Theory (SCT) is one of the "dominant models for understanding and modifying health habits" (Resnicow et al., 1997, p. 272). A brief literature review uncovered four research articles utilizing SCT as a framework for understanding the fruit and vegetable intake of young children. SCT posits that personal factors, the environment, and individual behavior interact to explain and predict behavior. Personal factors include beliefs of self-efficacy and outcome expectations. Environmental factors, such as family support, create opportunities or introduce barriers and reinforce behavior changes. A person's individual behavior can change self-efficacy beliefs, outcome expectations, and the environment. All three factors interact in what Bandura refers to as *reciprocal determinism*.

In 1997, Resnicow et al. recognized SCT as a significant model for understanding and changing health-related behaviors and, accordingly, sought to understand the dietary behaviors of third grade students through a SCT perspective. The authors concluded that the model may not address all of the constructs necessary to evaluate self-efficacy; this conclusion coincided with the results of other studies finding that self-efficacy may not be predictive of food choices for young children. Additionally, the authors reported that personality characteristics may mediate the relationship between SCT variables and health behaviors and therefore warrant a model more encompassing of personality characteristics (or different constructs of SCT). The

authors expressed the need for future work to further examine the psychological and social factors that influence diet and develop a more adequate model for young children.

Two years later, Reynolds, Hinton, Shewchuk and Hickey (1999) sought to understand the predictors of fruit and vegetable consumption with the goal of developing more effective interventions for increased intake. The authors believed SCT an acceptable model for children and used variables cited in literature to propose a SCT model to explain fruit and vegetable consumption by children. Three environmental factors were included in the model: availability, modeling, and nutrition education. Motivation and knowledge were included as personal factors; motivation was a composite measure of perceived self-efficacy, outcome expectations, and food preferences. A single behavior construction of fruit and vegetable consumption was included. In terms of the findings, availability had a direct impact on consumption in two subgroups (split 1 and females). This finding confirmed that of other studies—environmental factors do play an important role in consumption. The role of parents and the school in making fruits and vegetables available for students was highlighted. In conclusion, the findings suggested that the use of SCT to both explain and develop an intervention program for children is promising.

In 2007 Reinaerts, de Nooijer, Candel, and de Vries sought to explain the fruit and vegetable consumption of children 4 to 12 years old in the Netherlands. Their explanation was framed with "traditional psychosocial factors (attitude, social influence and self-efficacy) [and] additional factors (parent's fruit and vegetable consumption, availability and accessibility of fruits and vegetables in the home, exposure to fruits and vegetables and habit)" (p. 249). The findings of this study were beneficial as they confirmed the role of psychosocial factors in explaining fruit and vegetable consumption; the findings were also valuable in that they highlighted the importance of availability, parental consumption and habit in explaining

consumption of fruits and vegetables. Of these additional factors, habit was the most influential factor for both fruits and vegetables, especially for males. Because habit was found so influential, new interventions that promote fruit and vegetable consumption as a daily habit must be developed and implemented. Additionally, the role of the environment, especially parents, was found to be paramount. Because parental consumption, exposure and availability were found to be significant influential factors, interventions must focus specifically on the fruit and vegetable environment created by parents and the food habits that the home environment encourages.

Most recently Gross, Pollock, and Braun (2010) sought to "examine fruit and vegetable consumption by school-aged children from a culturally diverse, urban setting using a social cognitive framework to assess social and familial environmental influences of fruit and vegetable consumption" (p. 236). The authors borrowed their SCT framework from Cullen et al. (2001). The Cullen et al. (2001) study identified parental modeling, peer beliefs, and produce availability as important factors in student consumption of fruit, juice, and vegetables. Gross et al. utilized the findings from the Cullen et al. study, but expanded on these finding to "better understand the extent to which these variables are predictive of fruit and vegetable consumption among elementary school students" (p. 236). The authors added to the original study by including the school and family environments related to student food preparation, menu planning, selection, and consumption. Those students that perceived more parental support to consume fruits and vegetables had higher average daily intakes, 1.7 compared to 1.1 servings. Similarly, students of parents that reported eating fruits and vegetables on the day before the survey had higher daily intakes, 1.8 compared to 1.3 servings. Students that reported shopping with their parents, that their family always purchased their favorite fruits and vegetables, that asked to have their favorite fruits and vegetables to be accessible within the

home, and that made use of the family's grocery list all had higher daily intakes than students not reporting these characteristics. Multiple regression analysis was completed on the variables that were found to be statistically significant: parental modeling, home engagement, individual characteristics, and school environment. Three regression models were used to analyze the data with the student's average daily consumption of fruits and vegetables serving as the dependent variable. The first model included the home engagement variables and explained 34.9% of variance in consumption. The second model added parental modeling variables and explained 47.9% of variance in consumption. Individual characteristics were added to the third model, which explained 56.2% of the variance.

Summary

Chapter 3 has reviewed the relationship between nutrition and school performance and the outcomes of school nutrition programs with goals similar to those of the FFVP. Research has found negative academic consequences for students with vitamin and mineral deficiencies, for those with insufficient amounts of food, and for those that do not consume breakfast. School nutrition programs have shown success in increasing the fruit and vegetable consumption of students; a preliminary review of the FFVP by the USDA found that participants increased their fruit consumption by half a serving each day over non-participants. SCT has proven promising for understanding and improving the fruit and vegetable consumption of children.

The subsequent chapter reviews the dietary assessment instruments used to gather food consumption data. Chapter 5 presents the methodology of the research while the findings are presented in chapter 6. Discussions and conclusions are found in chapter 7.

CHAPTER 4

DIETARY ASSESSMENTS WITH CHILDREN

The purpose of this study was to examine the nutritional and academic outcomes of the Fresh Fruit and Vegetable Program (FFVP). The specific research aims were:

1. To determine whether the dietary patterns, specifically fruit and vegetable consumption, of children participating in the FFVP differ from those not participating in the FFVP.
2. To determine whether the academic performance of children participating in the FFVP differs from those not participating in the FFVP.

Before examining the results of the research, it is helpful to understand literature concerning the different dietary assessment methods used to gather dietary information from an individual. To analyze the nutritional impact of the FFVP on young children, it was necessary to quantify the diet characteristics of students participating in the research. Dietary assessment methodologies, including food recalls, food records, and food frequency questionnaires (FFQ), are used to measure dietary intake. While these methodologies are utilized with individuals of all ages, dietary assessments used with children present more complex issues than those used with adults. Following a definition of food recalls, food records, and FFQs is a brief literature review of the validity and reproducibility of assessments previously administered with young children and adolescents. Because the present research targeted fourth and fifth grade students, the discussion focuses on research studies that have examined dietary methodologies used with upper-elementary students.

24-Hour Dietary Recalls

A 24-hour recall asks participants to "define and quantify" (Willett, 1990, p. 52) all of the foods and beverages consumed within a specified 24-hour time period. Because the 24-hour dietary recall captures the eating habits of an individual on *one* day, it does not provide evidence of long-term eating habits. As described by Willett (1990), "any given 24-hour period is usually not typical or representative of long-term intake and may seriously misrepresent actual nutrient intake for an individual" (p.62). For this reason, multiple 24-hour dietary recalls are necessary to estimate an individual's usual diet. Whether one or multiple recalls are needed, the recall places a heavy burden upon the participant to remember the foods and beverages he consumes. The food recall is essentially a memory test. The participant is expected to remember and communicate correctly the foods and beverages he has consumed. Participant recall is most accurate with a limited lapse of time between the period in question and the food recall interview (Willett, 1990, p. 54). Even the most highly motivated individuals can have omissions (foods actually eaten but not included on the recall) and intrusions (foods falsely reported in the recall). It is also likely that the quantities of foods and beverages consumed are under- or over-reported as individual perceptions of standard serving sizes differ.

The 24-hour dietary recall has been a popular method of choice for many researchers (McPherson, Hoelscher, Alexander, Scanlon, & Serdula, 2000). School-age children are not under the continuous supervision of their parents and must often report their own food and beverage consumptions. Gathering this data from children with food recalls is difficult. Children are challenged to accurately remember the foods they have consumed over a specified period of time. In 2000 McPherson, Hoelscher, Alexander, Scanlon, and Serdula completed a review of the dietary assessment methods used with school-age children and concluded that the "validity of [food recalls] in children is mixed" (p. S28). The authors questioned the validity of food

recalls for a number of reasons. First, food recalls have a tendency to both over- and underestimate energy intake. Second, caution must be used when considering a food recall that has been validated through food records as young children often do not have the skills necessary to accurately complete a food record. And lastly, to achieve a long-term understanding of childhood diets, multiple 24-hour food recalls are necessary. Children are overly burdened in the completion of multiple recalls and often lack the motivation to do so.

More recent research continues to highlight the difficulties children experience with dietary recalls. Baxter, Thompson, Litaker, Frye, and Guinn (2002) evaluated the ability of fourth grade students to accurately recall their school breakfast and school lunch meals. Meal observation data were used to validate the student-completed food recalls. The average omission rate for all meal components was 54%. The average intrusion rate for all meal components was 41%. The authors concluded that individuals must be cautious when utilizing 24-hour dietary recalls completed by children. In a similar study, Baxter et al. (2003a) looked for significant differences in the accuracy of child-reported dietary recalls by interview type. On average, the fourth graders failed to report 33% of the items they had consumed and 17% of the items children reported were actually not eaten. While this study did find that the accuracy of recalls does not differ by the interview type, it again highlighted the difficulty of fourth grade students to accurately recall their diets.

Efforts have been made to improve the accuracy of the 24-hour food recalls completed by young children. Even while slight improvements have been made by adjusting the time period in review (Baxter & Thompson, 2002a), the order of the food recall (Baxter et al., 2003b), and the retention interval (Baxter et al, 2009), the accuracy of food recalls completed by young children remains poor.

Food Records

Food records or food diaries are listings of the *actual* foods and beverages consumed on a specified day or number of days. Food records have a fundamental advantage over food recalls. By asking participants to record the details of their diet before consumption, the accuracy of the participant's food record does not depend upon his recall ability. The limitations of food records are similar to those of food recalls. A one-day food diary does not capture day-to-day diet variability and is not representative of the participant's long-term diet. Food records place a heavy burden for completion on the participant and the quality of the diary diminishes as the number of recorded days increases.

Food records have been popular among researchers for gathering nutritional data from children. Food records completed with fourth graders have shown some success. Domel et al. (1994b) reported on the accuracy of seven-day food records completed by fourth and fifth grade students. The food records were either monitored daily or weekly by trained individuals that probed students for additional information. Pearson correlations for the weekly monitoring approach ranged from -0.21 to 0.69; three of the nine meal component correlations were significant. Pearson correlations for the daily monitoring approach ranged from 0.16 to 0.85; eight of the nine meal component correlations were significant. Domel et al. (1994b) concluded that fourth and fifth grade students were "reasonably accurate" in completing food records but were most accurate with daily monitoring of the records (p. 219S).

Domel et al. (1994a) again examined the ability of fourth and fifth grade students to accurately report consumption. This study, however, compared the reliability and validity of data collected from weekly food records to data collected from both weekly and monthly FFQs. The weekly and monthly questionnaires included 45 identical fruit and vegetable items identified as the most commonly consumed produce products of the participant population.

The questionnaires differed only in their response frequency options, one focusing on the past week and the other focusing on the past month. The 45 fruit and vegetable items were grouped into eight categories for statistical analysis. Concerning reliability, Spearman correlations for food record week one and food record week two were significant for seven of the eight categories. Spearmen correlations were significant for all eight categories when FFQ week one was compared to FFQ week two and when FFQ month one was compared to FFQ month two. Spearman correlations for total fruit and vegetables in the test-retest reliability analyses were significant and ranged from 0.47 to 0. 54. The validity of the food records and FFQs, however, was low. Correlation coefficients were significant for four of the eight food categories when FFQ week one was compared to food record week one and when FFQ week two was compared to food record week two. No coefficients were significant in comparisons between the monthly FFQs and the monthly records. The authors concluded that the food records and the FFQs were reliable. The food records had limited validity, but the FFQ was invalid.

In a review of six studies published between 1970 and 1999, McPherson et al. (2000) concluded that the validity of food records completed by young children was unclear. Four of the six food record validity studies provided nutrient intake correlation coefficients. These coefficients ranged from 0.52 to 0.71 for energy, from 0.56 to 0.66 for protein, and from 0.58 to 0.63 for fat. Average energy intake was overestimated in two studies and underestimated in another two studies. The authors concluded that food diaries require cognitive skills that many young children do not possess.

Food Frequency Questionnaires

The food frequency questionnaire (FFQ) is an instrument designed to determine the frequency at which a participant consumes particular foods within a specified time period. The questionnaire consists of a structured list of foods and beverages. Each participant is asked to

indicate the frequency at which he consumes each of the listed items, such as never, 2 to 4 times a month, or 4 to 6 times each day. FFQs have a fundamental advantage over food records and food recalls. FFQs do not gather data on the short-term diet—they collect data regarding the long-term diet. Long-term data are "conceptually [more] important" than short-term data: "It may be advantageous to sacrifice precise intake measurements obtainable on 1 or a few days in exchange for more crude information relating to an extended period of time" (Willett, 1990, p. 70). The ease of completion by the participant, the availability of computer processing, and reduced costs are additional advantages of the FFQ over food recalls and food records.

The FFQ does have limitations. The questionnaire cannot provide the level of detail and specificity available with food recalls and diaries (Hu, 2008, p. 87). Similar to food recalls and diaries, the FFQ is subject to the memory and cognitive estimation abilities of the participant. Populations with lower education levels or limited cognitive skills may have difficulty completing FFQs, particularly quantitative questionnaires.

The use of FFQs with children shows mixed results. The reliability and validity of a fruit and vegetable weekly FFQ and a fruit and vegetable monthly FFQ was compared to that of food records completed by fourth and fifth grade students (Domel et al., 1994a). Spearman correlation coefficients for test-retest reliability for both the weekly and monthly fruit and vegetable questionnaires were significant for all fruits and vegetables included on the questionnaire. However, validity was an issue for the fruit and vegetable FFQ. The mean number of daily servings for the fruits and vegetables in question were higher on the weekly and monthly questionnaires than the servings reported on the weekly and monthly food records. Baranowski et al. (1997) attempted to eliminate the issues of overestimation with an abbreviated fruit and vegetable FFQ. The Pearson correlation coefficients for the fruit and vegetable seven-item questionnaire were low, ranging from 0.13 to 0.25.

The Youth/Adolescent Questionnaire (YAQ), however, has shown reproducibility and validity with older children and adolescents aged 9 to 18. Rockett, Wolf, and Colditz (1995) examined the reproducibility of the YAQ by comparing participant results after a one year interval. Nutrient correlations ranged from 0.24 for protein to 0.58 for calcium. Food correlations ranged from 0.39 for meat to 0.57 for soda. The mean correlation coefficients for reliability were 0.41 for nutrients and 0.49 for food groups. The validity of the YAQ was addressed in 1997 by Rockett and Colditz. The participants completed two YAQs, approximately one year apart, and three 24-hour food recalls spaced at approximate five month intervals between the two YAQs. The YAQ was validated by comparing the means of the three 24-hour food recalls to the means of the two YAQs. The Pearson correlation coefficients for the energy adjusted nutrients ranged from 0.21 for sodium to 0.58 for folate when the three food recalls were compared to data from YAQs; the average correlation coefficient for all nutrients measured was 0.45. Only a slight difference in the mean correlations was found between the two age groups. The mean correlation for participants aged 9 to 13 was 0.42; the mean correlation for participants aged 14 to 18 was 0.49. While the authors did stress the need for continued research, the YAQ was found to be a valid instrument for older children and adolescents.

Conclusions

Dietary assessments are difficult, but their use with children presents special concerns. In selecting a dietary assessment method, attention must be given to the advantages and disadvantages of each method. Particular attention must be paid to the reliability and validity of the instrument. Direct observations, dietitian-led food recalls, and labor-intensive food records can provide accurate and reliable data. However, these methods are costly to implement because of the time and personnel resources required. FFQs offer a number of advantages for

nutritional research. First, the FFQ is conceptually superior to food records and food recalls as it accounts for the day-to-day variability of individual diets by assessing long-term eating patterns. Second, the FFQ is relatively inexpensive as it can be completed by the participant without support from trained personnel and the responses can be scanned by computer rather than hand. Third, FFQs are not overly burdensome for participants. For these reasons, the FFQ "has become the main dietary assessment tool in large nutritional epidemiologic studies, and numerous versions of FFQs have been developed for applications in various populations and contexts" (Hu, 2008, pp. 86 – 87). These are, nevertheless, advantages that one must take with reduced instrument validity. But no dietary assessment instrument is completely accurate or totally reliable, particularly those that are self-reported by children. The best dietary assessment method is one that provides reasonable reliability and validity for the specific research question and population under review.

Summary

Chapter 4 has reviewed dietary assessment methodologies, including food recalls, food records, and FFQs. Special attention was paid to the use of these methodologies with young children. No dietary instrument, particularly when self-reported by children, is completely accurate or reliable. The best dietary instrument is selected by examining the advantages and disadvantages of each instrument within the context of the research objectives.

The subsequent chapter presents the methodology of the present research. The findings from the research are presented in chapter 6. Chapter 7 ends the text with discussions and conclusions.

CHAPTER 5

METHODOLOGY

The purpose of this study was to understand the nutritional and academic implications of the FFVP on fourth and fifth grade students. Through a quantitative approach the researcher sought to understand how the Fresh Fruit and Vegetable Program (FFVP) impacts the students of participating schools as compared to students in non-participating schools with similar characteristics. The specific research aims were:

1. To determine whether the dietary patterns, specifically fruit and vegetable consumption, of children participating in the FFVP differ from those not participating in the FFVP.
2. To determine whether the academic performance of children participating in the FFVP differs from those not participating in the FFVP.

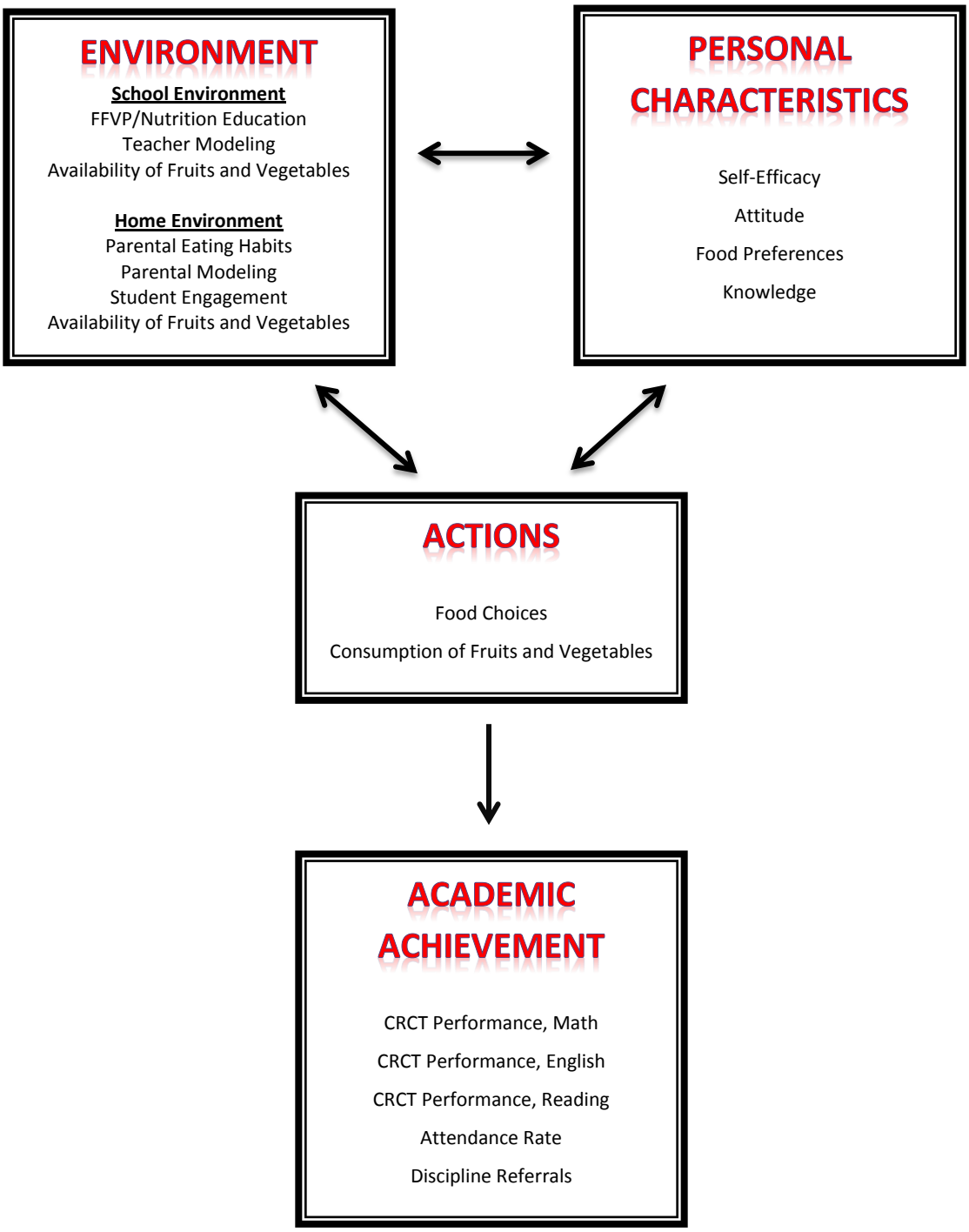
This study was approved by the University of Georgia's Institutional Review Board.

Theoretical Framework

Traditional behavioral theorists, such as John B. Watson and B. F. Skinner, have attempted to understand how behavior is learned and modified through *direct experiences*. Believing these theoretical approaches too limited in perspective, Albert Bandura (1977) posited the Social Learning Theory as a unifying "framework for analyzing human *thought and*

Figure 1

Social Cognitive Theory Framework for Understanding the Impact of the FFVP



behavior [italics added]" (p. vi). Bandura's theory asserts cognition as the mediating factor between human action and the environment: "…most external influences affect behavior through intermediary cognitive processes…" (Bandura, 1977, p. 160). The role of cognition within Bandura's view of learning prompted him to change the name of his theory to Social Cognitive Theory (SCT) with the 1986 publishing of *Social Foundations of Thought and Action: A Social Cognitive Theory*. The name change reflected the fundamental principles of Bandura's view of learning. *Social* acknowledges the "social origin of much human thought and action" (Bandura, 1986, p. xii). *Cognitive* refers to the "influential causal contribution of thought processes to human motivation, affect, and action" (Bandura, 1986, p. xii).

Bandura's approach to human learning and behavior is more complex than a direct relationship between environmental stimuli and human response. SCT explains behavior as a triadic reciprocal relationship among cognitive and other personal factors, behavior, and environment (Bandura, 1977; Bandura, 1986). This interactive process is known as reciprocal determinism. *Reciprocal* refers to "mutual action between causal factors" (Bandura, 1986, p. 23). Interaction between personal and environmental factors is an interdependent process. Likewise, people are not independent of their own behaviors. *Determinism* refers to the "production of effects by certain actors" (Bandura, 1986, p. 23). A person's actions influence his environment and the environment, in turn, influences his behavior. Accordingly then, an individual is neither powerless to the control of his environment nor an agent acting freely on his environment. Cognitive capabilities allow a person to both determine his behavior and consciously act on his environment; as outlined by Bandura, these cognitive capabilities include symbolism, vicarious learning, forethought, self-regulation, and self-reflection. Self-efficacy, or belief in one's capabilities, is a product of these cognitive capabilities and is a central component of SCT.

Many researchers and theorists have applied the tenets of SCT to a variety of fields. Bandura himself proved the wide applicability of SCT with his 1997 publication *Self-Efficacy: The Exercise of Control*. In this text Bandura devoted lengthy passages to the application of self-efficacy in lifestyle choices. Diet quality is one component of an individual's lifestyle choice. The research utilized SCT to understand the impact of the FFVP on the fruit and vegetable consumption of young children and the resulting implications for academic performance. It is recognized that personal and behavioral factors influence a child's decision to eat a variety of fruits and vegetables, but the environment remains a significant influence. The FFVP represents a direct attempt to change the school environment to support the increased consumption of fruits and vegetables. The theorized academic implications of fruit and vegetable consumption are highlighted in Figure 1.

Research Design and Rationale

The present research sought to measure both the health and academic implications of the FFVP. Health implications refer to differences between FFVP participants and non-participants in the frequency of fruits and vegetables consumed within a specified time period. Academic implications refer to differences between participants and non-participants in student attendance, discipline referrals, and CRCT scores in English, reading, and mathematics. These research aims require a quantitative study design. It is impossible to examine the impact of FFVP participation and non-participation on the *same* group of students and therefore the research design must include a control group of schools with characteristics similar to those schools participating in the FFVP.

A cross-sectional study of fourth and fifth grade students from the state of Georgia was planned; implementation and control schools were identified through FFVP data provided by the Georgia Department of Education. Nutritional data were collected through an internet-

based food frequency questionnaire (FFQ). The research participants completing the FFQ were sought from 78 elementary schools located in Northeast Georgia. Mean values at the group level were the unit of analysis. Dietary differences between students participating in the FFVP and those not participating in the FFVP were analyzed with crosstabs and T-tests.

Academic data were collected from the Georgia Department of Education. An effort was made to include all schools participating in the FFVP in the 2011 – 2012 school year in the analysis. FFVP participating schools were matched to non-participating schools with the same urban or rural location and a similar enrollment number and free and reduced lunch (FRL) percentage. Although these matched schools were not analyzed as pairs, the matching process ensured that the implementation and control schools were similar for the analysis. Mean values at the group level were the unit of analysis. Academic differences between students participating in the FFVP and those not participating were analyzed with ANOVA, T-tests, linear regression, and multiple regression.

Participants

The present study was limited to the state of Georgia. The participants differed with the research aim in question. The first research aim sought to determine whether the dietary patterns, specifically fruit and vegetable consumption, of children participating in the FFVP differed from those not participating in the FFVP as measured by data gathered from the FFQ. Schools utilized in this analysis were selected from 15 counties in northeast Georgia and were divided into two groups: implementation schools and control schools. The fifteen counties included 18 school districts with a total of 78 schools meeting the inclusion criteria. System superintendents and school nutrition directors were initially recruited for participation via email; follow-up communications were handled via email and phone conversations. Thirty-three schools, 42%, agreed to participate in the research; 20 schools, 26%, followed through

with participation and provided students the opportunity to complete the FFQ. Of the 20 schools, nine were currently participating in the FFVP in 2011 – 2012 and 11 had *never* participated in the FFVP. Only the fourth and fifth grade students in the implementation and control schools completed the FFQ.

The second research aim sought to determine whether the academic performance of children participating in the FFVP differed from those not participating in the FFVP. Schools utilized in this analysis were divided into two groups: implementation schools and control schools. The implementation group consisted of those schools participating in the FFVP in the 2008 – 2009 (n = 27), 2009 – 2010 (n = 54), and/or 2010 – 2011 (n = 77) school years. Attempts were made to include schools participating in 2011 – 2012 (n = 146), however academic data for these schools were unavailable from the Georgia Department of Education at the time of the analysis. After eliminating any primary schools and accounting for those schools that had participated for multiple years, a total of 56 schools met the requirements for inclusion in the implementation group. The control group was created by matching schools that had never participated in the FFVP to participating schools. The schools were matched on location (rural or urban), enrollment size (+/-250 students), and percent FRL (+/- 10%). Only four of the 56 pairs were matched with FRL percentages greater than 1% in difference. The Department of Education provided *school level data* for both the implementation and control schools; this data included enrollment size, demographics, CRCT scores, attendance rates and discipline referrals for all students enrolled in a school and individually for both the fourth and fifth grade levels of a school.

Dietary Assessment Instrument

The USDA's evaluation of the FFVP in early 2011 utilized two dietary assessment methods. A 24-hour recall was selected as the primary dietary instrument because of the

validity this instrument offers with young children (Palmer, n.d., pp. 14 – 15). A FFQ, "What Do Students Eat?," was used to increase the accuracy of the data collected through the 24-hour dietary recalls. Resource limitations of the present research demanded the use of a FFQ alone. Minor modifications of the "What Do Students Eat?" FFQ led to the "Understanding What Georgia Students Eat" FFQ (Appendix A). The survey included 14 consumption frequency questions, 3 typical school week behavior questions, 4 agree/disagree questions, 10 preference questions, and 1 knowledge question. One question regarding student grade level was added to the original FFQ. The most significant modification, however, was the change from a paper-and-pencil questionnaire to an internet-based questionnaire, a service offered by the University of Georgia's Survey Research Center. Question formatting, language, and graphics were maintained throughout the internet-based FFQ.

Validity and Reliability

Validity and reliability data for the "What Do Students Eat?" FFQ were unavailable from the USDA at the time of the research. However, the USDA's FFQ was created by selecting questions from previously validated instruments (Palmer, n.d., p. 19). Questions concerning the frequency of fruit and vegetable consumption were selected from the Centers for Disease Control's Youth Risk Behavior Surveillance System (YRBSS) questionnaire. This questionnaire has been widely used and validated with adolescents. While the YRBSS has not been validated with young children, no other validated instrument existed for use with young children (Palmer, n.d., p. 19). Pilot tests of the USDA's FFQ found the instrument acceptable for use with fourth through sixth grade students. Questions concerning snack and beverage related items were selected from the Beverage and Snack Questionnaire developed for use with seventh grade students (Neuhouser, Lily, Lund, & Johnson, 2009). This instrument was found to be both valid

(r = 0.56 to 0.87 for the individual food items in question) and reliable (r = 0.72 to 0.85 for the food categories in question).

The reliability of the "Understanding What Georgia Students Eat" FFQ was addressed through a pilot study. Two elementary schools from northeast Georgia served as pilot schools. These particular schools were selected for this role for two reasons. First, the school nutrition director for each school was very interested and involved in the administration of the FFVP. Second, the principals of the individual schools found value in the FFVP and were willing to invest in the research. The pilot study included a total of 184 students with parental permission to participate (Table 3). Pilot school students completed the questionnaire twice within a seven day time period. As the questionnaire asked for average consumption within the past week, data from the two questionnaire administrations were compared to determine the reliability of the instrument. The pilot study data described the FFQ as a reliable instrument to determine the consumption frequency of and preferences for a variety of fruits and vegetables in fourth and fifth grade students.

Data Collection Procedures

Two distinct elements comprised the data collection procedures. To understand the impact of the FFVP on the nutritional quality of student diets, students were asked to complete the "Understanding What Georgia Students Eat" questionnaire (Appendix A). Recruitment information (Appendix B) regarding the research was sent in February 2012 to the superintendent and school nutrition director of those schools identified for participation in the research. The emails originated from the researcher's University of Georgia email account. A listserv of the email addresses for principals of elementary schools identified for participation was collected from the Georgia Department of Education in December 2011.

Participating schools were provided a window of time (March through May 2012) to complete the FFQ with their fourth and fifth grade students. Prior to the questionnaire administration, students were provided informational handouts on which their parents were asked to indicate permission for participation; the permission slips were approved by the University of Georgia's Institutional Review Board and detailed the purposes, risks and benefits, and confidentiality of the research (Appendix C). Participating students were directed to the FFQ hosted on the University of Georgia's Survey Research Center's website. Each student was required to provide his or her consent for participation on the first page of the FFQ. Teachers were allowed to help students understand difficult vocabulary but were not allowed to provide an answer to the questions.

No instrument was necessary for the collection of school level academic data. The Informational Technology division of the Georgia Department of Education provided school level data for both the implementation and control schools in an Excel document. School level variables and grade level variables for each school included the percentage of FRL students, gender, race/ethnicity, attendance, discipline referrals, and CRCT scores in English, reading, and mathematics.

Data Analysis

FFQ completers were divided into two groups for analysis. Those students from schools participating in the FFVP constituted the implementation group; those students from schools not participating in the FFVP constituted the control group. Mean values at the group level were the unit of analysis. All analyses were run with a 95% confidence interval. The type of analysis, however, differed by research question. To answer the question regarding dietary characteristics, crosstabs and T-tests were run in SPSS. Crosstabs allowed for comparison of non-continuous variables, including participation status, grade level, race, and frequency of

consumption. Crosstabs were used to analyze mean differences for the frequency response questions, school week behavior questions, and the knowledge question. T-tests were used to analyze the agree/disagree questions and the fruit and vegetable preference questions. The T-tests assessed whether statistically significant differences existed between the means of the two independent groups on a continuous scale. T-tests were also used to analyze *created variables*. Created variables are new variables for analysis formed by summing similar FFQ questions. The means for the created variables were calculated by summing the variables and dividing by the number of variables in the original response scale. For those created variables that joined the food frequency questions, a higher mean score indicated higher consumption. For those created variables that joined the food preference items, a lower mean score indicated greater preference.

The second research question examined the relationship between participation in the FFVP and academic behaviors. This analysis utilized ANOVA, T-tests, and linear and multiple regression. The initial analysis used ANOVA to determine if the percentages of students passing or exceeding standards on the CRCT differed significantly by the number of years the school had participated in the FFVP. T-tests were used to identify differences between the means of FFVP participants and non-participants at both the fourth and the fifth grade levels. Linear regression was utilized to determine the relationship between school variables, such as location, FRL percentages, gender, race, attendance, discipline, and student achievement on the CRCT. And lastly, multiple regression was used to create models of the variables most predictive of student CRCT achievement.

Research Limitations

As with any research design, limitations were present. A state-wide representative sample of schools would have been statistically superior. However, the qualification

parameters established by the USDA for participation in the FFVP and restricted resources limited the number of schools that could be included in the study. The limited number of schools in Northeast Georgia participating in the FFVP further reduced the number available for inclusion as implementation schools in the dietary analysis. Matching was a viable alternative to a randomized design as it provided a set of schools with similar characteristics for the academic analysis. The statistical differences calculated between participants and non-participants in both the academic and dietary analyses maintained a 95% confidence interval; it is feasible that 5% of all of the statistical findings could be the result of chance rather than actual difference. Furthermore, the statistically significant results may not be practically significant in real world applications.

A second limitation was the evaluation of the FFVP in the short-term. Although some schools were currently in their fourth year of participation, others had less than one year of program participation at the time of analysis. While it is possible to consider the dietary and academic change resulting from participation in the FFVP across time, the program is relatively new and the present research compared only the mean values of participating and non-participating students from one school year. Future research may choose to follow elementary-aged participants into middle and high school to understand the lasting implications of participation in the FFVP.

A third limitation concerned the use of a FFQ to gather nutritional data. Although no dietary assessment methodology provides completely reliable and valid information, FFQs have often shown limited reliability and validity. The reliability of the FFQ was examined with a pilot study. The pilot study had two limitations. First, the reliability of the instrument was examined at the group level, not at the individual student level. The number of students completing the FFQ in week one and the number completing the FFQ in week two differed; only a subset of

students that completed the pre-test in week one completed the post-test in week two. Second, as the FFQ used in the present research was changed from a paper-and-pencil instrument to an internet-based instrument, it would have been advantageous to compare the reliability of the instrument formats. The pilot, however, did not make any reliability comparisons between the paper- and internet-based instruments.

The validity of the FFQ is also of concern. The questions comprising the instrument must coincide with the particular dietary habits or nutrition program for which the FFQ is gathering data. Countless foods could be assessed with a FFQ, but only those foods of particular interest should be included on the instrument. By focusing on a specific set of foods, the instrument will not capture the true variety of foods consumed by the research participant. The FFQ used in the present research focused on the consumption of fruits and vegetables. Even with a focus on the most popular fruits and vegetables and the inclusion of a number of non-fruit and non-vegetable questions, the instrument cannot portray the diet of the fourth and fifth grade participants in totality. This particular instrument also cannot explain student nutritional knowledge as a result of program participation. The FFVP does not dictate a nutritional curriculum. The FFQ cannot describe a difference in the knowledge of FFVP students as the knowledge in question was not a required component of program implementation. Furthermore, serving size is of concern with FFQs as participating individuals have differing concepts of food proportions. And lastly, the FFQ is subject to the memory and cognitive abilities of the participant. FFQs can be particularly difficult for young child to complete because the instrument requires them to both recall their food intake and estimate the average consumption of the food during a specified period of time.

A fourth limitation concerned the group level analysis. The students that completed the FFQ were non-identifiable. Although the initial research design included examining responses at

the school level, the limited number of student responses from many of the schools demanded that all responses be considered at the group level (implementation group compared to the control group). Data from the Georgia Department of Education were only available at the school and grade levels, not at the individual student level. The data were averaged for comparison at the group level. Future research should examine the dietary and academic characteristics of implementation and control students at an individual level.

Summary

Chapter 5 has reviewed the research methodology. Through a quantitative research approach, the researcher sought to understand the health and academic implications of participation in the FFVP. The data collection and statistical analysis procedures differed for the two research aims. Dietary data were collected through a FFQ. Validity and reliability of the FFQ was previously addressed by the USDA in their evaluation of the FFVP in 2010 - 2011. Reliability was addressed in the present research design through a pilot study. All fourth and fifth grade students in both implementation and control schools were asked to complete the internet-based FFQ. Academic data for the implementation and control schools were provided by the Informational Technology division of the Georgia Department of Education. All analyses were completed at the group, school or grade level.

The researcher assembled and completed statistical analysis on the data collected from the FFQs and Georgia Department of Education with the support of the University of Georgia's Statistical Consulting Center and the University of Georgia's Survey Research Center.

The final two chapters present the research findings and offer discussions and conclusions.

CHAPTER 6

FINDINGS

The purpose of this study was to examine the nutritional and academic outcomes of the Fresh Fruit and Vegetable Program (FFVP). The specific research aims were:

1. To determine whether the dietary patterns, specifically fruit and vegetable consumption, of children participating in the FFVP differ from those not participating in the FFVP.
2. To determine whether the academic performance of children participating in the FFVP differs from those not participating in the FFVP.

The findings are presented in three sections. The first section of the chapter discusses the reliability of the food frequency questionnaire (FFQ) as tested through a pilot study. The remainder of the chapter addresses the research aims directly. The second section presents the dietary differences between FFVP participants and non-participants. The third section presents the findings from the academic comparisons between participants and non-participants.

Reliability of the Food Frequency Questionnaire

The FFQ utilized in the research was reproduced with permission from the USDA's 2011 study of the FFVP. Minor modifications were made to the questionnaire; see section titled "Dietary Assessment Instrument" from Chapter 5 for a discussion of the modifications. Reliability and validity data for the FFQ from the USDA were not expected until fall or winter 2012. Consequently, a pilot study of the FFQ was conducted to understand the reliability of the instrument. The pilot study asked fourth and fifth grade students from schools currently

participating in the FFVP to complete the FFQ twice within a one week time period. Theoretically, as diet and food preferences are unlikely to change substantially within a seven day period, the FFQ accessed the same eating pattern with each completion of the survey. Resource constraints prohibited the pilot study from examining the validity of the FFQ. Validity of the FFQ can be accessed upon the publication of the USDA's review of the FFVP.

Table 3

Pilot Study School and Student Descriptors

School and Student Descriptors	School A	School B
Total School Enrollment	215	544
Fourth Grade Enrollment	94	90
Fifth Grade Enrollment	N/A*	83
Race/Ethnicity of Total School Enrollment		
White (%)	155 (72.1)	396 (72.8)
Black (%)	28 (13.0)	57 (10.5)
Hispanic (%)	20 (9.3)	66 (12.1)
Other (%)	12 (5.6)	25 (4.6)
FRL Participation, total school enrollment (%)	135 (61.4%)	358 (65.6%)
4^{th} & 5^{th} graders with parental permission to participate (%)	78 (82.9%)	106 (61.3%)
Students completing FFQ pre-test (%)	74 (78.7%)	106 (61.3%)
Students completing FFQ post-test (%)	44 (46.8%)	83 (48.0%)

*School A enrolls only third and fourth grade students. School B enrolls prekindergarten through fifth grade students.

Two northeast Georgia schools were asked to participate in the pilot study (Table 3). Both schools were located in Jackson County and were participating in their second year of the FFVP. School A had a total of 215 students in the third and fourth grades with 61% of students qualifying for FRL as measured for school year 2011 - 2012 (Georgia Department of Education, 2012). The student body was 72% white, 13% black, 9% Hispanic, and 6% other. As the research examined fourth and fifth grade students, the 94 fourth graders (D. Cash, personal

communication, January 19, 2012) were asked to participate in the pilot. Seventy-eight (83%) of the 83 students returning permission slips had parental permission to participate in the research. Seventy-four students completed the survey during the first week; 44 completed the survey during the second week. It was unclear why the number of students completing the survey during the second week was lower than that from the first week (D. Cash, personal communication, April 8, 2012).

School B enrolled students in grades prekindergarten through fifth with a total enrollment of 544 (Georgia Department of Education, 2012). Of these students, 66% qualified for FRL in school year 2011 - 2012. The student body was 73% white, 11% black, 12% Hispanic, and 5% other. The 173 fourth and fifth graders (D. Doss, personal communication, January 20, 2012) were asked to participate in the pilot. One-hundred six students (61%) returned signed permission slips with parent approval for participation. During the first administration of the survey, 106 students completed the survey; 83 completed the survey during the second administration.

Reliability of Frequency Questions

The reliability of the FFQ was examined by question type. The survey included 14 frequency questions, 3 typical school week behavior questions, 4 agree/disagree questions, 10 preference questions, and 1 knowledge question. The frequency questions gathered data regarding the number of times a student consumed a variety of foods and beverages within a seven day time period. Each frequency question offered a seven-item categorical response scale: 1) I did not eat this food during the past 7 days; 2) 1 to 3 times during the past 7 days; 3) 4 to 6 times during the past 7 days; 4) 1 time per day; 5) 2 times per day; 6) 3 times per day; and 7) 4 or more times per day. For the statistical analysis, the seven response categories were collapsed to three: 1) I ate this food 0 – 6 times during the past 7 days; 2) 1 to 2 times per day;

and 3) 3 or more times per day. The analysis compared group level responses pre-test (first week) to post-test (second week), fourth grade pre-test to fourth grade post-test responses, and fifth grade pre-test to fifth grade post-test responses. Table 4 presents the frequency questions for which scaled responses between the pre-test and the post-test were significantly different at $p = 0.05$.

Table 4

Distribution of Frequency Responses Pre – and Post – Test

Question	Frequency		
During the past seven days, how many times did you…	0 – 6 a week (%)	1 – 2 a day (%)	3 or more a day (%)
eat fruit?			
All Students Pre-test	51.1	32.8	16.1*
All students Post test	47.6	25.4	27.0*
4th Grade Pre-test	46.6	35.6	17.8
4th Grade Post-test	49.5	25.7	24.8
5th Grade Pre-test	59.7	27.4	12.9*
5th Grade Post-test	38.1	23.8	38.1*
drink any punch, Kool-Aid, sports drinks, energy drinks, vitamin water, or other fruit-flavored drinks?			
All Students Pre-test	67.2	17.8	15.0
All students Post test	73.2	18.9	7.9
4th Grade Pre-test	66.1	19.5	14.4
4th Grade Post-test	68.9	21.7	9.4
5th Grade Pre-test	69.4*	14.5	16.1
5th Grade Post-test	95.2*	4.8	0.0

An asterisk (*) indicates the scaled categories for which the pre-test and post-test data are significantly different at $p = 0.05$.

Reliability of Preference and Agree/Disagree Questions

Ten questions analyzed the degree to which students prefer a variety of fruits and vegetables. Preference was measured with a four-point Likert scale that included “A lot,” “A

Table 5

Distribution of Preference Responses Pre – and Post – Test

Question	**Preference**			
For each fruit and vegetable, how much do you like it?	A Lot (%)	A Little (%)	Don't Like It (%)	Don't Know Never Tasted (%)
Apples				
All Students Pre-test	74.3	22.3	3.4	0.0
All students Post test	81.7	16.7	1.6	0.0
4th Grade Pre-test	70.1*	25.6*	4.3	0.0
4th Grade Post-test	85.7*	12.4*	1.9	0.0
5th Grade Pre-test	82.3	16.1*	1.6	0.0
5th Grade Post-test	61.9	38.1*	0.0	0.0
Bananas				
All Students Pre-test	67.6*	23.9	6.8	1.7
All students Post test	80.0*	16.0	4.0	0.0
4th Grade Pre-test	65.5*	25.9	6.9	1.7
4th Grade Post-test	81.9*	16.2	1.9	0.0
5th Grade Pre-test	71.7	20.0	6.7	1.7
5th Grade Post-test	70.0	15.0	15.0	0.0
Pears				
All Students Pre-test	39.2*	32.4	22.7	5.7
All students Post test	55.6*	25.0	14.5	4.8
4th Grade Pre-test	36.5*	38.3	20.9	4.3
4th Grade Post-test	54.8*	26.0	14.4	4.8
5th Grade Pre-test	44.3	21.3	26.2	8.2
5th Grade Post-test	60.0	20.0	15.0	5.0

An asterisk (*) indicates the scaled categories for which the pre-test and post-test data are significantly different at $p = 0.05$.

little," "Don't like it," and "Don't know, Never tasted." The FFQ, as shown in Appendix A, used visual clues to help students understand the response categories. "A lot" was represented with two smiley faces, "A little" was represented with one smiley face, and "Don't like it" was represented with one frown face. Table 5 presents the preference questions for which responses between the pre-test and the post-test were significantly different at $p = 0.05$. There

were no significant differences in preferences for strawberries, oranges, grapes, pineapple, carrots, broccoli, and cauliflower.

Four questions assessed the degree to which students like or are willing to taste fruits and vegetables. The four-point Likert scale included "I agree very much," "I agree a little," "I disagree a little," and "I disagree a lot." Smiley and frown faces were again used to help students correctly report their food preferences. Only one response category had statistically different pre-test and post-test responses. The combined fourth and fifth grades, in responding to the statement "I like to try new kinds of fruits," reported statistically different answers between the pre-test and the post-test for "I disagree a lot." Three percent of students reported "I disagree a lot" in the pre-test while 10.3% reported the same answer in the post-test ($p = 0.05$).

Reliability of School Behavior and Knowledge Questions

School eating behaviors, including breakfast and lunch consumption, were assessed with three questions. Student response categories included less than once a week or never, 1 to 2 times a week, 3 to 4 times a week, or every day. Pre-test and post-test responses to these lunch and breakfast behavior questions were not significantly different at $p = 0.05$.

Likewise, the one question assessing student knowledge did not have statistically different responses between the pre-test and post-test. Students were asked the number of fruits and vegetables they believed were healthy to eat each day. The 4 categorical responses included at least 1 per day, 1 to 2 per day, 3 to 4 per day, and 5 or more each day.

Reliability of the Food Frequency Questionnaire Summary

The pre- and post-test scores describe the FFQ as a reliable instrument to determine the frequency of and preferences for a variety of fruits and vegetables in fourth and fifth grade students. Statistically significant differences were found between the pre- and post-test for the

frequency of fruit consumption and sugar-sweetened beverages consumption. Three of the ten preference questions and one of the four agree/disagree questions were found to have statistical differences. The school lunch behaviors and the knowledge question were not significantly different.

The pilot study had limitations. First, the pre- and post-test analysis examined only reliability, not validity, of the FFQ. The reliability of the instrument was examined at the group level, not at the individual student level. Although additional data regarding the validity and reproducibility of the instrument can be accessed upon the publication of the USDA's review of the FFVP, it is important to note that the questions comprising the FFQ were selected from previously validated instruments (Palmer, n.d., p. 19). And second, attention must be paid to the number of students completing the FFQ in week one and the number completing the FFQ in week two; only a subset of students that completed the pre-test in week one completed the post-test in week two.

Dietary Characteristics of FFVP Participants and Non-Participants

To answer the research question regarding differences in the dietary patterns of fourth and fifth grade students participating in the FFVP and those not participating in the FFVP, students from 15 counties, 78 elementary schools, in northeast Georgia were asked to complete a FFQ. Thirty-three schools, 42%, agreed to participate in the research but only 20 schools, 26%, had students complete the FFQ. Of the 20 participating schools, nine schools were currently participating in the FFVP in 2011 – 2012 and the other 11 had *never* participated in the FFVP (Tables 6 through 8). Descriptive characteristics of the FFQ participants are provided in Table 9. The following two sections present, first, a comparison between the fourth and fifth grade program participants and, second, a comparison of dietary characteristics between students participating in the FFVP and those not participating in the program.

Table 6

Frequency Summary of Years Participating in FFVP for Schools included in the Dietary Analysis

Number of Years Participating	Frequency	Percent
1	3	33.3
2	4	44.4
3	1	11.1
4	1	11.1

Table 7

Frequency of Location by FFVP Participation for Schools included in the Dietary Analysis

Location	FFVP Participant (%)	FFVP Non-Participant (%)	Total (%)
Rural	7 (77.8)	7 (63.6)	14 (70.0)
Urban	2 (22.2)	4 (36.4)	6 (30.0)

Table 8

Overall Summary Statistics for Schools included in the Dietary Analysis

Variable	All Schools			
	Mean (SD)	Minimum	Median	Maximum
Student Count	470 (191.71)	95	445	924
FRL Percent	63.64 (15.78)	30.12	59.90	96.22

Variable	FFVP Participants			
	Mean (SD)	Minimum	Median	Maximum
Student Count	522.22 (204.87)	220	546	924
FRL Percent	74.11 (14.15)	59.41	73.25	96.22

Variable	FFVP Non-Participants			
	Mean (SD)	Minimum	Median	Maximum
Student Count	426.82 (178.18)	95	412	777
FRL Percent	55.07 (11.56)	30.12	73.53	73.68

Table 9

Descriptive Characteristics of Food Frequency Questionnaire Completers

	Fourth Grade Students			Fifth Grade Students			All Students		
	FFVP Participant (%)	FFVP Non-Participant (%)	Total (%)	FFVP Participant (%)	FFVP Non-Participant (%)	Total (%)	FFVP Participant (%)	FFVP Non-Participant (%)	Total (%)
Total Students	170 (42.9)	226 (57.1)	396 (43.1)	219 (41.9)	304 (58.1)	523 (57.0)	389 (42.3)	530 (57.7)	919 (100.0)
Am. Indian/Alaska Native	8	17	28 (7.1)	19	15	36 (6.9)	27	32	59 (6.4)
Asian	5	3	14 (3.5)	3	4	7 (1.3)	8	7	15 (1.6)
Black	10	14	31 (7.8)	22	24	51 (9.8)	32	38	70 (7.6)
Native Hawaiian/Pacific Is.	2	5	14 (3.5)	4	3	7 (1.3)	6	8	14 (1.5)
White	145	187	360 (90.9)	171	258	441 (84.3)	316	445	761 (82.8)
Hispanic/Latino	18	11	65 (16.4)	47	11	78 (14.9)	65	22	87 (9.5)

Table 10

Distribution of Frequency Responses, All FFVP Participating Fourth and Fifth Grade Students

Question	Frequency		
During the past seven days, how many times did you…	0 – 6 a week (%)	1 – 2 a day (%)	3 or more a day (%)
eat any candy?			
4th Grade Students	69.2	18.6	12.2*
5th Grade Students	77.8	17.1	5.1*

An asterisk (*) indicates the scaled categories for which the fourth and fifth grade data are significantly different at $p = 0.05$

Comparing the Dietary Characteristics of Fourth and Fifth Grade FFVP Participants

The data analysis began with a comparison between fourth grade *participants* and fifth grade *participants*. Six of the nine FFVP schools had been participating for at least two years. Significant difference between fourth and fifth graders should not result from differing years of participation as both fourth and fifth graders would have been enrolled in elementary school at the time the program began implementation. Significant differences, however, may suggest that age and maturity have a greater influence on food choices than the knowledge and experiences gained from participation in the program. Comparisons were made between the fourth and fifth grade students participating in the FFVP on each of the 14 frequency questions. The participating fourth and fifth graders differed significantly on only one question (Table 10). Fourth grade participants were more likely to report consuming candy 3 or more times each day than were fifth grade students ($p = 0.031$). The frequency response categories of 0 to 6 times a week and 1 to 2 times a day were not significantly different.

Comparing the Dietary Characteristics of FFVP Participants and Non-Participants

As the first of the two research aims, the analysis sought to determine if the dietary habits of FFVP participants (implementation group) differed significantly from FFVP non-participants (control group). Comparisons were made for each FFQ question and for the created variables by participation status, race/ethnicity, and grade level (see "Data Analysis" section in Chapter 5 for a discussion of created variables). With the exception of Table 11 and a limited number of noteworthy results, only those questions with a statistically significant mean difference ($p < 0.05$) are presented. All other differences were statistically non-significant.

Fruit and Vegetable Consumption Frequencies and Preferences. The differences in fruit and vegetable consumption between FFVP participants and non-participants were of specific interest. Table 11 presents the six frequency questions that dealt only with fruits,

Table 11

Distribution of Frequency Responses for Fruits and Vegetables by Participation Status and Race/Ethnicity

Question	Frequency					
During the past seven days, how many times did you…	0 – 6 a week (%)		1 – 2 a day (%)		3 or more a day (%)	
	FFVP Participant	FFVP Non-Participant	FFVP Participant	FFVP Non-Participant	FFVP Participant	FFVP Non-Participant
drink 100% juice?						
All Students	65.6	65.6	22.1	23.6	12.3	10.7
African American/Black	62.5	44.7	18.8	34.2	18.8	21.1
Hispanic/Latino	44.6	45.5	32.2	40.9	23.1	13.6
White	68.0	67.4	21.2	22.0	10.8	10.6
eat fruit?						
All Students	50.0	54.9	30.4	27.9	19.6	17.2
African American/Black	40.6	42.1	34.4	28.9	25.0	28.9
Hispanic/Latino	46.2	45.5	26.2	34.6	27.7	18.2
White	51.7	56.1	30.3	27.3	18.0	16.7
eat green salad?						
All Students	83.6	84.8	13.8	12.9	2.6	2.4
African American/Black	75.0	70.3	18.8	24.3	6.3	5.4
Hispanic/Latino	73.4	63.6	23.4	36.4	3.1	0.0
White	86.0	86.2	12.1	11.3	1.9	2.5
eat other kinds of potatoes? Do NOT count French fries, fried potatoes, or potato chips.						
All Students	90.9	89.2	7.3	9.6	1.8	1.2
African American/Black	90.6	83.3	6.3	16.7	3.1	0.0
Hispanic/Latino	66.7	77.3	9.2	22.7	1.5	0.0
White	90.2	90.3	7.9	8.4	1.9	1.4
eat carrots?						
All Students	86.5	86.4	9.9	8.6	3.6	5.0
African American/Black	84.4	83.3	12.5	11.1	3.1	5.6
Hispanic/Latino	76.6	71.4	18.8	23.8	4.7	4.8
White	89.2	87.7	7.6	7.5	3.2	4.8
eat other vegetables? Do NOT count green salad, potatoes, or carrots.						
All Students	70.1	73.2	22.9	18.9	7.0	8.0
African American/Black	78.1	57.9	9.4*	28.9*	12.5	13.2
Hispanic/Latino	66.2	50.0	30.8	31.8	3.1	18.2
White	71.6	75.3	22.7	17.2	5.7	7.5

An asterisk (*) indicates the scaled categories for which the FFVP participants and non-participants are significantly different at $p = 0.05$.

Table 12

Distribution of Created Variables for FFVP Participating Students by Race/Ethnicity

Question		Mean (Standard Deviation)		Statistical Significance
Created Variable		**Black Students**	**Non-Black Students**	**T-Test**
Higher mean score indicates greater consumption.	*100% juice drinks*	1.62 (0.764)	1.46 (0.694)	0.071
	fruits and vegetable, no potatoes	2.382 (0.754)	2.111 (0.815)	0.060
	dessert and candy	2.948 (1.384)	2.470 (1.230)	0.038*
Lower mean score indicates greater preference.	*fruit and vegetable preferences*	1.340 (0.307)	1.568 (0.368)	0.007*
	fruit preferences	1.124 (0.217)	1.400 (0.346)	0.000*
Created Variable		**White Students**	**Non-White Students**	**T-Test**
Higher mean score indicates greater consumption.	*100% juice drinks*	1.45 (0.688)	1.59 (0.749)	0.020*
	juice and fruit	1.546 (0.566)	1.737 (0.621)	0.011*
	salad and vegetables, no potatoes	2.160 (1.048)	2.482 (1.318)	0.056
	fruit and vegetables, no potatoes	2.090 (0.814)	2.321 (0.786)	0.028*
	fruit, vegetables and juice, with potatoes	2.472 (0.923)	2.792 (1.030)	0.010*
	fruit, vegetables and juice, without potatoes	2.614 (1.012)	3.036 (1.169)	0.006*
	fruit and vegetables, without juice, without potatoes	1.325 (0.387)	1.476 (0.477)	0.014*
Lower mean score indicates greater preference.	*fruit and vegetable preferences*	1.572 (0.377)	1.466 (0.316)	0.060
	fruit preferences	1.402 (0.356)	1.272 (0.276)	0.007*
Created Variable		**Hispanic Students**	**Non-Hispanic Students**	**T-Test**
Higher mean score indicates greater consumption.	*100% juice drinks*	1.790 (.788)	1.430 (0.674)	0.001*
	all non- juice drinks	1.339 (0.427)	1.482 (0.514)	0.042*
	juice and fruit	1.540 (0.558)	1.800 (0.648)	0.003*
	fruit and vegetables, no potatoes	2.088 (0.803)	2.377 (0.815)	0.009*
	fruit, vegetables and juice, with potatoes	2.490 (0.932)	2.741 (1.018)	0.056
	fruit, vegetables and juice, without potatoes	2.637 (1.026)	2.978 (1.144)	0.019*
	dessert and candy	2.444 (1.200)	2.851 (1.437)	0.035*
Lower mean score indicates greater preference.	*vegetable preference*	1.955 (0.694)	2.184 (0.528)	0.012*

An asterisk (*) indicates a comparison in which the data are significantly different at $p = 0.05$.

including 100% juice, and vegetables. One significant difference was found; non-participating blacks were more likely than participating blacks to consume *other vegetables* 1 to 2 times a day. For each of the fruit and vegetable questions, more students—both FFVP participants and non-participants—reported consuming fruits and vegetables 0 to 6 times a week than 1 to 2 times a day or 3 or more times a day.

The food preference questions and the created variables were analyzed by comparing FFVP participants to non-participants *within* and *between* each grade and by comparing all participants to all non-participants. No significant differences were identified in these analyses. Significant differences were found, however, among FFVP participants by race and ethnicity (Table 12). For those created variables that report consumption, the averages range from one to three with a higher mean score indicating greater consumption. For those created variables that report food preferences, the averages range from one to four with a lower mean score indicating greater preference. Six of the created variables were significant for two of the three races/ethnicities. The greatest number of significant differences was found between white and non-white students. Non-white students had greater consumption of a variety of fruits and vegetables and had a greater preference for fruits than white students. When compared to non-Hispanics, Hispanic students had a significantly lower consumption of all non-juice drinks, fruits, vegetables, and dessert and candy. Hispanics, however, had a greater preference for vegetables than non-Hispanics.

Fruit and Vegetable Knowledge. Significant differences were found for the one knowledge question included on the FFQ (Table 13). Students were asked to indicate how many servings of fruits and vegetables are recommended to eat each day. The FFVP teaches students to consume at least five fruits and vegetables each day. This correct answer was provided by significantly more black students participating in the program than black students not

participating in the program. Fourth grade participants and non-participants did not have any significantly different answers for the knowledge question.

Other Foods and Participation in School Nutrition Programs. The analysis was expanded beyond the consumption of fruits and vegetables to include other types of beverages and foods and participation in the National School Lunch and School Breakfast Programs. Significant differences between FFVP participants and non-participants were found for five of the 14 food frequency questions; four of these differences were for foods that were not fruits or vegetables (Table 14). The data for each question are presented by participation status, grade level, and race/ethnicity. Significant differences were found for all three non-juice beverage questions; the significant differences were concentrated in the African American race and Hispanic ethnicity.

Non-white FFVP participants as compared to non-white non-participants were found to have significant differences on the question examining the consumption of regular sodas or soft drinks with program participants reporting less consumption. The consumption of regular soda was significantly different when all non-white participants (21.6) were compared to all non-white non-participants (38.2, $p = 0.05$) on the response scale of 1 to 2 times a day. The consumption of regular soda was also significant when all fourth grade non-white participants (22.2) were compared to all fourth grade non-white non-participants (3.1, $p = 0.05$) on the response scale of 3 or more times a day. The frequency of potato consumption, not including French fries, fried potatoes, or chips, was significantly different when all non-white FFVP participants were compared to all non-white FFVP non-participants on the response scales of 0 to 6 times a week (97.8 compared to 85.7, respectively) and 1 to 2 times a day (0.0 compared to 14.3, respectively).

Table 13

Distribution of Knowledge Question by Participation Status, Grade Level, and Race/Ethnicity

Question	Frequency							
	At least 1 serving		1 – 2 servings		3 – 4 servings		5 servings or more	
	FFVP Participant	FFVP Non-Participant	FFVP Participant	FFVP Non-Participant	FFVP Participant	FFVP Non-Participant	FFVP Participant	FFVP Non-Participant
How many servings of fruits and vegetables do you think are healthy to eat each day?								
All Students	11.2	11.9	39.7	39.4	33.9	35.6	15.2	13.1
African American/Black	16.0*	0.0*	12.0	32.1	32.0	57.1	40.0*	10.7*
Hispanic/Latino	5.8	5.3	30.8	36.8	38.5	42.1	25.0	15.8
White	11.2	12.1	42.0	39.9	34.9	43.9	11.9	13.1
4th Grade	11.5	12.4	38.5	38.7	35.8	32.3	14.2	16.7
4th Grade African American/Black	14.3	0.0	0.0	36.4	71.4	63.6	14.3	0.0
4th Grade Hispanic/Latino	0.0	10.0	28.6	50.0	35.7	20.0	35.7	20.0
4th Grade White	11.1	12.5	39.7	37.5	36.5	32.5	12.7	17.5
5th Grade	11.0	11.3	40.3	39.5	32.6	38.7	16.0	10.5
5th Grade African American/Black	16.7	0.0	16.7	29.4	16.7*	52.9*	50.0*	17.6*
5th Grade Hispanic/Latino	7.9	0.0	31.6	22.2	39.5	66.7	21.1	11.1
5th Grade White	11.2	11.7	44.8	41.8	33.6	36.6	11.2	9.9

An asterisk (*) indicates a comparison in which the data are significantly different at $p = 0.05$

Table 14

Distribution of Frequency Responses by Participation Status, Grade Level, and Race/Ethnicity

Question	**Frequency**					
During the past seven days, how many times did you…	0 – 6 a week (%)		1 – 2 a day (%)		3 or more a day (%)	
	FFVP Participant	FFVP Non-Participant	FFVP Participant	FFVP Non-Participant	FFVP Participant	FFVP Non-Participant
drink any punch, Kool-Aid, sports drinks, energy drinks, vitamin water or other fruit-flavored drinks?						
All Students	65.3	59.8	20.3*	26.8*	14.4	13.5
African American/Black	62.5*	29.7*	15.6*	51.4*	21.9	18.9
Hispanic/Latino	50.8	27.3	30.2*	54.5*	19.0	18.2
White	66.0	62.7	20.6	25.2	13.3	12.1
4th Grade	61.6	55.1	22.7	28.7	15.7	16.2
4th Grade African American/Black	70.0	42.9	0.0	35.7	30.0	21.4
4th Grade Hispanic/Latino	44.4	27.3	38.9	45.5	16.7	27.3
4th Grade White	61.4	57.2	23.4	29.4	15.2	13.4
5th Grade	67.9	63.4	18.4	25.2	13.7	11.4
5th Grade African American/Black	59.1*	21.7*	22.7*	60.9*	18.2	17.4
5th Grade Hispanic/Latino	53.3	27.3	26.7*	63.6*	20.0	9.1
5th Grade White	69.8	66.7	18.3	13.3	11.8	11.2
drink any regular (NOT diet) sodas or soft drinks?						
All Students	68.7	69.6	23.3	23.1	8.0	7.3
African American/Black	71.9	63.2	21.9	34.2	6.3	2.6
Hispanic/Latino	64.6	50.0	24.6	45.5	10.8	4.5
White	69.6	71.4	23.4	20.7	7.0	7.9
4th Grade	64.0	65.7	26.7	25.9	9.3	8.3
4th Grade African American/Black	50.0	71.4	40.0	21.4	10.0	7.1
4th Grade Hispanic/Latino	44.4	45.5	44.4	45.5	11.1	9.1
4th Grade White	66.2	66.8	26.9	23.5	6.9	9.6
5th Grade	73.1	72.7	20.4	20.8	6.5	6.5
5th Grade African American/Black	81.8	58.3	13.6*	41.7*	4.5	0.0
5th Grade Hispanic/Latino	72.3	54.5	17.0*	45.5*	10.6	0.0
5th Grade White	72.9	74.4	20.6	18.7	6.5	6.6

Table 14, Continued

Distribution of Frequency Responses by Participation Status, Grade Level and Race/Ethnicity

Question	Frequency					
During the past seven days, how many times did you…	0 – 6 a week (%)		1 – 2 a day (%)		3 or more a day (%)	
	FFVP Participant	FFVP Non-Participant	FFVP Participant	FFVP Non-Participant	FFVP Participant	FFVP Non-Participant
drink any diet sodas or soft drinks?						
All Students	85.4	85.3	9.2	12.4	5.4*	2.4*
African American/Black	81.3	81.6	15.6	13.2	3.1	5.3
Hispanic/Latino	78.5	72.7	12.3	22.7	9.2	4.5
White	85.8	86.0	8.2	11.8	6.0*	2.3*
4th Grade	84.9	82.1	9.3*	15.6*	5.8*	2.3*
4th Grade African American/Black	70.0	71.4	30.0	28.6	0.0	0.0
4th Grade Hispanic/Latino	77.8	63.6	5.6*	36.4*	16.7	0.0
4th Grade White	84.8	84.5	8.3	13.4	6.9*	2.1*
5th Grade	86.2	87.6	8.8	10.0	5.1	2.4
5th Grade African American/Black	86.2	87.6	8.8	10.0	5.1	2.4
5th Grade Hispanic/Latino	78.7	81.8	14.9	9.1	6.4	9.1
5th Grade White	87.1	87.1	7.6	10.6	5.3	2.4
eat French fries, fried potatoes, or chips?						
All Students	76.9	74.1	17.6	21.0	5.4	5.0
African American/Black	81.3	65.8	9.4	23.7	9.4	10.5
Hispanic/Latino	68.3*	38.1*	28.6	47.6	3.2	14.3
White	32.5	43.7	17.1	20.9	5.1	4.1
4th Grade	72.7	72.0	20.3	22.0	7.0	6.1
4th Grade African American/Black	80.0	71.4	10.0	21.4	10.0	7.1
4th Grade Hispanic/Latino	61.1	30.0	27.8	50.0	11.1	20.0
4th Grade White	74.5	72.4	19.3	21.6	6.2	5.9
5th Grade	80.2	75.6	15.5	20.2	4.2	4.2
5th Grade African American/Black	81.8	62.5	9.1	25.0	4.3	6.5
5th Grade Hispanic/Latino	71.1	45.5	28.9	45.5	0.0*	9.1*
5th Grade White	80.6	76.9	15.3	20.4	4.1	2.7

Table 14, Continued

Distribution of Frequency Responses by Participation Status, Grade Level and Race/Ethnicity

Question	**Frequency**					
During the past seven days, how many times did you…	0 – 6 a week (%)		1 – 2 a day (%)		3 or more a day (%)	
	FFVP Participant	FFVP Non-Participant	FFVP Participant	FFVP Non-Participant	FFVP Participant	FFVP Non-Participant
eat other vegetables? Do NOT count green salad, potatoes, or carrots.						
All Students	70.1	73.2	22.9	18.9	7.0	8.0
African American/Black	78.1	57.9	9.4*	28.9*	12.5	13.2
Hispanic/Latino	66.2	50.0	30.8	31.8	3.1	18.2
White	71.6	75.3	22.7	17.2	5.7	7.5
4th Grade	69.2	75.6	22.7	17.4	8.1	7.0
4th Grade African American/Black	60.0	57.1	10.0	21.4	30.0	21.4
4th Grade Hispanic/Latino	66.7	63.6	27.8	27.3	5.6	9.1
4th Grade White	71.7	78.8	22.8	15.8	5.5	5.4
5th Grade	71.5	71.4	23.4	20.0	5.1	8.6
5th Grade African American/Black	86.4*	58.3*	9.1*	33.3*	4.5	8.3
5th Grade Hispanic/Latino	66.0	36.4	31.9	36.4	2.1*	27.3*
5th Grade White	71.9	72.8	22.8	18.3	5.3	8.9

An asterisk (*) indicates the scaled categories for which the FFVP participants and non-participants are significantly different at $p = 0.05$.

Three school behavior questions asked the frequency at which students ate school breakfast, ate school lunch and brought their lunch from home (Table 15). All fourth grade Hispanic students participating in the FFVP reported consuming the school lunch *every* day; only 70% of fourth grade Hispanic students not participating in the FFVP reporting eating the school lunch each day. The percentage of fifth grade blacks bringing their lunch each day differed significantly when FFVP participants (20.0) were compared to non-participants (0.0, p= 0.05). FFVP participants are more likely than not to eat the school breakfast. All participants, white participants, and fourth grade white participants were significantly more likely than non-participants to eat the school breakfast 1 to 2 times each week. Fifth grade participants were significantly more likely to eat school breakfast each day. Participating Hispanics, participating

Table 15

Distribution of School Week Behaviors by Participation Status, Grade Level, and Race/Ethnicity

Question	**Frequency**							
In a usual school week, how often do you…	Less than once a week or never (%)		1 – 2 times a week (%)		3 – 4 times a week (%)		Every day (%)	
	FFVP Participant	FFVP Non-Participant	FFVP Participant	FFVP Non-Participant	FFVP Participant	FFVP Non-Participant	FFVP Participant	FFVP Non-Participant
eat school lunch?								
All Students	9.0	6.6	7.7	6.1	9.6	10.1	73.7	77.3
African American/Black	7.4	2.6	3.7	5.3	7.4	13.2	81.5	78.9
Hispanic/Latino	4.8	5.0	11.3	0.0	8.1	15.0	75.8	80.0
White	11.2	8.7	8.1	6.5	11.5	9.6	69.2	75.2
4th Grade	9.0	6.6	7.7	6.1	9.6	10.1	73.7	77.3
4th Grade African American/Black	0.0	0.0	0.0	7.1	12.5	0.0	87.5	92.9
4th Grade Hispanic/Latino	0.0	0.0	0.0	0.0	0.0*	30.0*	100*	70.0*
4th Grade White	9.2	7.1	7.6	6.5	10.7	10.0	72.5	76.5
5th Grade	12.3	9.1	7.9	6.2	12.3	10.1	67.5	74.6
5th Grade African American/Black	10.5	4.2	5.3	4.2	5.3	20.8	78.9	70.8
5th Grade Hispanic/Latino	6.8	10.0	15.9	0.0	11.4	0.0	65.9	90.0
5th Grade White	12.9	9.8	8.6	6.5	12.3	9.4	66.3	74.3

Table 15, Continued

Distribution of School Week Behaviors by Participation Status, Grade Level, and Race/Ethnicity

Question	**Frequency**							
In a usual school week, how often do you…	Less than once a week or never (%)		1 – 2 times a week (%)		3 – 4 times a week (%)		Every day (%)	
	FFVP Participant	FFVP Non-Participant	FFVP Participant	FFVP Non-Participant	FFVP Participant	FFVP Non-Participant	FFVP Participant	FFVP Non-Participant
bring lunch from home?								
All Students	68.4	74.2	12.1	10.0	8.8	6.2	44.0	56.0
African American/Black	70.0	80.6	10.0	19.4	0.0	0.0	20.0	0.0
Hispanic/Latino	85.4	85.7	8.3	7.1	4.2	0.0	2.1	7.1
White	66.4	71.9	13.2	10.0	10.4	7.1	10.0	11.0
4th Grade	69.7	76.4	8.3	9.6	9.8	5.6	12.1	8.4
4th Grade African American/Black	60.0	83.3	20.0	16.7	0.0	0.00	20.0	0.0
4th Grade Hispanic/Latino	100.0	100.0	0.0	0.0	0.0	0.00	0.0	0.0
4th Grade White	68.2	73.2	9.1	10.5	10.9	6.5	11.8	9.8
5th Grade	67.8	73.0	15.2	9.8	7.6	6.6	9.4	10.5
5th Grade African American/Black	73.3	78.9	6.7	21.1	0.0	0.0	20.0*	0.0*
5th Grade Hispanic/Latino	80.6	71.4	11.1	14.3	5.6	0.0	2.8	14.3
5th Grade White	65.0	71.1	16.4	9.6	10.0	7.5	8.6	11.8

Table 15, Continued

Distribution of School Week Behaviors by Participation Status, Grade Level, and Race/Ethnicity

Question	**Frequency**							
In a usual school week, how often do you…	Less than once a week or never (%)		1 – 2 times a week (%)		3 – 4 times a week (%)		Every day (%)	
	FFVP Participant	FFVP Non-Participant	FFVP Participant	FFVP Non-Participant	FFVP Participant	FFVP Non-Participant	FFVP Participant	FFVP Non-Participant
eat school breakfast?								
All Students	39.6	44.6	19.4*	11.4*	10.4	12.5	30.6	31.5
African American/Black	28.6	23.1	14.3	0.0	0.0	7.7	57.1	69.2
Hispanic/Latino	0.0*	50.0.*	33.3	0.0	16.7	25.0	50.0	25.0
White	41.1	46.8	19.6*	10.9*	10.7	14.7	28.6	27.6
4th Grade	39.6	44.6	19.4	11.4	10.4	12.5	30.6	31.5
4th Grade African American/Black	28.6	23.1	14.3	0.0	0.0	7.7	57.1	69.2
4th Grade Hispanic/Latino	0.0*	50.0*	33.3	0.0	16.7	25.0	50.0	25.0
4th Grade White	41.1	46.8	19.6*	10.9*	10.7	14.7	28.6	27.6
5th Grade	37.4*	50.4*	14.0	13.0	15.1	12.6	33.5*	24.0*
5th Grade African American/Black	16.7	15.8	33.3	15.8	5.6	15.8	44.4	52.6
5th Grade Hispanic/Latino	26.3	22.2	10.5	22.2	15.8	22.2	47.4	33.3
5th Grade White	43.6	54.0	11.4	12.9	16.4	11.2	28.6	21.9

An asterisk (*) indicates a comparison in which the data are significantly different at $p = 0.05$.

fourth grade Hispanics, and participating fifth grade students were less likely to report eating the school breakfast less than once a week or never.

Summary of the Dietary Findings . Fourth and fifth grade students from 20 northeast Georgia schools completed a FFQ that provided the data to compare the dietary characteristics of FFVP participants to non-participants. Only one significant fruit and vegetable consumption difference was noted; African Americans participating in the FFVP reported consuming significantly less "other vegetables" 1 to 2 times a day than non-participating African Americans. No significant differences for fruit and vegetable preferences or the created variables were found between all participants and all non-participants.

Significant racial differences among *participants* were found. Most differences were noted between white and non-white participants with non-whites having a greater consumption of fruits and vegetables and greater preferences for fruits than whites. Hispanics had a significantly lower consumption of non-juice drinks, fruits, vegetables, and desserts and candy but a greater preference for vegetables than non-Hispanics. Significantly more blacks participating in the FFVP answered the fruit and vegetable knowledge question correctly than blacks not participating in the FFVP.

Non-fruit and vegetable dietary pattern differences were found. Significant differences for sugar-sweetened beverages were concentrated in blacks and Hispanics. When participating students were compared to non-participating students, significantly fewer non-white FFVP participants are consuming soda 1 to 2 times a day than non-white non-participants. FFVP participants, particularly blacks and Hispanics, are consuming the school lunch and breakfast more frequently than non-participants.

Academic Performance of FFVP Participants and Non-Participants

As the second of the two research aims, the study sought to determine if the academic performance of FFVP participants differed significantly from FFVP non-participants. Academic performance includes measures of attendance, discipline referrals, and success on the CRCT in English, reading and mathematics. The daily attendance rate and discipline referral count were examined individually through T-tests. Seven variables were examined for their impact on student CRCT success: school location; FRL percent; English-Language learners percent; male percent; racial/ethnic percents for Hispanic, Caucasian, African American, and other; attendance proportion; and discipline events per student.

Fifty-six pairs of matched schools were selected from across the state of Georgia for inclusion in this analysis. The schools were matched on location, enrollment size, and percent FRL. A total of 111 schools were used for the analysis; two schools participating in the FFVP and one school not participating in the program had only fourth grade observations. The descriptive characteristics of the 111 schools are provided in Tables 16 through 20. Table 16 presents the frequency of schools participating in the FFVP by years. Table 17 presents the frequency of participating and non-participating schools by location. Tables 18 through 20 provide descriptive characteristics at the individual grade level from each school. Continuous variable summary characteristics for all fourth and fifth grade classrooms included in the analysis are presented in Table 18; summary characteristics by participation status and individual grade level are presented in Tables 19 and 20.

Attendance Rate and Discipline Referrals

The daily attendance rate and discipline referral count were examined through T-tests. Daily attendance rate was not significantly different between participating (0.9657) and non-participating schools (0.9670, $p = 0.2473$). The discipline referral means were different with

participating schools (0.4244) reporting significantly more referrals than non-participating schools (0.3136, $p = 0.0052$).

CRCT Scores for English, Reading, and Mathematics

The following four sections report the findings from the statistical analysis designed to examine the relationship between participation in the FFVP and student achievement on the CRCT.

Relationship between Years Participating in the FFVP and Student Achievement. Before any comparative analyses were run, it was first determined if schools should be considered according to the number of years they have participated in the FFVP or if they should simply be considered as one group of schools participating in the program. ANOVA was used to determine any significant mean differences between CRCT scores from schools participating for one, two, or three years. Means were compared on six student success variables: English pass percent, English exceed percent, reading pass percent, reading exceed percent, mathematics pass percent, and mathematics exceed percent. The *p*-values for these analyses are presented in Table 21. No significant relationship existed on the six variables by years of participation and all further analyses were run by examining all participating schools as one group.

Table 16

Frequency Summary of Years Participating in FFVP for Schools included in the Academic Analysis

Number of Years Participating	Frequency	Percent
1	33	58.9
2	14	25.0
3	9	16.1

Table 17

Frequency of Location by FFVP Participation for Schools included in the Academic Analysis

Location	FFVP Participant (%)	FFVP Non-Participant (%)	Total (%)
Rural	23 (41.1)	22 (40.00)	45(40.5)
Urban	33 (58.9)	33(60.00)	66 (59.5)

Table 18

Overall Summary Statistics for Continuous Variables included in the Academic Analysis, Fourth and Fifth Grades

Variable	Mean (SD)	Minimum	Median	Maximum
Student Count	97.12 (55.12)	32	83	385
FRL Percent	80.88 (12.92)	48.74	79.61	100.00
English-Language Learner Percent	7.31 (10.33)	0.00	3.30	56.58
Male Percent	51.08 (5.75)	35.59	51.16	69.23
White Percent	36.08 (27.43)	0.00	38.38	97.56
Black Percent	47.51 (30.98)	0.00	46.58	100.00
Hispanic Percent	12.20 (15.07)	0.00	5.88	65.71
Other Race Percent	8.44 (7.46)	0.00	7.23	53.49
Daily Attendance Percentage	0.9663 (0.0086)	0.9428	0.9663	0.9967
Discipline Count Per Student	0.3692 (0.4244)	0.0000	0.2266	3.3012
English Pass Percent	87.55 (8.45)	53.66	89.25	100.00
English Exceeds Percent	25.70 (10.67)	0.00	25.93	58.62
Math Pass Percent	81.52 (13.11)	38.78	84.00	100.00
Math Exceeds Percent	28.99 (13.98)	0.00	27.06	70.69
Reading Pass Percent	87.87 (9.17)	51.22	89.77	100.00
Reading Exceeds Percent	24.94 (10.77)	3.08	25.00	54.81

Table 19

Summary Statistics for Continuous Variables of Schools included in the Academic Analysis, Fourth Grade

Variable	Mean (SD)		Minimum		Median		Maximum	
	FFVP Participant	FFVP Non-Participant	FFVP Participant	FFVP Non-Participant	FFVP Participant	FFVP Non-Participant	FFVP Participant	FFVP Non-Participant
Student Count	107.66 (69.95)	91.47 (45.06)	35	37	89.5	83	385	276
FRL Percent	82.31 (12.57)	79.68 (12.79)	54.63	52.38	79.11	78.57	100.00	100.00
English-Language Learner Percent	7.44 (11.01)	9.16 (12.16)	0.00	0.00	3.14	4.00	50.00	56.58
Male Percent	49.70 (5.28)	50.61 (6.70)	36.84	35.59	50.77	50.52	60.82	69.23
White Percent	39.24 (27.05)	33.86 (28.33)	0.00	0.00	41.89	36.00	88.24	97.56
Black Percent	43.59 (29.09)	49.40 (32.47)	0.00	0.00	37.92	49.07	100.00	97.73
Hispanic Percent	12.88 (17.00)	12.42 (14.43)	0.00	0.00	5.49	7.06	65.71	57.89
Other Race Percent	8.57 (7.00)	8.65 (8.36)	0.00	0.00	8.02	7.33	43.68	53.49
Daily Attendance Percentage	0.9651 (0.0085)	0.9671 (0.0084)	0.9428	0.9442	0.9642	0.9690	0.9943	0.9837
Discipline Count Per Student	0.4167 (0.3886)	0.2708 (0.4021)	0.0000	0.0000	0.3263	0.1139	1.6506	2.3919
English Pass Percent	84.11 (8.61)	85.40 (9.31)	57.14	53.66	85.71	87.50	98.73	98.28
English Exceeds Percent	23.24 (10.45)	25.67 (10.57)	0.00	4.23	23.54	26.25	46.84	49.18
Math Pass Percent	74.84 (11.90)	75.78 (13.20)	38.78	39.02	75.67	76.60	92.98	97.09
Math Exceeds Percent	25.47 (10.82)	28.55 (14.96)	0.00	5.45	24.96	26.60	46.00	64.86
Reading Pass Percent	83.86 (9.44)	83.25 (9.47)	54.17	51.22	86.93	84.21	100.00	98.36
Reading Exceeds Percent	27.05 (10.64)	27.61 (11.95)	4.17	4.88	27.18	25.33	46.67	54.81

Table 20

Summary Statistics for Continuous Variables of Schools included in the Academic Analysis, Fifth Grade

Variable	Mean (SD)		Minimum		Median		Maximum	
	FFVP Participant	FFVP Non-Participant	FFVP Participant	FFVP Non-Participant	FFVP Participant	FFVP Non-Participant	FFVP Participant	FFVP Non-Participant
Student Count	96.54 (56.07)	92.54 (45.59)	32	40	78	82	364	284
FRL Percent	81.78 (14.14)	79.72 (12.26)	48.74	51.00	81.00	78.68	100.00	100.00
English-Language Learner Percent	5.76 (7.55)	6.83 (9.98)	0.00	0.00	2.32	3.08	29.69	48.21
Male Percent	52.27 (5.12)	51.81 (5.56)	38.89	40.91	52.51	51.54	65.63	66.20
White Percent	37.50 (27.60)	33.64 (27.08)	0.00	0.00	41.30	32.49	91.67	95.45
Black Percent	45.71 (30.30)	51.43 (32.24)	0.00	0.76	41.67	55.24	100.00	98.31
Hispanic Percent	12.68 (16.16)	10.78 (12.58)	0.00	0.00	5.06	6.16	64.06	48.21
Other Race Percent	8.21 (7.46)	8.31 (7.13)	0.00	0.00	6.56	5.78	40.48	30.66
Daily Attendance Percentage	0.9662 (0.0088)	0.9669 (0.0087)	0.9442	0.9480	0.9667	0.9665	0.9967	0.9890
Discipline Count Per Student	0.4323 (0.4002)	0.3572 (0.4926)	0.0000	0.0000	0.3119	0.2377	1.7759	3.3012
English Pass Percent	90.33 (7.23)	90.53 (6.45)	57.35	68.97	90.18	92.46	100.00	98.61
English Exceeds Percent	26.93 (11.29)	27.05 (10.19)	2.94	5.66	25.52	28.24	58.62	46.00
Math Pass Percent	88.38 (10.02)	87.42 (10.82)	57.14	51.52	90.48	89.50	100.00	100.00
Math Exceeds Percent	31.30 (14.68)	30.76 (14.73)	2.04	3.64	31.07	28.77	70.69	58.57
Reading Pass Percent	92.06 (6.82)	92.55 (5.98)	70.77	75.86	93.94	94.53	100.00	100.00
Reading Exceeds Percent	22.10 (10.18)	22.90 (9.28)	3.08	5.45	21.37	21.17	44.59	40.28

Table 21

ANOVA Summaries for Predicting Percent Passing and Percent Exceeding Standards on CRCT with Years of Participation in FFVP (Schools that have Participated 1, 2, or 3 Years)

CRCT Variable	Fourth Grade		Fifth Grade	
	F Statistics	*P*-Value	F Statistics	*P*-Value
English Pass Percent	0.78	0.4651	0.13	0.8764
English Exceeds Percent	0.69	0.5079	1.58	0.2153
Math Pass Percent	0.53	0.5915	0.16	0.8535
Math Exceeds Percent	0.09	0.9148	1.11	0.3370
Reading Pass Percent	0.36	0.6972	0.51	0.6032
Reading Exceeds Percent	0.71	0.4969	1.69	0.1950

Table 22

T-Test CRCT Variable Summaries Comparing FFVP Participating Schools to Non-Participating Schools

CRCT Variable	FFVP Mean	No FFVP Mean	Fourth Grade Difference	t-Statistic	P-Value
English Pass Percent	84.11	85.40	-1.28	-0.75	0.4521
English Exceeds Percent	23.24	25.67	-2.43	-1.22	0.2257
Math Pass Percent	74.84	75.78	-0.94	-0.39	0.6946
Math Exceeds Percent	25.47	28.55	-3.08	-1.25	0.2154
Reading Pass Percent	83.86	83.25	0.60	0.34	0.7372
Reading Exceeds Percent	27.05	27.61	-0.56	-0.26	0.7954

CRCT Variable	FFVP Mean	No FFVP Mean	Fifth Grade Difference	t-Statistic	P-Value
English Pass Percent	90.33	90.53	-0.20	-0.15	0.8803
English Exceeds Percent	26.93	27.05	-0.12	-0.06	0.9555
Math Pass Percent	88.38	87.42	0.96	0.48	0.6336
Math Exceeds Percent	31.30	30.76	0.54	0.19	0.8484
Reading Pass Percent	92.06	92.55	-0.49	-0.40	0.6934
Reading Exceeds Percent	22.10	22.90	-0.80	-0.43	0.6690

Relationship between FFVP Participation and Student Achievement. The impact of the FFVP alone on student CRCT success was analyzed. This analysis did not take into consideration any potentially influential factors such as race percentages or FRL percentages. T-tests were

used to determine if a significant difference between the mean CRCT scores for both fourth and fifth grades students existed. As presented in Table 22, no significant CRCT mean score differences were found. Participation in the FFVP alone was not found to significantly change student achievement on the CRCT.

Relationship between Other Variables and Student Achievement. The impact of the other variables of interest on student CRCT success was subsequently analyzed. These variables included location, FRL percent, English-Language leaner percent, male percent, white percent, black percent, Hispanic percent, other racial percent, daily attendance rate, and discipline count per student. As these are continuous variables, linear regression was used. With ten variables to consider for each of the six CRCT measures, 60 results are presented for *each* grade level. The results of this analysis are discussed in the present text; a complete presentation of the results can be found in Appendix D. For each of the CRCT measures (English pass percent, English exceed percent, reading pass percent, reading exceed percent, mathematics pass percent, and mathematics exceed percent) it is typical for statistically significant relationships to exist with location (greater percentages of students tend to succeed in rural, not urban, schools), FRL percent (higher FRL percentages are associated with lower CRCT success), white and black percent (higher white percentages are associated with higher CRCT success and higher black percentages are associated with lower CRCT success) and discipline counts per students (higher discipline counts are associated with lower CRCT success).

Variable Modeling for Student Achievement. For each of the six CRCT success measures for each grade, the final analysis created statistical models that best predict student CRCT success. A stepwise multiple regression analysis was used to determine which variables are the best predictors of each success measure. This process involved adding variables to the statistical model individually and removing any variables that become insignificant; the process

Table 23

Significant Predictors of CRCT Success Measures for Schools included in the Academic Analysis

Variable	Fourth Grade English Pass Percent (R-square = 0.3871)				
	DF	Estimate	Std Err	t-Statistic	P-Value
Intercept	1	118.92	7.22	16.47	<0.0001
Black Percent	1	-0.10	0.03	-3.51	0.0007
FRL Percent	1	-0.22	0.07	-3.27	0.0015
Male Percent	1	-0.23	0.11	-2.02	0.0462

Variable	Fifth Grade English Pass Percent (R-square = 0.2384)				
	DF	Estimate	Std Err	t-Statistic	P-Value
Intercept	1	87.91	1.17	74.90	<0.0001
White Percent	1	0.10	0.02	4.72	<0.0001
Discipline Per Student	1	-2.89	1.33	-2.18	0.0313

Variable	Fourth Grade English Exceeds Percent (R-square = 0.4088)				
	DF	Estimate	Std Err	t-Statistic	P-Value
Intercept	1	50.46	8.43	5.98	<0.0001
White Percent	1	0.09	0.04	2.28	0.0243
FRL Percent	1	-0.36	0.09	-4.06	<0.0001

Variable	Fifth Grade English Exceeds Percent (R-square = 0.3787)				
	DF	Estimate	Std Err	t-Statistic	P-Value
Intercept	1	59.30	5.63	10.54	<0.0001
Black Percent	1	-0.08	0.03	-2.49	0.0142
FRL Percent	1	-0.35	0.08	-4.38	<0.0001

Variable	Fourth Grade Math Pass Percent (R-square = 0.4768)				
	DF	Estimate	Std Err	t-Statistic	P-Value
Intercept	1	107.84	6.27	17.19	<0.0001
Black Percent	1	-0.19	0.04	-5.20	<0.0001
FRL Percent	1	-0.29	0.09	-3.34	0.0012

Variable	Fifth Grade Math Pass Percent (R-square = 0.2362)				
	DF	Estimate	Std Err	t-Statistic	P-Value
Intercept	1	95.75	1.63	58.84	<0.0001
Black Percent	1	-0.16	0.03	-5.72	<0.0001

Variable	Fourth Grade Math Exceeds Percent (R-square = 0.4799)				
	DF	Estimate	Std Err	t-Statistic	P-Value
Intercept	1	64.40	6.53	9.86	<0.0001
Black Percent	1	-0.18	0.04	-4.70	<0.0001
FRL Percent	1	-0.36	0.09	-3.93	0.0002

Table 23, Continued

Significant Predictors of CRCT Success Measures for Schools included in the Academic Analysis

Variable	Fifth Grade Math Exceeds Percent (R-square = 0.3779)				
	DF	Estimate	Std Err	t-Statistic	P-Value
Intercept	1	45.00	2.07	21.76	<0.0001
Black Percent	1	-0.29	0.04	-8.02	<0.0001

Variable	Fourth Grade Reading Pass Percent (R-square = 0.5181)				
	DF	Estimate	Std Err	t-Statistic	P-Value
Intercept	1	91.70	6.87	13.35	<0.0001
FRL Percent	1	-0.19	0.07	-2.66	0.0090
White Percent	1	0.17	0.03	5.12	<0.0001
Hispanic Percent	1	0.10	0.04	2.48	0.0148

Variable	Fifth Grade Reading Pass Percent (R-square = 0.3669)				
	DF	Estimate	Std Err	t-Statistic	P-Value
Intercept	1	88.96	1.00	88.73	<0.0001
White Percent	1	0.12	0.02	6.72	<0.0001
Discipline Per Student	1	-2.79	1.13	-2.46	0.0153

Variable	Fourth Grade Reading Exceeds Percent (R-square = 0.5864)				
	DF	Estimate	Std Err	t-Statistic	P-Value
Intercept	1	64.30	9.58	6.71	<0.0001
FRL Percent	1	-0.38	0.08	-4.74	<0.0001
Male Percent	1	-0.23	0.12	-1.99	0.0494
White Percent	1	0.15	0.04	4.10	<0.0001

Variable	Fifth Grade Reading Exceeds Percent (R-square = 0.5157)				
	DF	Estimate	Std Err	t-Statistic	P-Value
Intercept	1	54.81	4.50	12.17	<0.0001
FRL Percent	1	-0.34	0.06	-5.29	<0.0001
Black Percent	1	-0.10	0.03	-3.85	0.0002

stopped when all variables in the model were significant and variables not included in the model were insignificant. Participation or non-participation in the FFVP was a variable considered throughout the entire process. The results of the stepwise process for fourth and fifth grade students are displayed in Table 23. The R-square of each model is included in the tables. The R-square value can range from zero to one. An R-square value of zero would indicate that the

variables together do not explain the success measure while an R-square value of one would indicate that the variables together explain 100% of the success measure.

Participation in the FFVP was *not* a significant variable in any of the CRCT success measures models. Participation in the FFVP is not a significant predictor of student achievement. While the significant variables differ slightly for each model, eight of the twelve models include both race and FRL percentage. Two models include the male percentage variable and two models include the number of discipline counts per student.

Summary of the Academic Findings

The fourth and fifth grade classrooms of 111 Georgia schools were included in the analysis that examined differences between schools participating in the FFVP and those not participating in regards to attendance rate, discipline referrals, and success on the CRCT in the areas of English, reading, and mathematics. No significant differences were found for attendance rate between participating and non-participating schools. Schools participating in the FFVP had significantly more discipline referrals than those not participating in the FFVP. Regardless of years participating in the FFVP, participation in the FFVP was not significantly related to student success on the CRCT.

Passing or exceeding standards on the CRCT was significantly related to other variables considered in the analysis. It was typical for statistical relationships to exist with location (greater percentages of students tend to succeed in rural, not urban, schools), percent FRL (higher FRL percentages are associated with lower CRCT success), percent white and black (higher white percentages are associated with higher CRCT success and higher black percentages are associated with lower CRCT success) and discipline counts per students (higher discipline counts are associated with lower CRCT success). Statistical models were created to predict student success passing or exceeding the CRCT at each grade level. While the significant

variables differ slightly for each model, eight of the twelve models include both race and FRL percentage.

Summary

Chapter 6 has reviewed the findings from the analysis of both the dietary and academic research questions. The first research aim sought to determine if the dietary patterns, specifically fruit and vegetable consumption, of fourth and fifth grade children in northeast Georgia participating in the FFVP differed from those not participating in the FFVP. No substantial fruit and vegetable consumption differences were noted between FFVP participants and non-participants. Significant racial differences *among participants* were found. Most differences were noted between white and non-white participants with non-whites having a greater consumption of fruits and vegetables and greater preferences for fruits than whites. Hispanics had a significantly lower consumption of non-juice drinks, fruits, vegetables, and desserts and candy but a greater preference for vegetables than non-Hispanics. Significantly more blacks participating in the FFVP answered the fruit and vegetable knowledge question correctly than blacks not participating in the FFVP. Significant non-fruit and vegetable dietary pattern differences were found. Differences for sugar-sweetened beverages were concentrated in blacks and Hispanics. When participating students were compared to non-participating students, significantly fewer non-white participants reported consuming soda 1 to 2 times a day than non-white non-participants. FFVP participants, particularly blacks and Hispanics, reported consuming the school lunch and breakfast more frequently than non-participants.

The second research aim sought to determine whether the academic performance of fourth and fifth grade students across the state of Georgia participating in the FFVP differed from those not participating in the FFVP. No significant difference existed between participants and non-participants regarding attendance, but significantly more discipline referrals were

noted in the participating schools. The number of years a school participated in the FFVP did not make a significant difference on CRCT achievement in English, reading, or mathematics and therefore all participating schools were considered as one group for the analysis. Participating schools on average were not shown to have higher percentages of students passing or exceeding CRCT standards. Statistical models found the percentage of students qualifying for FRL and racial distribution the most influential on CRCT success.

The subsequent and final chapter offers conclusions based upon the research findings.

CHAPTER 7

DISCISSION AND CONCLUSIONS

The purpose of this study was to examine the nutritional and academic outcomes of the Fresh Fruit and Vegetable Program (FFVP). The specific research aims were:

1. To determine whether the dietary patterns, specifically fruit and vegetable consumption, of children participating in the FFVP differ from those not participating in the FFVP.
2. To determine whether the academic performance of children participating in the FFVP differs from those not participating in the FFVP.

The discussion and conclusions are presented in three sections. The first and second sections deal directly with the findings of the research. The third section elaborates upon the role of schools in implementing public health policies such as the FFVP, offers strategies for success, and makes predictions regarding the future. It becomes apparent in the last section that the goals of the Food Revolution are bigger than federal policy. Congressional legislation and federally funded programs are essential components in this Revolution, but the goal is *to change people*. Lifestyles cannot be mandated by policy. Policy can, however, provide the support for necessary for a Food Revolution.

Dietary Characteristics of FFVP Participants and Non-Participants

A statistically significant difference in fruit and vegetable consumption between FFVP participants and non-participants was not found. The FFVP has not significantly increased the

frequency of fruit and vegetable consumption among participating fourth and fifth grade students in Northeast Georgia. The frequency of fruit and vegetable consumption by *all FFQ completers* mirrors that of the National average. According to the National Health and Nutrition Examination Survey, less than 20% of children 18 years of age or younger consume five or more servings of fruits and vegetables each day (Guenther, Dood, Reedy, & Krebs-Smith, 2006). All individuals are encouraged to eat a minimum of five fruit and vegetable servings daily. Assuming that an individual would eat two to three servings of fruits and two to three servings of vegetables to meet the minimum recommendation, the vast majority of the research participants are not meeting guidelines. Less than 20% of the research participants ate fruit three or more times each day. Less than 8% of the research participants ate vegetables, not including potatoes, green salad, or carrots, three or more times each day. Potatoes, green salad, and carrots were consumed 0 to 6 times a week by 84% to 91% of the participants.

No statistically significant differences existed between FFVP participants and non-participants regarding fruit and vegetable *preferences*. Among *FFVP participating students*, the research did find that blacks, Hispanics, and non-white students have greater preferences for fruits and vegetables than non-blacks, non-Hispanics, and whites. A strong relationship exists between a child's fruit and vegetable preferences and his consumption of fruits and vegetables (Baxter & Thompson, 2002b). Although it is unsubstantiated why these races and ethnicities reported higher preferences but similar consumption of fruits and vegetables than non-participants, it is assumed that blacks, Hispanics, and other non-white races are of comparatively lower socioeconomic status and therefore unable to afford the costs of fruits and vegetables outside of school.

Despite the explicit objective to improve the fruit and vegetable consumption of program participants, the FFVP has failed to meet this goal. Limitations of the present research

should, however, mediate this conclusion. First, FFQs are not considered the gold standard instrument for collecting dietary data. Dietary records completed with the help of trained adults would provide superior data. The USDA's recent study of the FFVP included both a FFQ and 24-hour dietary recall. Preliminary findings from the USDA's study found that participants were consuming half a serving more of fruit each day (0.24 cups, $p < 0.0001$; Olsho, Klernman, & Bartlett, 2011). Although an additional half serving of fruit is promising, half a serving of fruit will not solve America's childhood obesity epidemic. Second, 77% of the schools with students completing the FFQ had been participating in the FFVP for two years or less. Dietary patterns represent lifestyle choices that are difficult to change and that require extended time periods for modification. As supported by SCT, dietary pattern changes in children also require parents to change the types of food available in the home environment—a change most probable when parents understand the health consequence of poor diets and can afford the costs of healthier foods. Changes in parental behaviors and the home environment are not a focus of the FFVP.

Nevertheless, while consumption of fruits and vegetables did not show improvement, the analysis did indicate that specific races are gaining nutritional knowledge through program participation. Significantly more blacks correctly answered that an individual should consume at least five or more servings of fruits and vegetables each day. The increase in student knowledge through participation in nutritional interventions has been supported in previous research. Tuuri, et al. (2009) found that students participating in a nutrition intervention program increased their nutritional knowledge *and* self-efficacy to consume fruits and vegetables. As self-efficacy is positively associated with fruit and vegetable consumption in young students (Thompson, Bachman, Baranowski, & Cullen, 2007), future research of the FFVP should examine the self-efficacy of students participating in the program to consume fruits and vegetables.

Interestingly, healthier *non-fruit* and *non-vegetable* choices were being made by FFVP participants. All individuals are encouraged to limit their intake of sugar-sweetened beverages such as Kool-Aid, sports drinks, energy drinks, vitamin water and other fruit-flavored drinks. Significantly fewer FFVP participants, especially blacks and Hispanics, reported consuming these beverages. Moreover, participating blacks and Hispanics reported consuming regular soft drinks significantly less frequently than non-participants. Ironically, this finding coincides with Mayor Bloomberg's ban on the sale of sugar-sweetened beverages over 16 ounces in the restaurants, theaters, stadiums and street carts of New York City (Huffington Post, 2012). Healthier dietary choices are also being made when students choose not to consume French fries, fried potatoes, and potato chips. Participating Hispanics reported consuming these fried foods less frequently than non-participating Hispanics. The decreased consumption of sugar-sweetened beverages, sodas, and fried potato products cannot be ignored. Healthy eating plans include limited amounts, if any, of these unhealthy foods and beverages. These are empty calorie foods; they provide a relatively high amount of calories per serving but insignificant amounts of key nutrients. By decreasing consumption of these items, students are decreasing the amount of sugar, fat and calories they consume—dietary changes that will help maintain a healthy weight or support weight loss. It is imperative that students learn healthy eating habits and make appropriate dietary changes at a young age as obese children are more likely to carry their weight and health problems into adulthood (Department of Health and Human Services & Centers for Disease Control and Prevention, 2012).

Ironically, however, FFVP participants are consuming more diet soft drinks than non-participants. All students, white students, fourth grade students, and white fourth grade students participating in the program are significantly more likely to report consuming diet sodas 3 or more times a day. As previously discussed, students participating in the FFVP are

consuming fewer sugar-sweetened beverages and sodas; participating students may be replacing regular sodas with diet sodas. This finding needs to be further explored and attention paid to the effects of sugar alcohols on the health of young children.

Differences were found between participants and non-participants regarding the frequency at which the school lunch and breakfast was being consumed. One-hundred percent of FFVP participating fourth grade Hispanics ate the school lunch Monday through Friday. Only 70% of non-participating students reported eating the school lunch each day of the school week. Hispanics and fifth graders were significantly less likely to report consuming the school breakfast less than once a week or never; all other differences indicated that participants are significantly more likely to eat the school breakfast than non-participants. While the higher percentages of participants consuming the school lunch and school breakfast could be a function of participation in the FFVP, greater participation could reflect the higher FRL percentages found in the schools participating in the FFVP. Regardless of the explanation why the FFVP participants are consuming the school breakfast or lunch more frequently, these students are being exposed to and have the opportunity to consume a greater variety of healthy foods as stricter dietary guidelines are currently being implemented through the requirements of the Healthy, Hunger-Free Kids Act of 2010.

Academic Performance of FFVP Participants and Non-Participants

A significant difference in student achievement on the English, reading and mathematics sections of the CRCT between FFVP participants and non-participants was not found. Participation in the FFVP did not significantly increase student success on the CRCT. All schools participating in the FFVP constituted one group for the analysis as schools with three years of program implementation did not differ significantly from schools finishing their first or second year of implementation. It is expected that the implementation and outcomes of a curriculum

would improve as teachers gain valuable years of experience. Future research should seek to understand how the FFVP is currently being implemented in schools and offer suggestions to increase the impact of the program on student dietary choices. Schools that view participation in the FFVP as a "free snack" would not expectedly experience the full benefits of participation. Those schools with serious intentions of introducing students to a variety of fruits and vegetables and of encouraging healthier food choices should experience greater benefits; researchers may find more significant dietary changes in these students and, perhaps, significant increases in academic achievement.

The variables found to significantly influence student success on the CRCT would be extremely difficult to overcome through dietary changes alone. Specific racial groups and schools with high FRL percentages (a proxy variable for student socioeconomic status) carry with them a multitude of confounding factors that impact student achievement. The present study hypothesized that that those schools participating in the FFVP would have higher fruit and vegetable consumption and would therefore have higher CRCT scores. As no significant dietary changes were identified in FFVP participants, it follows that no significant academic changes would be identified either. Even if the present research had found that students participating in the FFVP significantly increased their consumption of fruit by half a serving each day, as the preliminary report of the USDA's evaluation of the FFVP described, significant differences in CRCT scores between participants and non-participants would be highly unlikely.

None of the 12 models used to predict student achievement on the CRCT found participation in the FFVP to be significant. The most influential variables on CRCT scores were race and FRL percentages. Schools with high FRL participants serve families of low-economic status. Kirby, Baranowski, Reynolds, Taylor and Binkley (1995) found striking environment differences between socioeconomic groups in the availability of fruits and vegetables. Families

with a lower socioeconomic status were found to have only a few fresh fruits and vegetables in their home, eat more frequently at fast food locations where fruits and vegetables are not readily available, and provide few or no fruits and vegetables prepared and readily available as snacks. As the percentage of students qualifying for FRL lunch is a factor for participation in the FFVP, students in the participating schools are more likely to be from a family of low socioeconomic status. It is unlikely that one fruit or vegetable snack for each school day will overcome limited fruits and vegetables in the home environment every day. As supported by SCT, future modifications of the FFVP should consider a parental education component that teaches parents how to provide healthy food choices within the home at affordable prices.

The Food Revolution: Moving Forward with Public Policy

The importance of healthy eating is one fundamental concept that parents and schools alike have failed to teach the current generation of children. Both the home and school environments are laden with foods high in calories, fat, and sugar. Environments filled with foods high in these ingredients are harmful as they compromise a child's present and future health; dangerous health conditions result from the consumption of these foods over an extended period. Homes and schools should create a safe environment for children, not an environment that is detrimental to their well-being. But parents and administrators are failing in this task. Children's diets consist of processed foods to the extent that many cannot identify a variety of fresh fruits and vegetables. Children are paying the price. Since the mid-1970s the obesity rate has doubled for children aged 2 to 5 and has tripled for children aged 6 to 19 (Department of Health and Human Services & Centers for Disease Control and Prevention, 2012). Diseases that were once thought to affect only adults, such as type 2 diabetes, high blood pressure, and heart disease, are now common in childhood. A serious problem exists. And changes must be made.

Having reached epidemic proportions, the issues of overweight and obesity and their closely related medical and financial consequences are important *public* health issues. The obesity epidemic is a matter of public interest because a population of "nutritional illiterates" (Schweiker, 1973) is inherently an unhealthy nation. Nutrition education is simultaneously an investment in individuals and the nation. Healthy individuals are productive individuals that contribute positively to the workforce. Healthy individuals are physically capable individuals ready to serve when national security is threatened. Matters that impact economic productivity and national security require governmental action in the form of public policy. There is no institution more public than the school house. There is no institution more appropriate for educating the populace on matters of public health issues. This idea of the school as a "social reform tool" was far from new in 1940, but in this year it was written in the *Journal of Home Economics*:

> the easiest as well as the most efficacious plan *for improvement of national nutrition* [italics added] is to better the feeding of children during the school years when food needs are most exacting and when nearly all the children of the community are gathered together five days a week under the observation of the schools (as cited in Lautenschlager, 2006, p. 58).

Schools have been and continue to be the center of American reform. The present reform is only unique in its focus. Schools are being called upon to be part of a "Food Revolution," a nation-wide movement seeking to change the way Americans eat (Oliver, n.d.).

The Role of the School

According to Birkland (2011), "public policies address problems that are public or, more importantly, that some number of the people think should be public instead of private. Indeed, a key feature of politics and policy decision making is the very definition of what problems are public and which are private" (p. 4). The Robert Wood Johnson Foundation, Action for Healthy Kids, Michele Obama's *Let's Move* campaign, and Jamie Oliver's Food Revolution all recognize

the *public* problem of childhood obesity. It has become apparent in the last decade through Congressional action that Capitol Hill recognizes the public nature of the obesity epidemic and is becoming serious about addressing the issue. And since schools play a significant role in the lives of countless students and their families, schools represent an opportunistic location to implement public policy; "education remains our most effective personal and national defense against the ravages of poor nutritional health" (Lautenschlager, 2006, p. 213).

Nevertheless, significant problems arise when one considers using the school to implement policies designed to correct childhood eating habits and to overcome obesity. These problems can be attributed to the fact that educators—administrators and teachers—are street-level bureaucrats. Street-level bureaucrats are public service workers charged with enforcing public policy, but through the discretion and autonomy provided their positions, their decisions profoundly shape how the general public experiences public policies (Lipsky, 1980).

> Polices are not just contained in laws and regulations; once a law or rule is made, policies continue to be made as the people who implement policy…make decisions about who will benefit from policies and who will shoulder burdens as a result (Birkland, 2011, pp. 9 – 10).

Public policies are not necessarily implemented as written. Public policies only *begin* with a signed document. Public policies are open to interpretation by street-level bureaucrats who "believe themselves to be doing the best they can under adverse circumstances" (Lipsky, 1980, p. xiii). Consider one study of the perceptions of select individuals concerning the success of schools with local wellness policies, a federal mandate reauthorized in the Healthy, Hunger-Free Kids Act of 2010 in which schools must plan and implement policies to create a healthy school environment. Argon, Berends, Ellis, and Gonzalez (2010) undertook a national research project to identify the challenges facing schools in developing, implementing, monitoring and evaluating local wellness policies. Four subject groups were utilized: school board members; state school board association leaders; school wellness advocates that were members of the Action for

Healthy Kids coalition; and state public health nutrition directors. As suggested by Lipsky, school board members, those bureaucrats charged with implementing the policy, were very confident in the work of their districts towards implementing school wellness policies. But in stark contrast, public health directors and wellness advocates had little, if any, confidence in schools.

Lipsky (1980) also described the problem of resources for street-level bureaucracies. These governmental institutions "*chronically* experience resource constraints. These agencies are virtually never adequately provided for, and perhaps cannot be adequately provided for" (p. 33). With limited resources, administrators must then contend with "conflicting and ambiguous goals" (p. 40). School administrators faced with inadequate budgets often turn to the lucrative business of competitive foods. While schools financially benefit from vending contracts and a la carte sales, competitive foods adversely affect students by replacing nutrient dense foods with empty calories, impairing cognitive capacity, and vying for coins. Unhealthy foods compete for a student's daily calories without offering significant contributions toward nutritional requirements and thereby hinder his cognitive capacity and academic achievement. Children with poor diets experience higher rates of absenteeism and, consequently, schools must provide remedial programs to overcome the health and academic problems that result when competitive foods trump more nutrient dense foods. Schools do need additional funding to provide adequate educational opportunities, but revenue generated from competitive foods perpetuates a cycle of unhealthy eating, underachievement, and under-funded programs.

Perhaps the most serious issue of utilizing schools to end the obesity epidemic arises when the personal goals and habits of educators are compared to those of the policies they are to implement. Without question, teachers constitute a portion of the 72 million obese Americans (Department of Health and Human Services & Centers for Disease Control and Prevention, 2011). How can the very individuals that are asked to serve as role models and to

educate students about nutrition and fitness successfully fulfill this responsibility if they cannot practice these principles in their own daily habits? The very individuals that are overweight or obese, that routinely consume processed foods, and rarely participate in any form of physical activity, are the individuals responsible for implementing the Food Revolution. It is not difficult to imagine the conflict that emerges between the goals of the local wellness policy, the FFVP included, and lifestyle habits of educators. The health habits that teachers are being asked to address in their students are those same habits that many teachers have yet to embrace.

Strategies for Success

Perhaps the simplest, but most effective strategy in ending the obesity epidemic is *awareness*. Public awareness of the obesity epidemic, however, is not limited to the number of children identified as overweight or obese. Statistics must also focus on the financial costs and medical conditions related to obesity. And, most importantly for gaining the support of administrators and teachers, the link between a child's diet and his academic performance cannot be ignored. Because education is currently in an era of accountability, it is this relationship between nutrition and academic achievement that must be stressed. Educational leaders can no longer ignore the obesity epidemic as the health—and subsequent academic and professional success—of our children is dependent upon it:

> …educators have an essential role to play in advancing student health and preventing childhood obesity. If we want all our children to have an equal chance to succeed in school and in life, our schools must not only promote academic achievement but also help students develop habits of healthy eating and physical activity (Satcher, 2009/2010, p. 38).

Nutrition education and awareness will only permeate all aspects of schooling when the local wellness policy, including the goals of the FFVP, is implemented. Five suggestions adapted from *Let's Move* are made to help school leaders implement their local wellness policy, embrace the FFVP, and create a healthy environment for students. These implications for practice extend

beyond the availability and types of foods in a la carte lines and vending machines; a healthy school environment must consider every aspect of school life.

Create a School Wellness Team. Just as successful administrators look for advice from school leadership teams, administrators must create a school wellness team that can provide information concerning the health status of the school, make policy recommendations, and keep abreast of health-related issues. Members of the school wellness team should include, but are not limited to, the school dietitian, school nurse, physical education and nutrition teachers, and a student, parent, and community representative. Administrators should work with their wellness team to identify how their school can encourage healthy eating and physical activity. Suggestions from the wellness team are expected to cover a broad area of issues, including student snacks, birthday parties, fundraisers, and student rewards.

Encourage Everyone to Participate. Education is not just for the young; health is not just for the young. If a school is to change the lifestyle habits of students, *everyone* must be part of the movement—administrators, teachers, cafeteria workers, and the school secretary. Teachers, because of their direct contact with students and collective power in the creation of a health-conscious environment, have a particularly vital role. Teacher development must be "both separate from and integrated with efforts to improve the education and health outcomes of students" (Eaton et al., 2007, p. 558). Fullan (2007) stated that "change will always fail until we find some way of developing infrastructures and processes that *engage* [italics added] teachers in developing new knowledge, skills and understandings" (p. 29). And similarly, Bate, Bevan and Robert (2005) described that people must participate in the desired behavior before they realize its value: "people cannot want 'it' until they have tried it. The concrete experience of participating in a movement is crucial, meanings and value being formed after the experience not before it" (p. 31). If teachers are expected to teach and model appropriate eating and

exercise habits, they must receive the support necessary to understand the fundamental concepts of nutrition and physical exercise (Schwahn & Spady, 1998). Consequently then, administrators must find professional development opportunities and resources that support the health of teachers. And, of course, administrators must serve as a role model for both students and teachers throughout the entire process.

Enhance the Curriculum. Awareness of healthy lifestyle choices must become integral components of the school environment, including curricula (Sergiovanni, 1994; Fullan, Cuttress, & Kilcher, 2005; *Let's Move*, n.d.). Administrators, working in conjunction with the wellness team, must provide ideas and support for all subjects to incorporate nutrition and physical education into classroom content and activities. At a most basic level, students should be provided opportunities for physical activity during each class; these activities could include reenactments of stories and historical events or a nature walk. Core subjects can integrate health and nutrition education just as easily as classes in physical education, health, and nutrition. For example, nutrition labels and grocery advertisements can be used to teach addition, percentages, and graphing in math class. Science class is a logical setting to study digestion, metabolism, and exercise physiology. Large research projects can be completed in a multi-disciplinary manner, incorporating content from science, English, social studies, health, and nutrition. By integrating nutrition and physical education content within all subject areas, wellness will no longer be a topic for health class—wellness will become an integral component of the school environment and its culture.

Modify the Schedule. Administrators must ensure that student schedules support a culture of wellness. The demand to achieve Annual Yearly Progress under No Child Left Behind pressures administrators to increase student time in core subjects at the expense of programs such as nutrition education and physical activity (Shilts et al., 2009; Horowitz et al., 2008;

Chomitz et al., 2009). But in fact, student achievement may be better accomplished by providing more opportunities for physical activity (Murray, Low, Hollis, Cross, & Davis, 2007; Trost & van der Mars, 2009/2010). Academic success can also be encouraged by providing time for nutritious meals and snacks. Students should be allowed time for breakfast. Administrators may have to open the school earlier for longer access to the cafeteria, set up fruit kiosks throughout the building, or offer breakfast in the classroom. Regardless of the method, the importance of breakfast cannot be ignored (Kleinman et al., 2002). Snacks, especially for younger students, must be provided early so as not to decrease a child's appetite for lunch. A child's appetite, however, can be improved if he is provided time for physical play immediately prior to lunch. In totality, whatever the component of the schedule in consideration, administrators must work conscientiously to preserve the elements of the school day that promote health and wellness.

Reach out to the Community. External relationships provide support for changing and maintaining a healthy school environment (Action for Healthy Kids, 2007; FNS, 2010; Fullan, Cuttress, & Kilcher, 2005). Partnerships should be created with local wellness centers, physicians, and grocery, health, and sporting goods stores. Families, particularly parents, are significant members of the external environment. Home and school environments must coincide if behaviors and attitudes regarding healthy lifestyle choices are to be realized. Schools cannot mandate a healthy home environment, but schools can promote it. Newsletters, fairs, and PTO meetings are excellent opportunities to educate parents regarding the health and wellness of their family.

The Future of the Fresh Fruit and Vegetable Program

It is difficult to label school nutrition programs, such as the NSLP and SBP, which have been integral components of the nation's schools as failures. But the NSLP and the SBP have

failed America's children. Whether the result of agricultural commodities, limited budgets, or fast food menus, the *nutritional* quality of school meals has been less than that desired of a *nutrition* program. This is partly to blame on the conflicting history of the school nutrition programs:

> We have never tried to design a school food program with our children's health, both immediate and long-term, as its central goal, its clear priority. The well-being of children has always had to compete with other agendas: the disposal of farm commodities or the maintenance of segregation or the reduction of the federal budget deficit. It's time to see what we can do if we put children first (Poppendieck, 2010, p. 60).

The FFVP is proving that it has learned from the failures of the NSLP and the SBP. Where the NSLP and SBP had issues with stigmatized participation and nutritionally poor meals, the FFVP is succeeding. All students of a participating school share in the benefits of the FFVP. There are no forms to complete and no embarrassing eligibility classifications. Every student in every classroom is provided the opportunity to partake in a universally free program. The nutritional quality of snacks administered through the program is addressed in detail. *Fresh* produce is to be served at all possible occasions—produce in its natural state with no additives. And the program has the explicit goal of increasing student exposure to and consumption of fresh fruits and vegetables in a student's diet.

Unlike the NSLP and the SBP, the nutritional value of the snacks provided through the FFVP does *not* have to compete with political or agricultural objectives. The FFVP can focus on one goal—the provision of healthy snacks. The nutritional integrity of the program, however, will only be upheld if the snacks served are healthy foods—an integrity that is completely dependent upon the street-level bureaucrats responsible for it is implementation. If school leaders are to become serious about the relationship between food and academic achievement, the FFVP must be contextualized within the totality of the school environment. The school environment represents the lived curriculum of students and must reflect the value of healthy

food and lifestyle choices. Implementation of a healthy school environment, including the FFVP, bears implications for schools leaders: "administrators play a central role because they determine conditions under which policy interpretation and implementation will be carried out" (Louis, Febey, & Schroeder, 2005, p. 180).

But the FFVP has one large lesson to be learned—a lesson that will be crucial to the success of the program. It is a lesson in Congressional funding. Although funding has increased since the FFVP began in the 2002 school year, funding remains limited. A specified amount of federal money is allotted to provide fresh fruits and vegetables to students from the elementary schools with the highest FRL percentages. A stated purpose of the FFVP is to "[ensure] that the Program benefits low-income children that generally have fewer opportunities to consume fresh fruits and vegetables on a regular basis" (FNS, 2010, p. 4). While it is true that low-income families may not have the resources to provide fresh foods for their children, there is no guarantee that families with greater resources are purchasing these items either. As stated by Senator Schweiker in 1973, we live in a "nation of nutritional illiterates" (p. 597). Money does not necessarily equate to healthier food choices; money does not protect one from the ravages of poor dietary habits. All students, regardless of income, deserve to participate and experience the benefits of the FFVP.

The FFVP is idealistic. Just as the American public had an "idealism" of the NSLP "that far outreached its capacities" (Levine, 2008, p. 89), the FFVP speaks of a goal unattainable through one small fruit or vegetable snack each day. One small fruit or vegetable snack each day will not solve the obesity epidemic. The FFVP *alone*—the fifteen minutes of school dedicated to providing children a health lesson and a nutritious snack—will not change the diets of children so significantly as to end childhood obesity. The issues of childhood obesity are larger than federal policy. The Food Revolution is larger than federal policy. The goal is *to*

change people. Lifestyles cannot be mandated by policy. The FFVP can, however, support environmental changes within the school that are necessary for a Food Revolution.

Final Thoughts

It can be argued that a multitude of environments, not just the school, influence student diet and physical activity. It can also be argued that schools are already over-burdened with responsibilities, both academic and not. While these arguments do pose valid points, the school has a responsibility to prepare students to become productive citizens—and one's productivity is directly dependent upon his health. The necessity of health education was clearly identified in the *Cardinal Principles* of 1918:

> To discharge the duties of life and to benefit from leisure, one must have good health. The health of the individual is essential also to the vitality of the race and to the defense of the Nation. Health education is, therefore, fundamental (Commission on the Reorganization of Secondary Education, 1918, p. 10).

Considering the amount of time a student spends in the schoolhouse, it is not difficult to imagine the school's "significant influence on children's diets" and "important role in teaching and modeling appropriate health behaviors" (Stallings & Yaktine, 2007, p. 1). The role of the school in addressing the food and physical activity habits of students has increased significantly as the nutritional status of young children and adolescents have come into public awareness.

The Food Revolution has been spurred on by Michele Obama, Jamie Oliver, Action for Healthy Kids, and the Robert Wood Johnson Foundation. These individuals and organizations, and many more like them, have made people aware of how extremely unhealthy the nation is. While the goals of these individuals and organizations read differently, they all share the same objective—get the nation, and particularly the children, healthy. Congress has shown support for these goals as exemplified by the Healthy, Hunger-Free Kids Act of 2010, local wellness policies, and the FFVP. The fundamental question with these policies and programs, however, is implementation.

Implementation is dependent upon the interpretation of legislation at the school level. Schools are street-level bureaucracies. With much discretion and autonomy, administrators and teachers determine how legislation will be implemented—they determine how students and parents will experience Congressional mandates. Variability of implementation rather than uniformity is the rule. It is important then that any policy intended to improve the diet and physical activity habits of students allow for input and flexibility at the local level. The policy must serve as a support mechanism, not a mandate. Fullan (2007) supported this condition with what he called "permeable connectivity": the solution to educational change "[integrates] top-down and bottom-up forces in an ongoing dynamic manner" (p. 262). He further delineated that governments must move beyond standards and accountability to focus on capacity building, a process of "guiding and directing people's work" (p. 263) through professional learning.

In creating new legislation and programs targeted at improving the health of America's students, such as the FFVP, Congress must acknowledge that successful implementation will depend on governmental infrastructures that support the work of individual schools and motivated, knowledgeable members of local educational systems. Fullan (2007) defined large scale reform as "*shared* meaning" (p. 11), a process that is both individual and social. Individuals within the local educational context—particularly administrators, teachers, and school nutrition directors—must first begin to understand the importance of healthy lifestyle habits for their own personal benefit. But the role of students in bringing about change cannot be overlooked. If the FFVP is to achieve social change, students must develop personal meaning for the goals of the program. Students, as integral members of the organization undergoing reform, are—and must be interpreted as—active participants of the change process. Students are part of the solution and their motivation and engagement are central to sustained self-improvement and

social change (Fullan, 2007). As the benefits of healthy lifestyle habits are internalized by the school and its participants, meaning is found in the goals of the Food Revolution. An engaging cycle begins as "meaning fuels motivation" (Fullan, 2007, p. 39).

Student well-being was the motivation for early volunteer cafeterias; student well-being is the motivation of current health initiatives. While the specific nutritional concern has changed through time, the goal of healthier students has remained constant. This goal, however, is bigger than federal policy. It is not enough to simply introduce policies and programs in the schools. The goal is to actually *change* people and their habits. Public policy is important, but public policy alone will not solve the issues of the food environment that currently surrounds our children: "This problem can't be solved just by passing laws in Washington" (*Let's Move*, n.d., para. 4).

Policy can, however, provide the support for making changes. The FFVP is supporting change in the dietary habits of America's children. The present research found that students participating in the FFVP are making healthier choices in regards to sugar-sweetened beverages, sodas, and fried potato products. These healthier choices, concentrated in blacks and Hispanics, represent significant dietary changes. Although not through the anticipated increase in fruit and vegetable consumption, the FFVP is making a difference in the diets of children—the FFVP is meeting its goal of impacting the present and future health of students.

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APPENDIX A

FOOD FREQUENCY QUESTIONNAIRE

Understanding What Georgia Students Eat

I want to see if you would be willing to help me with a research project about the Fresh Fruit and Vegetable Program. You will be asked how often you consume a variety of foods, such as fruits, vegetables, crackers, and candy. You will also be asked to tell me what your favorite fruits and vegetables are. The questionnaire that you will be asked to complete is not a test. There are no right or wrong answers to these questions. I just want to understand what types of food you eat.

If you decide to do the project, you will give your answers through a survey on the computer. Your answers will be kept just between you and me. You can decide to stop at any time or can choose not to answer questions that you don't want to answer. If you decide not to do the project you will not be punished in any way.

Will you participate in the project? Click on your answer.

Yes. I want to participate. No. I do not want to participate.

Please answer the questions below. **Please check the box or fill in the blanks.**

This is not a test! There are no right or wrong answers. I want to know about you and what you like to eat.

Many of these questions are about the foods you ate or drank during the past 7 days (weekdays and weekend days). Think about all meals, snacks, and drinks you had each day and evening for all 7 days. Be sure to include food you ate at home, school, restaurants and anywhere else.

1. During the past 7 days, how many times did you drink any punch, Kool-Aid, sports drinks, energy drinks, vitamin water, or other <u>fruit-flavored drinks</u>?

*Do **NOT** count* 100% fruit juice or soda.

Mark only ONE box.

- ☐$_1$ I did not drink fruit-flavored drinks during the past 7 days
- ☐$_2$ 1 to 3 times during the past 7 days
- ☐$_3$ 4 to 6 times during the past 7 days
- ☐$_4$ 1 time per day
- ☐$_5$ 2 times per day
- ☐$_6$ 3 times per day
- ☐$_7$ 4 or more times per day

2. During the past 7 days, how many times did you drink any <u>regular (NOT diet) sodas or soft drinks</u>?


Mark only ONE box.

- ☐$_1$ I did not drink *regular* soda during the past 7 days
- ☐$_2$ 1 to 3 times during the past 7 days
- ☐$_3$ 4 to 6 times during the past 7 days
- ☐$_4$ 1 time per day
- ☐$_5$ 2 times per day
- ☐$_6$ 3 times per day
- ☐$_7$ 4 or more times per day

3. During the past 7 days, how many times did you drink any *diet* sodas or soft drinks?

Mark only ONE box.

- ☐1 I did not drink *diet* soda during the past 7 days
- ☐2 1 to 3 times during the past 7 days
- ☐3 4 to 6 times during the past 7 days
- ☐4 1 time per day
- ☐5 2 times per day
- ☐6 3 times per day
- ☐7 4 or more times per day

4. During the past 7 days, how many times did you drink 100% fruit juices such as orange juice, apple juice, or grape juice?

*Do **NOT** count* fruit punch, Kool-Aid, sports drinks, energy drinks, vitamin water or other fruit-flavored drinks.

Mark only ONE box.

- ☐1 I did not drink 100% fruit juice during the past 7 days
- ☐2 1 to 3 times during the past 7 days
- ☐3 4 to 6 times during the past 7 days
- ☐4 1 time per day
- ☐5 2 times per day
- ☐6 3 times per day
- ☐7 4 or more times per day

5. During the past 7 days, how many times did you eat fruit? Include fresh, canned, frozen and dried fruit.

*Do **NOT** count* fruit juice.

Mark only ONE box.

- ☐1 I did not eat fruit during the past 7 days
- ☐2 1 to 3 times during the past 7 days
- ☐3 4 to 6 times during the past 7 days
- ☐4 1 time per day
- ☐5 2 times per day
- ☐6 3 times per day
- ☐7 4 or more times per day

6. During the past 7 days, how many times did you eat green salad?

Mark only ONE box.

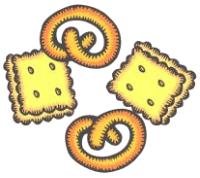
- ☐1 I did not eat green salad during the past 7 days
- ☐2 1 to 3 times during the past 7 days
- ☐3 4 to 6 times during the past 7 days
- ☐4 1 time per day
- ☐5 2 times per day
- ☐6 3 times per day
- ☐7 4 or more times per day

7. During the past 7 days, how many times did you eat French fries, fried potatoes, or chips? Chips are potato chips, tortilla chips, Cheetos, puffs, corn chips, or other snack chips.

Mark only ONE box.

- ☐1 I did not eat French fries, fried potatoes or chips during the past 7 days
- ☐2 1 to 3 times during the past 7 days
- ☐3 4 to 6 times during the past 7 days
- ☐4 1 time per day
- ☐5 2 times per day
- ☐6 3 times per day
- ☐7 4 or more times per day

8. During the past 7 days, how many times did you eat other salty snacks? Other salty snacks include cheese nibs, chex mix, gold fish crackers, Ritz, or other snack chips.

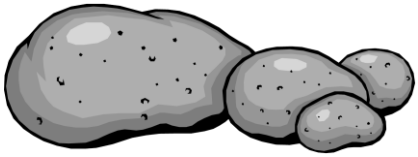


Mark only ONE box.

- ☐1 I did not eat other salty snacks during the past 7 days
- ☐2 1 to 3 times during the past 7 days
- ☐3 4 to 6 times during the past 7 days
- ☐4 1 time per day
- ☐5 2 times per day
- ☐6 3 times per day
- ☐7 4 or more times per day

9. During the past 7 days, how many times did you eat <u>other kinds of potatoes</u>?

*Do **NOT** count* French fries, fried potatoes, or potato chips.



Mark only ONE box.

- ☐$_1$ I did not eat potatoes during the past 7 days
- ☐$_2$ 1 to 3 times during the past 7 days
- ☐$_3$ 4 to 6 times during the past 7 days
- ☐$_4$ 1 time per day
- ☐$_5$ 2 times per day
- ☐$_6$ 3 times per day
- ☐$_7$ 4 or more times per day

10. During the past 7 days, how many times did you eat <u>carrots</u>? Include cooked or raw carrots.

Mark only ONE box.

- ☐$_1$ I did not eat carrots during the past 7 days
- ☐$_2$ 1 to 3 times during the past 7 days
- ☐$_3$ 4 to 6 times during the past 7 days
- ☐$_4$ 1 time per day
- ☐$_5$ 2 times per day
- ☐$_6$ 3 times per day
- ☐$_7$ 4 or more times per day

11. During the past 7 days, how many times did you eat <u>other vegetables</u>? Include fresh, canned, and frozen vegetables.

Do NOT count green salad, potatoes, or carrots.

Mark only ONE box.

- ☐$_1$ I did not eat other vegetables during the past 7 days
- ☐$_2$ 1 to 3 times during the past 7 days
- ☐$_3$ 4 to 6 times during the past 7 days
- ☐$_4$ 1 time per day
- ☐$_5$ 2 times per day
- ☐$_6$ 3 times per day
- ☐$_7$ 4 or more times per day

12. During the past 7 days, how many times did you eat a <u>frozen dessert</u>? A frozen dessert is a cold, sweet food like ice cream, sherbet, milk shake, frozen yogurt, an ice cream bar or a Popsicle.


Mark only ONE box.

- ☐$_1$ I did not eat frozen desserts during the past 7 days
- ☐$_2$ 1 to 3 times during the past 7 days
- ☐$_3$ 4 to 6 times during the past 7 days
- ☐$_4$ 1 time per day
- ☐$_5$ 2 times per day
- ☐$_6$ 3 times per day
- ☐$_7$ 4 or more times per day

13. During the past 7 days, how many times did you eat <u>sweet rolls, doughnuts, Pop Tarts, Twinkies, Ho Hos, cookies, brownies, pies or cake</u>?




Mark only ONE box.

- ☐$_1$ I did not eat things like cookies during the past 7 days
- ☐$_2$ 1 to 3 times during the past 7 days
- ☐$_3$ 4 to 6 times during the past 7 days
- ☐$_4$ 1 time per day
- ☐$_5$ 2 times per day
- ☐$_6$ 3 times per day
- ☐$_7$ 4 or more times per day

14. During the past 7 days, how many times did you eat any <u>candy</u>? Count chocolate candy, candy bars, jelly bellies, gummies and Lifesavers.


Do NOT count cookies or gum.

Mark only ONE box.

- ☐$_1$ I did not eat candy during the past 7 days
- ☐$_2$ 1 to 3 times during the past 7 days
- ☐$_3$ 4 to 6 times during the past 7 days
- ☐$_4$ 1 time per day
- ☐$_5$ 2 times per day
- ☐$_6$ 3 times per day
- ☐$_7$ 4 or more times per day

15. In a usual school week (weekdays), how often do you eat the following school meals?
Mark only ONE box for each statement.

	Less than once a week or never	1 to 2 times a week	3 to 4 times a week	Every day
A. I usually eat the school lunch…	☐1	☐2	☐3	☐4
B. I usually bring lunch from home…	☐1	☐2	☐3	☐4
C. I usually eat the school breakfast….	☐1	☐2	☐3	☐4

16. How many servings of fruits and vegetables do you think are healthy to eat <u>each day</u>?
Mark only ONE box.

☐1 At least 1 serving

☐2 1-2 servings

☐3 3-4 servings

☐4 5 servings or more

☐5 Don't know

17. How much do you agree or disagree with each of the following statements?
Mark only ONE box for each statement.

	I agree very much ☺☺	I agree a little ☺	I disagree a little ☹	I disagree a lot ☹☹
A. I like most fruits	☐1	☐2	☐3	☐4
B. I like most vegetables	☐1	☐2	☐3	☐4
C. I like to try new kinds of fruits	☐1	☐2	☐3	☐4
D. I like to try new kinds of vegetables	☐1	☐2	☐3	☐4

18. For each fresh fruit or vegetable, mark how much you like it. Even if you can't eat one of these foods now (for example, you have braces or some other reason) answer whether you like or don't like it. Mark only ONE box for each fruit or vegetable.

	A lot ☺☺	**A little ☺**	**Don't like it ☹**	**Don't Know Never tasted**
A. Apples	☐1	☐2	☐3	☐4
B. Bananas	☐1	☐2	☐3	☐4
C. Strawberries	☐1	☐2	☐3	☐4
D. Oranges	☐1	☐2	☐3	☐4

E. Pears	☐$_1$	☐$_2$	☐$_3$	☐$_4$
F. Grapes	☐$_1$	☐$_2$	☐$_3$	☐$_4$
G. Pineapple	☐$_1$	☐$_2$	☐$_3$	☐$_4$
H. Carrots	☐$_1$	☐$_2$	☐$_3$	☐$_4$
I. Broccoli	☐$_1$	☐$_2$	☐$_3$	☐$_4$
J. Cauliflower	☐$_1$	☐$_2$	☐$_3$	☐$_4$

You are nearly finished! Just a couple of questions about you…

19. Are you Hispanic or Latino?

☐$_1$ Yes

☐$_2$ No

20. How do you describe yourself? Mark all that apply

☐$_1$ American Indian or Alaska Native White

☐$_2$ Asian

☐$_3$ Black or African American

☐$_4$ Native Hawaiian or Other Pacific Islander

☐$_5$ White

21. What language do you use with your parents most of the time?

☐$_1$ English

☐$_2$ Spanish

☐$_3$ Other (please describe) _____

22. What is the name of your school? _____

23. What grade are you in? _____

Thank you for completing this questionnaire!

APPENDIX B

SUPERINTENDENT PARTICIPATORY EMAIL

Superintendent:

Specific elementary schools within your system have been selected to participate in a Fresh Fruit and Vegetable Program (FFVP) doctoral research study. The research is designed to evaluate the health and academic implications of the USDA's FFVP. I am presently seeking data regarding the number of schools willing to participate. **I ask you to respond to this email indicating your interest in allowing your fourth and fifth grade students an opportunity to participate.** Study details follow.

- Example Elementary School 1
- Example Elementary School 2

Students in 75 northeast Georgia elementary schools are asked to participate. Your school's participation is voluntary, but I encourage you to support this important study. The success of the research is dependent upon the participation of your students.

The research will examine how the FFVP impacts the diets of Georgia students in the fourth and fifth grades. The research will also examine the academic benefits, including CRCT scores, behavior, and attendance, for students participating in the FFVP. **Nutritional and academic comparisons will be made between those schools that are participating in the FFVP and those schools not participating.** The FFVP evaluation is part of an *independent, doctoral research* project; I am *not* conducting this research for the USDA.

If you desire for your students to participate, each fourth and fifth grade student will be asked to complete a food frequency questionnaire accessible through the web. A copy of the questionnaire is attached for your review. The questionnaire asks students to report on the frequency at which they consume a variety of foods. **Data collected from your students will be strictly anonymous.** I request that your students complete the questionnaire between mid-March and the end of May; this window allows you to schedule the questionnaire around your CRCT testing dates and spring holidays. The questionnaire will take each student less than 20 minutes. If you choose to participate, I will work closely with your elementary school principals as they plan for the questionnaire.
Thank you in advance for your assistance in this important research. If you would like additional information at this time, please contact me at 706 – 340 – 1176 or at cepps@uga.edu.

Sincerely,

Christy Epps
Ed. D. Candidate, University of Georgia
Lifelong Education, Administration, and Policy
706-340-1176
cepps@uga.edu

APPENDIX C

FFVP RESEARCH PARTICIPATION PARENTAL PERMISSION SLIP

Evaluating the Health and Academic Implications of the FFVP

I agree to allow my child to take part in a research study titled "Evaluating the Health and Academic Impact of the Fresh Fruit and Vegetable Program" *which is being conducted by* Christy Epps under the direction of Dr. Catherine Sielke. Christy Epps is a doctoral student in the Department of Lifelong Education, Administration, and Policy at the University of Georgia and can be reached at cepps@uga.edu or 706-340-1176. Dr. Catherine Sielke is a professor in the Department of Lifelong Education, Administration, and Policy at the University of Georgia and can be reached at csielke@uga.edu or 706-542-9767. My child's *participation is voluntary; I do not have to allow my child to participate if I do not want to. My child can refuse to participate or stop taking part at any time without giving any reason, and without penalty or loss of benefits to which he/she is otherwise entitled.*

What is the Purpose of the Study?
The United States Department of Agriculture (USDA) recently funded a study to learn how the Fresh Fruit and Vegetable Program (FFVP) is implemented in schools and how the program impacts students' diets. The present doctoral research will examine how the FFVP impacts the diets of Georgia students. The research will also examine the academic benefits, including CRCT scores, behavior, and attendance, for students participating in the FFVP. Nutritional and academic comparisons will be made between those schools participating in the FFVP and similar schools not participating in the FFVP.

What does it Mean to Participate in the Study?
All fourth and fifth grade students in 15 northeast Georgia counties are being asked to participate in the research. Students are asked to report on the frequency at which they consume certain foods, such as fruits, vegetables, crackers, and candy. The students will report this information through a food frequency questionnaire on the school computer. The questionnaire will take approximately 20 minutes for students to complete. The questionnaire will only be taken once.

What are the Risks and Benefits?
Completing the questionnaire is voluntary. There are no penalties for refusing to participate. Students are not required to be in the study in order to continue participation in any school program. Being part of this study will not hurt students or parents in any way; no discomforts or stresses are expected. No risks are expected. If any student feels uncomfortable at any time during the study, he or she may decide not to participate. No direct student benefit is expected. However, by participating in the study, students provide valuable data regarding the FFVP; these data are expected to improve the implementation of the FFVP.

Will it be Confidential?
Confidentiality will be protected to the extent provided by law. *All collected responses are anonymous; no individually identifiable information will be collected from students or parents.* Teachers, school staff, program staff and parents will not be allowed to see student questionnaire responses.

What if I Have Questions?

The researcher, Christy Epps, will answer any further questions about the research, now or during the course of the project, and can be contacted at 706 – 340 – 1176 or at cepps@uga.edu.

Parental Permission

My signature below indicates that the researchers have answered all of my questions to my satisfaction and that I consent for my child to participate in this study. I have been given a copy of this form.

Christy Epps	_____	*February 20, 2012*
Researcher	*Signature*	*Date*
cepps@uga.edu		
706-340-1176		
_____	_____	_____
Parent/Guardian	*Signature*	*Date*

PLEASE SIGN BOTH COPIES OF THIS FORM. KEEP ONE FORM AND RETURN THE OTHER TO YOUR CHILD'S SCHOOL.

APPENDIX D

RELATIONSHIP BETWEEN OTHER VARIABLES AND STUDENT ACHIEVEMENT

Table D1

Relationship between Other Variables and Student Achievement

Success Measure	Grade	Variable	Intercept	Estimate	t-Statistic	P Value
English Pass Percent	4	Rural Location	82.90	4.55	2.70	0.0080*
		FRL Percent	115.72	-0.38	-6.74	< 0.0001*
		ELL Percent	84.43	0.04	0.52	0.6045
		Male Percent	98.98	-0.28	-2.03	0.0449*
		White Percent	78.39	0.17	6.66	< 0.0001*
		Black Percent	92.11	-0.16	-6.79	< 0.0001*
		Hispanic Percent	83.75	0.08	1.45	0.1497
		Other Percent	85.42	-0.08	-0.70	0.4830
		Attendance	65.97	19.43	0.19	0.8479
		Discipline Per Student	86.49	-5.05	-2.42	0.0172*
	5	Rural Location	89.37	2.75	2.07	0.0408*
		FRL Percent	105.82	-0.19	-4.09	0.0001*
		ELL Percent	90.54	-0.02	-0.22	0.8259
		Male Percent	102.12	-0.22	-1.84	0.0693
		White Percent	86.42	0.11	5.21	< 0.0001*
		Black Percent	95.19	-0.10	-5.17	< 0.0001*
		Hispanic Percent	89.87	0.05	1.05	0.2957
		Other Percent	89.90	0.07	0.72	0.4761
		Attendance	79.32	11.49	0.15	0.8800
		Discipline Per Student	92.09	-4.21	-2.96	0.0038*

Table D1, Continued

Relationship between Other Variables and Student Achievement

Success Measure	Grade	Variable	Intercept	Estimate	t-Statistic	P Value
English Exceeds Percent	4	Rural Location	22.51	4.78	2.40	0.0181*
		FRL Percent	65.91	-0.51	-8.18	< 0.0001*
		ELL Percent	24.93	-0.06	-0.67	0.5043
		Male Percent	34.95	-0.21	-1.26	0.2111
		White Percent	16.60	0.21	7.14	< 0.0001*
		Black Percent	32.39	-0.17	-6.02	< 0.0001*
		Hispanic Percent	24.64	-0.02	-0.23	0.8157
		Other Percent	24.07	0.04	0.33	0.7383
		Attendance	136.09	-115.56	-0.98	0.3316
		Discipline Per Student	27.27	-8.19	-3.42	0.0009*
	5	Rural Location	24.69	5.90	2.89	0.0047*
		FRL Percent	65.24	-0.47	-7.42	< 0.0001*
		ELL Percent	26.88	0.02	0.15	0.8837
		Male Percent	37.30	-0.20	-1.02	0.3096
		White Percent	19.33	0.22	6.76	< 0.0001*
		Black Percent	35.54	-0.18	-6.18	< 0.0001*
		Hispanic Percent	26.49	0.04	0.59	0.5556
		Other Percent	25.98	0.12	0.85	0.3955
		Attendance	56.41	-30.44	-0.26	0.7989
		Discipline Per Student	29.67	-6.79	-3.06	0.0028*
Math Pass Percent	4	Rural Location	72.51	6.89	2.95	0.0039*
		FRL Percent	122.28	-0.58	-7.59	< 0.0001*
		ELL Percent	74.29	0.12	1.19	0.2354
		Male Percent	85.31	-0.20	-1.01	0.3168
		White Percent	65.23	0.28	8.04	< 0.0001*
		Black Percent	87.58	-0.26	-8.94	< 0.0001*
		Hispanic Percent	73.23	0.16	2.20	0.0303*
		Other Percent	75.66	-0.04	-0.26	0.7959
		Attendance	146.57	-73.77	-0.52	0.6024
		Discipline Per Student	77.36	-5.95	-2.02	0.0453*
	5	Rural Location	85.83	5.32	2.67	0.0088*
		FRL Percent	108.44	-0.25	-3.52	0.0006*
		ELL Percent	87.27	0.10	0.89	0.3780
		Male Percent	99.69	-0.23	-1.20	0.2312
		White Percent	81.73	0.17	5.27	< 0.0001*
		Black Percent	95.75	-0.16	-5.72	< 0.0001*
		Hispanic Percent	86.48	0.12	1.76	0.0813
		Other Percent	86.79	0.13	0.97	0.3341
		Attendance	74.12	14.26	0.12	0.9022
		Discipline Per Student	89.34	-3.65	-1.64	0.1036

Table D1, Continued

Relationship between Other Variables and Student Achievement

Success Measure	Grade	Variable	Intercept	Estimate	t-Statistic	P Value
Math Exceeds Percent	4	Rural Location	24.03	7.32	3.00	0.0033*
		FRL Percent	77.99	-0.63	-8.06	< 0.0001*
		ELL Percent	26.15	0.10	0.94	0.3472
		Male Percent	40.23	-0.26	-1.28	0.2042
		White Percent	16.61	0.28	7.87	< 0.0001*
		Black Percent	39.55	-0.27	-8.62	< 0.0001*
		Hispanic Percent	25.14	0.15	1.87	0.0645
		Other Percent	26.32	0.08	0.48	0.6309
		Attendance	80.40	-55.27	-0.37	0.7087
		Discipline Per Student	29.67	-7.75	-2.55	0.0121*
	5	Rural Location	28.38	6.81	2.41	0.0177*
		FRL Percent	64.39	-0.41	-4.14	0.0001*
		ELL Percent	28.61	0.39	2.46	0.0157*
		Male Percent	35.10	-0.08	-0.29	0.7701
		White Percent	20.85	0.29	6.49	< 0.0001*
		Black Percent	45.00	-0.29	-8.02	< 0.0001*
		Hispanic Percent	27.75	0.28	2.95	0.0039*
		Other Percent	27.84	0.39	2.01	0.0471*
		Attendance	75.50	-46.01	-0.28	0.7782
		Discipline Per Student	34.35	-8.41	-2.74	0.0071*
Reading Pass Percent	4	Rural Location	80.79	6.82	3.99	0.0001*
		FRL Percent	120.56	-0.46	-8.15	< 0.0001*
		ELL Percent	83.46	0.01	0.15	0.8823
		Male Percent	97.46	-0.28	-1.88	0.0630
		White Percent	75.14	0.23	9.60	< 0.0001*
		Black Percent	92.85	-0.20	-9.04	< 0.0001*
		Hispanic Percent	82.70	0.07	1.19	0.2384
		Other Percent	84.53	-0.11	-0.96	0.3370
		Attendance	222.77	-144.10	-1.37	0.1748
		Discipline Per Student	84.88	-3.83	-1.72	0.0876
	5	Rural Location	91.20	2.85	2.31	0.0229*
		FRL Percent	109.65	-0.21	-5.10	< 0.0001*
		ELL Percent	92.25	0.01	0.14	0.8926
		Male Percent	104.29	-0.23	-2.01	0.0466*
		White Percent	87.52	0.13	7.23	< 0.0001*
		Black Percent	97.91	-0.12	-7.05	< 0.0001*
		Hispanic Percent	91.64	0.06	1.34	0.1839
		Other Percent	92.05	0.03	0.37	0.7117
		Attendance	156.08	-65.98	-0.93	0.3540
		Discipline Per Student	94.04	-4.39	-3.33	0.0012*

Table D1, Continued

Relationship between Other Variables and Student Achievement

Success Measure	Grade	Variable	Intercept	Estimate	t-Statistic	P Value
Reading Exceeds Percent	4	Rural Location	24.54	6.86	3.29	0.0014*
		FRL Percent	78.28	-0.63	-10.49	< 0.0001*
		ELL Percent	27.75	-0.05	-0.55	0.5831
		Male Percent	45.21	-0.36	-2.03	0.0453*
		White Percent	16.98	0.28	10.10	< 0.0001*
		Black Percent	37.87	-0.23	-8.27	< 0.0001*
		Hispanic Percent	27.45	-0.01	-0.15	0.8808
		Other Percent	27.01	0.04	0.26	0.7978
		Attendance	125.16	-101.27	-0.80	0.4265
		Discipline Per Student	29.12	-5.22	-1.97	0.0514
	5	Rural Location	21.05	3.73	1.97	0.0513
		FRL Percent	62.16	-0.49	-9.26	< 0.0001*
		ELL Percent	22.28	0.04	0.33	0.7396
		Male Percent	40.74	-0.35	-2.02	0.0460*
		White Percent	14.57	0.22	8.29	< 0.0001*
		Black Percent	31.87	-0.19	-8.17	< 0.0001*
		Hispanic Percent	21.65	0.07	1.12	0.2643
		Other Percent	20.14	0.29	2.25	0.0264*
		Attendance	184.48	-167.58	-1.57	0.1197
		Discipline Per Student	24.83	-5.91	-2.92	0.0042*

An asterisk (*) indicates the variables that are significantly related to each CRCT success measure at $p = 0.05$.