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UTILIZATION OF THE USDA SUPERTRACKER SYSTEM IN HIGH SCHOOLS: A QUALITY IMPROVEMENT PROJECT

by

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Submitted in Partial Fulfillment of the Requirements

For the Degree of Doctor of Nursing Practice in

Nursing Practice

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2018

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DEDICATION

I dedicate this dissertation to my students as future health leaders prepared to institute change and improve nutritional education in our community. A special gratitude to my parents, Garland and Amy R. Huffman for supporting me through this endeavor. I am extremely blessed to have a mother who unselfishly sacrificed her time and displayed unconditional love.

A special thanks to my friend Dr. Tara Smalls; whom we have held hands on every nursing level. I am abundantly thankful to Dr. Neal for always believing in me; even when my spark is low. And most of all, thank you Kayla Adams and Health Science students for your endless support during the research process and dissertation preparation; for without you, this day would be impossible.

I am so thankful to the Addison, Huffman, and Ritter families for showing unrelentless love, support, and prayers. Most of all I dedicate this work to my late father, Gerald Addison, and my grandparents, Thomas and Louise Ritter, Rose Addison, and Freddie and Luellen Huffman; who would have been glorified to be a part of this momentous accomplishment.

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Dr. Deitra Watson, Dr. Jada Quinn, and Melissa Billie thank you all for taking the time to read my dissertation and encouraging me through this process. I am lavished with love from my family members and friends; Darrian, Jamia, Kenya, Asumpter, Lorene, Angela, Wendy, Nicole, Tierra, Tessey, and Taryll. I thankful to have encouraging friends, Andrea, Beyonka, Natasha, Teresa, Ericka, and Kelvin, to constantly push me through each writing phase.

But most of all, I grateful acknowledge my family of health care cheerleaders; my baby sister, Albany, and my two aunts, Claretha and Vernia; thanks for waving me to the finish line.

ABSTRACT

Obesity is a major chronic care condition proven to affect more than 12 million children and adolescents, age 2 to 19; categorizing approximately 17% of America's youth as obese or overweight. As a result, Congress established federal mandates targeting obesity by enforcing nutritional policies for cafeteria and competitive foods to enhance learning environments. Establishing federal nutritional guidelines in education allows more than 31 million children to receive meals at a free or low cost in more than 96,000 public and nonprofit private schools. As such, the purpose of this quality improvement project is to compare individual food choices with the National School Lunch Program (NSLP) and physical activity following an educational program on food choices and physical activity to high school students.

The John Hopkins Nursing Evidence-Based (JHNEBP) 18-step research model is utilized to establish practice change, search evidence, and translate action plans in a NSLP environment. Opportunities to improve current student nutritional practices are established by recruiting Wellness Committee members to monitor and evaluate meal consumption and physical activity behaviors; while conducting an internal and external search for evidence.

An extensive review of the literature is conducted to identify evidence-based practices that effect body mass index (BMI), dietary patterns and food choices, and physical activity levels to assist the researcher to establish strategies to improve nutrition and physical fitness. The intervention includes the implementation of an educational

program; using the USDA SuperTracker, journaling, and accurate recording of nutrition logs; to determine adherence and identify barriers.

The 4-week cross-sectional study is comprised of sample data that reveals participant's demographic information, BMI, food choices, physical activity level, and adherence to recording nutritional information during pre-and post-intervention. The sample population is assessed during the pre-and post-intervention phase of the study and included a total of 84 adolescents, age 14-17. The data shows 55.95 % of participants prefer to eat in the Cafeteria (n = 47) compared to 44.05% who like to eat in the Canteen (n = 37). There is no change in the pre-and post-intervention population and the dietary preferences remained the same. Comparable to the pre-intervention group, Week 4 data shows BMI and physical activity decreased 32% over time; totaling 27 participants not adhering to the recording requirements.

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CHAPTER 1

INTRODUCTION

According to the National Conference of State Legislatures (2014), obesity is a major chronic care condition affecting 17% of today's youth. More than 12 million children and adolescents, age 2 to 19, are obese and over 23 million are either obese or overweight (National Survey of Children's Health, 2014). Active Living Research (2015) confirms that one in three children in the United States are overweight or obese and 48% of high school students attend only one physical education class weekly.

The State of Obesity (2016), reports in 2013 that 13.9% of South Carolina's high school students are obese, ranking 10th of 52 states. Unintended by the No Child Left Behind Act (NCLB), the Institute of Medicine (2016) reports a decrease in physical activity time in public school curricula report approximately 50% of school administrators decrease time from physical education and recess to enhance reading and mathematical skills. Mandated by Congress, the United States Department of Agriculture Efforts (2015) provide enriched learning environments targeting obesity and providing nutritious meals by establishing the National School Lunch Program (NSLP); first authorized by the National School Lunch Act (NSLA) of 1946. Operating in more than 96,000 public and nonprofit private schools, the NSLP provides low cost and free lunches meeting nutritional standards to more than 31 million children daily (2015).

The purpose of the quality improvement project is to compare individual food choices with the National School Lunch Program and physical activity following an educational program on food choices and physical activity to high school students. Outcomes measured will include body mass index (BMI), physical activity level, and grade point averages (GPA) pre-and post-intervention among high school students.

Description of Clinical Problem

More than 15 million U.S. children live in food-insecure households by having limited access to adequate food and nutrition due to cost, vicinity, and resources (Coleman-Jensen et al., 2015). State of Obesity Report (2016) declares unhealthy diets containing low nutritional value and insufficient food decreases academic performance and limits the brain's ability to perform properly. Contributing factors that increase the risk of obesity, as evidenced by the State of Obesity Report (2016) are as follows:

- Cycle of food deprivation and overindulgence.
- Meal restrictions due to lack of funding.
- Increase levels of anxiety.
- Limited access to safe, convenient locations for physical activity engagements.

United States Department of Agriculture (2014) proposed schools ensure policies meet minimum standards supporting environments that promote nutrition and student health. According to the Center for Disease Control and Prevention (2017), the Youth Risk Behavior Surveillance System examines dietary behaviors and physical activity of high school students:

- 5.2% of high school students report not eating fruit or drinking 100% fruit juice; 6.8% report not eating vegetables.

- One in five (20.4%) students drink one or more can, bottle or glass of soda per day, which is a 39.6% decrease from rates in 2007 (33.8%).
- 13% drink two or more soda servings per day and 7.1% drink three or more. The question did not include energy or other added-sugar drinks.
- 13.8% of students do not eat breakfast regularly.
- 72.9% of students do not engage in at least 60 minutes of physical activity seven days of the week.
- 41.7% of students play video or computer games three or more hours a day; which is an 88.7% increase from 2003 (22.1%) and television viewing dropping by 35.5%; decreasing from 38.2% to 24.7%.

Food Access Research Atlas reports less access to supermarkets and nutritious, fresh foods in many urban and lower-income neighborhoods heavily marketing less healthy items at the point-of purchase (USDA, 2017). Ver Ploeg et al. (2012) confirms more than 29 million Americans live in “food deserts”; living within miles of supermarket or supercenter in an urban area or within 10 miles in a rural area; causing a challenge to access healthy, affordable food. Patlak et al. (2013) asserts greater accessibility to supermarkets consistently linked to lower rates of overweight and obesity.

Educators and health care professionals must assess parental knowledge and values to understand the commitment level of students. Brown et al. (2008) proclaims that access to nutritious food, particularly breakfast, reduces obesity in children, as well as enhance student’s psychosocial well-being, reduce aggression and school suspensions, and decrease discipline problems overall. Hesketh et al. (2014) attests the more inactive the mother, the more inactive the child, and the more physically active the mother, the

more physically active the child early in life. According to National Survey of Children's Health (2012), 55.8% of South Carolina's mothers have established and maintained Excellent or very good physical and emotional health.

The State of Obesity Report (2016) proclaims that disadvantaged individuals are at risk for food insecurity and obesity. South Carolina's Obesity Burden Report shows evidence of overweight and obese high school students (SCDHEC, 2011). In the report, the South Carolina Department of Health and Environmental Control (2011) report 9.6% of South Carolina high school students are either overweight or obese, showing males (32.3%) more likely to be overweight or obese than females (26.8%). Of the 16.3% of overweight students, the female population (18.4%) is greater than the male (14.3%); showing the percentage of Blacks (23.4%) is greater than Whites (12.6%) (SCDHEC, 2011). Of the 13.3% of obese students, the male population (18%) is greater than the female (8.4%); showing the percentage of Blacks (17.6%) is greater than White (9.9%) (2011).

South Carolina Department of Health and Environmental Control (2013) reports 80,929 adolescents resides in Richland County; 18.2% are overweight and 21.1% are obese and contributes to the $509,633,531 total estimated physical inactivity in county cost. The South Carolina State Nutrition, Physical Activity, and Obesity Profile show 15% of adolescents are overweight and 16.7% are obese (CDC, Division of Adolescent and School Health, 2017). County Health Ranking (2016) indicates that 22% of children (under age 18) residing in 9.1% of rural Richland County homes live in poverty with a 6% unemployment rate, 44% live in single parent households, and 18% have food security.

Characteristics of residential neighborhoods have profound health effects ranging from conditioning the type and amount of exercise undertaken and food consumed by residents (Davidson, 2014). According to the National Survey of Children's Health (2012):

- 81.5% of South Carolina's children live in supportive neighborhoods.
- 86.7% of children usually or always feel safe in neighborhoods.
- 35.3% live in neighborhoods that include parks, sidewalks, libraries, and community centers.
- 14.1% of South Carolina's children, ages 6 to 17, engage in four or more weekday hours of screen time, including television, videos, and video games.
- Due to developmental transitions, adolescents and young adults are sensitive to environmental influences (USDHHS, 2014).
- County Health Rankings (2016) reports 18% of Richland County residents live in homes with severe housing problems and 12.5% affected by air pollution.
- Low-income minorities in Richland County spend more time traveling to work requiring the use of public transit systems and carpooling than low-income whites, who have private vehicles (2014).
- County Health Rankings reports 79% of Richland County residents use public transit for work commute and 27% for long commute (2016).

Scope of the Problem

Academic Achievement. Rappaport et al. (2011) asserts negative relationships between school attendance and academic performance; proving that obese students are at the highest risk for absenteeism, requiring school professionals to pay attention and

develop approaches to maintain regular attendance. Further research by Callahan (2013) shows obese students being less able to complete assignments involving prolonged physical exertion than physically fit students.

According to the State of Obesity (2016), children who are overweight or obese have lower academic achievement than those who are non-overweight or non-obese as evidenced by:

- Poor math scores as early as the first grade.
- Lower intelligence scores in math and spelling.
- Decrease mental flexibility and attention span.
- Nutrient content deficiencies; Vitamins A, B6, B12, C, folate, iron, and zinc.
- Negatively impact cognitive performance and grades.
- Increase absenteeism and tardiness.
- Inability to focus in the classroom.
- Lack of physical activity lowers cognitive skills, attitudes, and academic behavior.

Healthcare Expenditures and Visits. Obesity is a major risk factor leading to other chronic health conditions in youth, such as diabetes and hypertension, totaling $147 billion annually in the United States in estimated health care costs; with $60 billion funded by taxpayers through Medicare and Medicaid (NCSL, 2016). The Department of Health and Environmental Control (2013) shows South Carolina and Richland County singly estimates $500 million in annual medical expenditures due to physical inactivity. Finkelstein et al. (2008) claim annual obesity-attributable medical cost per overweight child an estimated at $240; children ages 8 to 13 years old; and $320; children ages 14 to 19 years old. The American Diabetes Association's (2008) research concluded

approximately 208,000 diabetic children and young adults; ages 2 to 20; and two million pre-diabetic teens; ages 12 to 19; living in the United States. Dabelea (2014) discovered the rate of type 2 diabetes among children and youth (ages 0 to 19) have increased by more than 30% since 2001.

Private insurance coverage for obese children is over three times greater than all children combined who are covered by private insurance companies (Trasande & Chatterjee, 2009). Trasande & Chatterjee (2009) conferred that the average total annual health cost for a child treated for obesity under private insurance is $3,743, while the average health cost for all children covered by private insurance is $1,108; the difference is $2,635. Overweight and obesity during childhood is associated with $14.1 billion in additional prescription drug, emergency room and outpatient healthcare costs annually (Trasande & Chatterjee, 2009). Based on a Medical Expenditure Panel, Trasande and Chatterjee (2009) surveyed obese children for two consecutive years, finding $194 increase in outpatient visit expenditure, $114 greater prescription drug expenditure, and $12 rise in emergency room expenditure compared to a normal or underweight child during the same two years.

Physical Outcomes. Obese children and teenagers are at greater risk for developing serious chronic diseases such as dental health issues, type 2 diabetes, heart disease, hypertension, asthma, sleep apnea, and reproductive complications (NCSL, 2016). Increased extracurricular activity improves classroom behavior and self-esteem, lower dropout rates and indirectly enhanced academic achievement (Story et al., 2009). The National Conference of State Legislatures (2016) corroborates 70% likelihood that overweight adolescents will become overweight or obese as adults.

Psychosocial Outcomes. Obesity Association Coalition (2016) attests that overweight and obese children are victimized because of their weight; more vulnerable to depression, anxiety, lower self-esteem, and poor body image. Research confirms that obese youth victimized by peers are two to three times more likely to engage in suicidal thoughts and behaviors (2016). Others report that obese children experience stigma and discrimination in multiple domains of living, including the workplace, health care facilities, educational institutions, social media, and even in close interpersonal relationships (Puhl & Heuer, 2010). As also shown by Yau et al. (2012), significantly lower intelligence scores in math and spelling, lower mental flexibility and attention spans are observed in adolescents with metabolic syndrome.

Special Populations. Abeysekara et al. (2014) confirm high prevalence of childhood obesity especially in children and youth with special healthcare needs. World Health Organization (2010) claim that one of the main reasons for increased vulnerability to obesity in high school aged children with disabilities is physical inactivity, such as pregnancy, substance use, violent behavior, and sexual identity.

Barriers. Physical activity barriers include facility restrictions, lack of understanding from employers and teachers regarding their physical activity capabilities, as well as financial and time constraints with family (WHO, 2010). Gatepath (2016) confirms people with disability often experience decreased physical levels, motor deficiencies, lacking motivation, withdrawal, physical disabilities and various other health issues, that require medication, which can cause weight gain.

Farhat et al. (2010) further emphasize the association between overweight and obesity with substance use among girls and violent behavior among boys:

- 22.5% of children with disabilities are obese compared to 16% of children without disability. The problem pronounced among girls than boys (NHANES as cited in Gatepath, 2016).
- 20% of women in the United States who gave birth in their teenage years are likely to be overweight or obese than women who first gave birth at older ages (Chang et al., 2013).
- Smoking and drinking is associated with younger overweight and obese girls when compared to older girls (Farhat et al., 2010).
- Smoking and cannabis use is associated with overweight younger girls only (Farhat et al., 2010).
- Younger obese boys are likely to become victims of bullying and older obese boys are likely to carry weapons, when compared to boys of normal weight (Farhat et al., 2010).
- Lesbian and bisexual females are likely to be overweight or obese (Struble et al., 2010).

Dietary Factors. Children frequently exposed to high-calorie foods can easily have an increase in weight gain, especially if their intake is from fast food restaurants, baked sweets, and vending machine snacks that consist of soft drinks, candy and desserts. According to the OAC (2016), approximately 40 to 50% of every dollar spent on food outside the home, restaurants, cafeterias, and sporting events; where people consume larger quantities of food and calories.

The 2010 South Carolina School Health Profiles assessed the school environment, indicating that among high schools (CDC, 2012):

- 28.8% did not sell less nutritious foods and beverages anywhere outside the school food service program.
- 14.7% always offered fruits or non-fried vegetables in vending machines and school stores, canteens, or snack bars, and during celebrations whenever foods and beverages are offered.
- 46.6% prohibited all forms of advertising and promotion of candy, fast food restaurants, or soft drinks in all locations.

Although the NSLP guidelines are established, there are restrictions experienced in some schools limiting the consumption of nutritious meals. Alliances for a Healthier Generation (2016) describe challenges that occur when serving healthy meals based on satisfaction, access, and parental guidance. Final decisions are based on recommendations of district and school level administrators as well as board members, nutrition and service staff members in order to provide the best solutions for the school meals (Nemours, 2014).

The Food Research and Action Center (2015) has made significant strides to include healthier items, but is restrained by inadequate incentives for the promotion of good nutrition and limited to provide fresh produce from local vendors:

- **Participation.** School meals are rarely subsidized with district funds and must sell themselves; as the amount of student meals increase, the more money food service managers have to meet program needs.
- **Pressure to serve appealing meals.** Food service managers want to ensure serving meals pleasing to students, leading to increase healthy food consumption and decrease unnecessary waste.

- **Decrease food waste.** Feeling as if students are less likely to buy healthier meals, food service managers are hesitant to incorporate changes.
- **Competitive foods.** Less nutritious “a la carte” items sold in the cafeteria by food services in addition to federally reimbursable meals; in which the revenue does not return to the school meal program.

In 2010, Congressional Legislation updated standards for “competitive foods”; food and beverage items sold in schools that are not part of the United States Department of Agriculture (USDA) School Meal Programs; ensuring that all foods sold in schools participate in the NSLP should promote healthy diets (USDA, 2015). Required wellness policies for participating districts allowed opportunity for schools to address obesity and promote healthy eating and physical activity through changes in school environments (FRAC, 2015).

The Food Research and Action Center (2015) proclaims that the NSLP provides school children with one-third or more of their Recommended Dietary Allowance (RDA) for key nutrients; no more than 30% of calories from fat and less than 10% from saturated fat. Food sales that do not meet the federal school nutrition requirements, including à la carte’ sales in the cafeteria and vending machines; such as snacks and beverage, which are in direct competition with the school meal programs for students; are considered competitive foods (2015)**.**

As of January 2012, the USDA issued new nutritional standards for school meals under the Food Research and Action Center (FRAC) recommendations to eradicate poverty-related hunger (2015):

- Increase the amount of fruits and vegetables served, emphasize whole grain-rich foods, require only low fat and nonfat milk, limit calories, and reduce saturated fats and sodium.
- Require implementation of school lunch standards in all schools; starting 2012-2013.
- Implement a three-year phase in of school breakfast standards.
- Allow "offer versus serve" fruit and vegetable serving options, which are consistent with the Institute of Medicine recommendations.
- Improve cultural food options, by allowing tofu to qualify as a meat alternate.

In June 2013, the USDA issued the "Smart Snacks in School" rule which (FRAC, 2015):

- Set limits on calories, fats, sugar, and sodium and encourage the consumption of dairy, whole grains, protein, fruits, and vegetables.
- Stipulate that all snack foods sold in school must be "whole grain-rich" (50% whole grains), have whole grains as the first ingredient, or have as the first ingredient a fruit, a vegetable, a dairy product, or a protein-rich food.

THEORETICAL FRAMEWORK

Discussion of Practice Innovation

Alliances for a Healthier Generation Model

Currently local schools are implementing the federal standards for school wellness policy. Lead by the Superintendent and Student Nutrition Director according to the Healthy, Hunger-Free Kids Act of 2010, the district utilize the Alliance for a

Healthier Generation (AHG) Model; awarded Healthy Schools Program Bronze-level for best practice standards (2016). AHG Model is comprised of a 6 Step Process (as shown in Figure 1.1), where schools continuously take a status check, work on making improvements, learn from success and challenges, and keep pushing forward (AHG, 2016):

- Builds Support
- Assess Schools
- Develop Action Plans
- Explore Resources
- Take Action
- Celebrate Success

Figure 1.1. Adapted from Alliances for a Healthier Generation Model (2016).

When schools repeat the cycle each year, their healthy changes embed in the culture of the school and efforts to become a healthy school sustained (AHG, 2016). Developing a wellness policy transforms the model to highlight the following five categories with 28 functioning components:

- School Wellness Committee
- Wellness Policy Implementation, Monitoring, Accountability and Community Engagement
- Nutrition
- Physical Activity
- Other Activities that Promote Student Wellness

Johns Hopkins Nursing Evidence-Based Model

The prevalence of obesity and overweight has increased dramatically in the United States and contributing to high costs, health, social, and economics (ERS, 2017). Previous alarming data show South Carolina's high school students in the County are at risk of obesity and chronic medical conditions. Johns Hopkins Nursing Evidence-Based Practice (JHNEBP) model is warranted due to its problem-solving approach, which guides clinical, educational, and administrative decisions that combines the best available scientific and practical evidence (JHM, 2017).

JHNEBP (2017) outlines the following three categories to incorporate the use of the 18-step research design stimulating healthcare change (as shown in Figure 1.2):

- Practice
- Evidence
- Translation

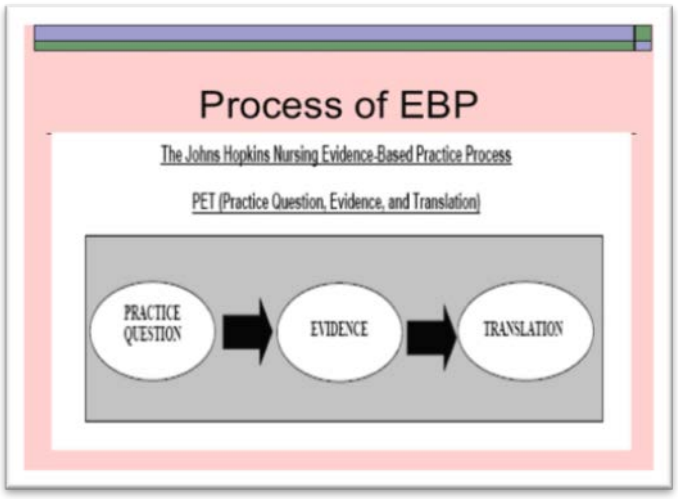

Figure 1.2 Adapted from Johns Hopkins Medicine Evidence-based Practice (2017).

The Johns Hopkins Nursing Evidence-Based (JHNEBP) model and tools are used to advance the DNP to expand leadership skills to appraise scholarly research and apply methods to clinical practice. Figure 1.3 shows how the triangular framework employs education and research as the foundation of practice (JHM, 2017). The APN view external factors; such as accreditation, legislation, quality measures, regulations, and standards; are driven by research whereas internal factors; culture, environment, staffing, and standards are propelled by education (JHM, 2017). The model is designed to meet the practicing nurse's need by ensuring that the latest research findings and best practices are incorporated into patient care (JHM, 2017).

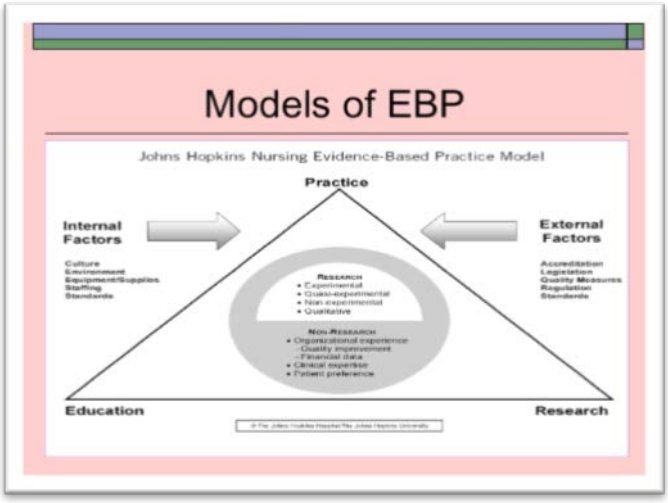

Figure 1.3 Adapted from Johns Hopkins Medicine Evidence-based Practice (2017).

Statement of Purpose

The purpose of the quality improvement project is to compare individual food choices with the National School Lunch Program and physical activity following an educational program on food choices and physical activity to high school students. Outcomes include body mass index (BMI), physical activity level, food choices, and adherence to recording nutritional content during pre-and post-intervention among high school students.

The prevalence of obesity and overweight has increased dramatically in the United States and contributing to high costs, health, social, and economics (USDHHS, 2017). Evidence-based research is used to examine the cause of adolescent obesity, identify potential solutions, and propose interventions outlined by the district's Coordinated School Health Advisory Council (CSHAC) and Student Nutrition Services (SNS) Wellness Committee. The JHNEBP guides the DNP to addressed growing public health concerns of adolescent obesity rates in NSLP participating schools (USDHHS, 2017):

PRACTICE

Step 1. The School Wellness Committee (SWC) recruited an inter-professional team consisting of three physical education teachers, two health education teachers, one nutrition teacher, one science teacher, one medical doctor, two administrators, and the DNP. Most of the members have a dual role in the school setting; where they teach physical education and health education, coach, or have an administrative position.

The APN applies the JHNEBP Practice Question, Evidence, and Translation ([PET] Appendix A) to direct the EBP team. To develop evidence-based questions that require scholarly justification and practice translation.

Practice Question

Step 2: The JHNEBP is applied to develop and refine the EBP question using related keywords. The EBP team focuses on the problem of adolescent obesity and current practice strategies of the National School Lunch Program (NSLP) and physical activity guidelines. The EBP Team derived two burning questions of interest:

- Are NSLP cafeteria student's BMI lower than canteen students?
- Do students who make healthier food choices adhere and engage in more physical activity?

The State of Obesity (2016) reports that environmental factors of school-based programs focus to enhance nutritional quality of foods available in schools, improve the duration and quality of physical education, increase physical activity before, during, and after school as well as build evidence-based wellness programs. Multiple studies are investigated to determine the influences of dietary patterns and physical activity.

Step 3: The scope of the EBP question is defined by the SWC closely analyzing related articles are selected by committee consensus opinion for review and ranking. A final full text list is then used by the SWC Team for review and ranking to identify the best available evidence to answer the PICOT question (as shown in Figure 1.4).

PICOT Question

What are the mean differences in pre-and post-intervention BMI, dietary preferences, physical activity, and recording adherence among students enrolled in the NSLP?

P Population	I Intervention	C Comparison	O Outcome	T Time
High school students, age 14 to 18	Dietary preferences and physical activity educational program	Personal dietary preferences for Canteen vs. NSLP usage	Canteen/NSLP usage as measured by: a. BMI b. Dietary preferences c. Physical Activity Level as measured by USDA SuperTracker d. Daily adherence to recording nutritional intake and activity	4 wks

Figure 1.4 DNP Project PICOT Question.

Stakeholders

The SWC identified the following groups as stakeholders in this research: University of South Carolina College of Nursing, district research committee, district and school level administration, nutrition services, athletic department, parents, teachers, and students.

Definitions

- **Adolescent:** Children ages 12 to 19 (CDC, 2017).
- **Body Mass Index (BMI):** A number calculated by dividing a person's weight in kilograms by his or her height in meters squared; which is used to determine obesity (OAC, 2016).
- **Canteen:** School approved foods or fundraiser items purchased outside of the cafeteria that meets the USDA Guidelines.
- **Logged Food:** Recording of food and drink for breakfast, lunch, dinner, and snack.
- **MyPlate:** USDA food patterns for the 2010 Dietary Guidelines for Americans; a colorful visual representing the five food groups (USDA, 2017).
- **National School Lunch Program (NLSP):** Nation's second largest food and nutrition assistance program; approved by the USDA (ERS, 2017).
- **Nutrition Lessons:** Designed to encourage high school students to build healthier meals and increase physical activity using the SuperTracker interactive tool (USDA, 2017).
- **Obesity:** A child is defined as "affected by obesity" if their body mass index-for-age (or BMI-for-age) percentile is greater than 95%, categorized as a body mass index (BMI) of 35 or greater (OAC, 2016).
- **Overweight:** A child is defined as "overweight" if their BMI-for-age percentile is greater than 85% and less than 95%, categorized as a body mass index (BMI) of 30 or greater (OAC, 2016).
- **Personal Food Choices:** High calorie, carbohydrate, sugar foods and drinks with no limitations.

- **Physical Activity (PA):** Exercise activity regimens as outline by the CDC (2015):

  Moderate Intensity and Muscle Strengthening-

  150 minutes of moderate-intense aerobic activity; 2 days of muscle strengthening

  Vigorous Intensity and Muscle Strengthening-

  75 minutes of vigorous-intense aerobic activity; 2 days of muscle-strengthening

  Mixture of Moderate & Vigorous Intensity and Muscle Strengthening-

  Equivalent of 150 minutes of moderate-intensity aerobic activity;

  2 days of muscle-strengthening activity
- **School Breakfast Program (SBP):** Provides nutritious meals to students at participating schools; USDA approved (ERS, 2017).
- **Subject:** High school students; working to meet South Carolina graduation requirements, grades 9 to 12; age 14 to 18 (SDE, 2017).
- **SuperTracker:** United States Department of Agriculture's food, physical activity, and weight tracking tool (USDA, 2017).

Assumptions

There are many misconceptions for the cause of obesity among adolescents (Cohen, Richardson, Austin, Economos, & Rimm, 2013). The Obesity Action Coalition (2016) suggests various forms of weight and peer stigmatization based on assumptions for obese students:

- Lack academic achievement and are often dismissed from school (Obesity Action Coalition, 2016).
- Parental socioeconomic factors are important in predicting both a lower school performance and overweight among children (Veldwijk et al., 2012).

- Obesity is prevalent among United States adolescents of low-income families because excess calories often come from nutrient-poor sources (Cohen, Richardson, Austin, Economos, & Rimm, 2013).
- Poor dietary intake and physical inactivity induce overweight and reduce school performance (Veldwijk et al., 2012).
- Increased weight is caused by factors within personal control such as overeating and lack of exercise (Puhl & Heuer, 2010).
- Increase weight gain may occur because students do not consume enough school lunch, leave school hungry, and search for replacement calories from calorie dense, high salt and/or sugary snacks and drinks at fast food establishments and corner stores (Cohen, Richardson, Austin, Economos, & Rimm, 2013).
- Overweight and obese children suffer more often from physical health problems, which may influence school performances due to increased school absences (Veldwijk et al., 2012).

Step 4: Project leadership and responsibility is determined by the SWC who delegated the DNP to oversee Operation F.L.A.S.H. and orient members to ensure university objectives are met. The School Wellness Team Leader (SWTL) work collaboratively to adhere to district initiatives and requirements are met.

Step 5: The SWC team schedule team meetings in each phase of the JHNEBP model as outlined in the PET Management Guide (Appendix A). In the Practice phase, the SWC will meet biweekly from August to November. During the Evidence Search, an internal review of literature is conducted by the EBP team from September to November.

Team meetings increased to weekly during Translation (Spring Semester) due to the implementation of the SuperTracker action plan; which requires frequent monitoring, evaluation, and feedback to participants (Appendix A).

CHAPTER SUMMARY

Obesity is a major chronic health condition, ranking South Carolina's high school students 10th of 52 states by the State of Obesity (2016). The NCLB Act delegated public schools to enrich basic skills in reading and mathematics, which forced officials to reduce physical activity in the daily curriculum (IOM, 2016). As a result, the United States Department of Agriculture (2015) are required to provide learning environments targeting obesity in more than 96,000 public and nonprofit private schools and provides low cost or free lunches to meet nutritional standards to more than 31 million children.

Children with access to nutritious food, especially breakfast, have a lower likelihood of obesity; which enhances their psychosocial health, lowers aggression and school suspensions, and reduces discipline (Brown et al., 2008). The Food Access Research Atlas (2017) shows there is a heavy market of unhealthy items and decrease access to supermarkets and nutritious, fresh foods in urban and lower-income neighborhoods. Trust for America's Health (2016) confirms that South Carolinian's daily fruit (11.6%) and vegetable (6.8%) consumption cause an increase of obesity among high school students, including the special populations with academic disadvantages, physical disorders, and psychosocial illnesses.

Alliance's Healthy Schools Program (2016) sustains healthy change in schools proving positive impact on student health. Focusing on the NSLP, the advanced practice

nurse (APN) can monitor and apply evidence-based practice measures in the high school setting. Surveying and educating students, the APN provide government officials, school administrators, and parents with informative facts to promote exercise and nutrition, which are optimal for brain function, cognitive development, positive social behaviors, and energy to carry out school and educational activities.

Alliance for a Healthier Generation (AHG) Model (2016) creates healthy environments where students, particularly disadvantaged, can learn and flourish. Transforming the district's Coordinated School Health Advisory Council (CSHAC) policies, the APN will spearhead the School Wellness Committee (SWC) while developing a scholarly project. Employing the JHNEBP model, the APN initiates leadership in the first five of the 18-step framework to develop the EBP question, establish SWC responsibilities, and develop meeting schedule designed to focus on adolescent obesity, identify potential solutions, and propose interventions.

CHAPTER 2

LITERATURE REVIEW

In 2010, Congressional Legislation updated standards for “competitive foods”; food and beverage items sold in schools that are not part of the United States Department of Agriculture (USDA) School Meal Programs; ensuring that all foods sold in schools participate in the NSLP should promote healthy diets (USDA, 2015). Over the past decade, school-based efforts have focused on improving the nutritional quality of food available in schools, improving the duration and quality of physical education, increasing opportunities for physical activity before, during and after school, and building evidence-based wellness programs (State of Obesity, 2016). Multiple studies have proven that schools play a critical role in improving dietary and physical activity behaviors of children and adolescents by creating supportive learning environments of healthy eating, physical activity, and opportunities for students to learn and practice behaviors (CDC, 2017).

The associations between psychosocial and physical factors are the concentrated themes of research related to obesity. Studies have shown multiple dynamics in childhood and adolescent populations such as culture, household income, food insecurity, dietary habits, environmental stimuli, and activity levels, which significantly influence obesity. Home environments and familial eating patterns are essential components of a child's diet that effect their personal eating habits and accessibility to food (Torres, et al., 2014).

The purpose of the quality improvement project is to compare individual food choices, activity level, and BMI in pre-and post-educational program on food choices and physical activity to high school students. Outcomes measured will include body mass index (BMI), physical activity level, and food choices pre-and post-intervention among high school students. The objective of this chapter is to present the appraisal and synthesis of the literature on healthy behavior choices (school lunch and exercise) and BMI.

EVIDENCE

Step 6: An investigation of evidence is conducted internally and externally. An internal search shows the DNP as an expert in patient care and nutrition education by spearheading team members to pilot school observation initiatives and incorporate evaluation processes using the USDA SuperTracker online system. An external search shows the DNP as being knowledgeable of data mining through various database systems to retrieve scholarly journals for review and summarization. The DNP utilizes Education Resources Information Center (ERIC) and PubMed databases to retrieve information, which allows easy access to educational and medical journal articles.

When applying the ERIC and PubMed database, the key terms “academic achievement”, “adolescents”, “at-risk students”, “body mass index”, “physical fitness”, “cafeteria”, “childhood obesity”, “cognition”, “cognitive ability”, “cognitive development”, “competitive foods”, “culture”, “dietary intake”, “National School Lunch Program”, “physical activity”, “school environment”, “School Breakfast Program”, “school meals”, and “school performance.” Utilization of articles allows a thorough review of literature to create a framework involving physical activity and nutrition as it relates to childhood obesity in disadvantage population, dietary patterns, and memory.

All evidence is reviewed independently for applicability by at least two experienced EBP project leaders. PubMed and Education Resources Information Center (ERIC) databases are accessed through the University of South Carolina Thomas Cooper Library external intranet services to retrieve professional journal articles to investigate prior research data from 2008 to 2017.

Step 7: The DNP lead the SWC in the appraisal of scholarly literature, where five articles synthesized at Level II; four rating high and one good for quality. Four studies analyzed at Level IV; showing a quality rating of two high and two good. One study is evaluated at Level V; rating high for overall quality.

Step 8: The JHNEBP Individual Evidence Summary Tool (Appendix B) is used to summarize studies that focus on internal and external various factors that affect BMI, dietary patterns, and physical activity. The DNP understands that student nutrition and fitness are greatly affected by academic performance and memory and the benefits of implementing NSLP has advantages of preparing a visually, healthy school environment.

Studies Examining Dietary Patterns

In a quality improvement study, Bhatia, Jones & Reicker (2011) evaluated the nutrition program and finances of potential discriminatory effects of competitive foods and stigma in San Francisco Unified School District (SFUSD). Researchers launched this study involving 2,579 low-income students enrolled in one middle and two high schools offering the National School Lunch Program and competitive a` la carte' lunch alternatives.

Researchers implemented a point-of-service payment system at all school locations to improve fiscal accountability and protect low-income students' identity.

Interventions include alternating services, storage areas, and food handling equipment, training food service personnel, and engaging students through taste testing and surveys (Bhatia et al., 2011). School reimbursements are reported to the California Department of Education showing that qualified students eating free lunch ranged from 31% to 60% at the intervention sites (Bhatia et al., 2011). Among nonqualified students, 3% to 30% participated in the lunch program, with the highest participation at the middle school (Bhatia et al., 2011). Students eating à la carte meals varied substantially less than the number in the NSLP lines at all sites; because all students paid cash, qualified students purchasing à la carte meals could not be enumerated (Bhatia et al., 2011).

As a result, eliminating à la carte' options and integrating all meal offerings and service areas within the NSLP daily participation of qualified students eating the NSLP lunch increased substantially at one high school but decreased modestly at the other two sites; 21% to 58% (Bhatia et al., 2011). Specifically, the National School Lunch Program's participation decreased from 56% to 12% at Middle X, increased from 3% to 230% at High School X, and increased from 19% to 63% at High School XX, free lunch participants increased 13% at Middle X, 41% at High School X, and 73% at High School XX (Bhatia et al., 2011). Among students who qualified for reduced-price meals, participation increased by 23%, 38%, and 154%, respectively, at the three sites (Bhatia et al., 2011).

The major strength of the point-of-service study is to track the average daily participation in the meal program disaggregated by the student's NSLP subsidy status; free, reduced price, or paid; before and after integration (Bhatia et al., 2011). Daily participation is recorded through the point-of-service system and reported to and

reimbursed from the state department of education (Bhatia et al., 2011). Research limitations in the NSLP lunch environments, minimize identification of low-income participants, and students' perceptions of stigma or motives for NSLP (Bhatia et al., 2011). The effects of competitive foods on NSLP participation would increase among qualified students (Bhatia et al., 2011). Limited evidence suggests that NSLP lunch environments may allow identification of low-income participants. The presence of competitive food is considered, which led to situations causing stigmatization of students, such as segregated school meal services (Bhatia et al., 2011).

School districts should proactively identify sources of barriers to participation and include anti-discriminatory provisions in school wellness policies (Bhatia et al., 2011). Further work is suggested to increase the diversity of alternatives offered under the NSLP and reduced wait times related to increasing the points of service, which may also have independently increased demand for the NSLP option (Bhatia et al., 2011).

Researchers concluded that additional support is needed to modify public health and educational policy to encourage a physically active lifestyle in children (Bhatia et al., 2011). Higher cognitive control, observed in higher-fit children, enhances skills needed inside and outside the classroom (Bhatia et al., 2011). Children with higher cognitive control show increase selective attention, inhibition of inappropriate or interfering responses, flexible thinking, and maintenance of information in working memory (Bhatia et al., 2011). The overall study results suggest that aerobic fitness and specific brain volumes are associated with cognitive health at the initial time of fitness testing as well as play a role in future cognitive performance (Bhatia et al., 2011).

The non-intervention study is delivered by several investigators and no inter-rate reliability is reported. The evidence is graded as level V and of high quality.

In comparison, a qualitative study by Cullen & Chen (2017), at the National Center for Health Statistics of the Centers for Disease Control and Prevention, utilized the National Health and Nutrition Examination Survey (NHANES) to evaluate dietary intake using a multi-pass method. The SBP and NSLP provides free or reduce price meals to eligible children in the United States; showing low socioeconomic status children consuming both meals to provide 58% of their daily intake at school (Cullen & Chen, 2017). Researchers evaluated 7,800 participants, ages 5 to 18, reporting 3,883 eating breakfast or lunch on a weekday and 1,035 only eating the NSLP meal (Cullen & Chen, 2017). Participant's data included NHANES 24-hour dietary intake, monthly poverty level determination, measuring height and weight, and body mass calculation (Cullen & Chen, 2017).

As a result, 448 students reported eating both a SBP and NSLP meal on the day of the recall (Cullen & Chen, 2017). The findings showed 64% are in elementary school; 57% male, 30% Hispanic, 32% non-Hispanic Black, and 33% non-Hispanic White and approximately 82% classified as low income, 59% normal weight, 16% overweight, and 17% obese (Cullen & Chen, 2017). The mean breakfast intake did not meet the federal breakfast pattern; accounting for 21% of the daily energy intake, less than 0.50 cup of fruit, or 100% fruit juice is consumed, and approximately 70% of the dairy products (Cullen & Chen, 2017). Only 27% of daily energy intake is disbursed from the school lunch meal with low vegetable and protein consumption (Cullen & Chen, 2017). The

NSLP and SBP meals supplies almost one-half of the energy intake (47%), which includes the major food groups (40.6%).

Major strengths of the study are application of NHANES data and 24-hour dietary intake collection of student information with multiple pass systems (Cullen & Chen, 2017). Providing the opportunity to select more fruits and vegetables during meals may increase student fruit and vegetable consumption (Cullen & Chen, 2017). Researchers suggest evaluating the impact of new school meal patterns on school dietary intake to include a 24-hour recall is an important area for future study (Cullen & Chen, 2017). Research limitations show NHANES data did not directly identify whether foods are obtained from the school meal program, but defined by eating occasion, place, food source, and day of week as reported by each participant (Cullen & Chen, 2017). The measurement errors are associated with self-reported dietary intake. Only 5.7% of the NHANES child participants consumed both a school breakfast and lunch on the recall day and 57% are male, reducing generalizability (Cullen & Chen, 2017).

The authors concluded that the study contributes data for the SBP and NSLP meals on the daily dietary intake of children in the United States; prior to implementing new meal patterns (Cullen & Chen, 2017). As a nutrition safety net for low income children, the school lunch program is the second largest US food assistance program (Congressional Budget Office, 2015; Governmental Accountability Office, 2014). Further research is suggested by continued assessment of federal meal programs that focus on children's dietary intake (Cullen & Chen, 2017).

The non-intervention study is delivered by several investigators and no inter-rate reliability is reported. The evidence is graded as level III and of good quality.

Studies Examining Dietary Patterns, Physical Activity, & BMI

In a multiple regression study, Li and Hooker (2010) determined the effects and probability of obesity (BMI) by randomly selecting children from a sample of 62,880 from different households; ages 6 to 17. Researchers examined the significant effects of BMI for children from households eligible for the NSLP and SBP attending public schools relating socioeconomic, schools, households, and environmental variables that affect children's BMI and likelihood of being overweight (Li & Hooker, 2010).

In lower socioeconomic status (SES) households, school types do not have a significant effect on the probability of being overweight (Li & Hooker, 2010). Children attending public school, BMI value is 0.398 higher average than children attending private school (Li & Hooker, 2010). Eligible children for the NSLP or SBP have a BMI 0.41 higher than children ineligible (Li & Hooker, 2010). Children with employed parents or caregiver are associated with 0.294 decrease in BMI (Li & Hooker, 2010).

Parents with a high school education are associated with an average reduction in BMI of 0.517 compared to children whose parents' education level is lower than high school (Li & Hooker, 2010). Parents with college and above education level are linked to a 1.279 reduction in the child's BMI value (Li & Hooker, 2010). Households where Spanish is the primary language, the mean value of BMI is 0.680 higher than in corresponding households where English is the primary language (Li & Hooker, 2010).

Children of physically active parents have mean BMI values 0.199 lower than inactive parents' children (Li & Hooker, 2010). Parental smoking behavior has a positive association on the child's BMI; mean 0.500 higher than a nonsmoking parent's child (Li & Hooker, 2010). A one-hour increase in watching television increases a child's BMI by

0.148 on average (Li & Hooker, 2010). Children participating on a sports team or in lessons after school or on weekends have lower BMI and are less likely to be overweight as compared to those who do not; mean BMI 0.751 (Li & Hooker, 2010).

Findings demonstrated that the use of free or reduced-cost lunch or breakfast programs at public schools positively correlated with children's BMI (mean 0.150) higher than children attending public school (Li & Hooker, 2010). They are also more likely to be overweight than those attending private schools; a BMI value 0.401is higher than those attending private schools ($p < .05$) (Li & Hooker, 2010). Public school students eligible for NSLP or SBP show a BMI is 0.725 higher ($p < .001$) and 4.5% higher probability of being overweight ($p < .001$) (Li & Hooker, 2010).

Major strengths of this study involve analyzing the data from various viewpoints and models (Li & Hooker, 2010). Researchers integrated comprehensive viewpoints of multiple school-related elements to explore their effects on childhood obesity (Li & Hooker, 2010). Examining multidimensional relationships between childhood obesity, family, school, and community factors are important perspectives to consider surrounding a child’s life (Li & Hooker, 2010). Incorporating Probit models to analyze the data shows the probability of being overweight for children enrolled in the NSLP and SBP (Li & Hooker, 2010).

Research limitations in this study show major weakness using the NHANES and CDC survey (Li & Hooker, 2010). The NHANES data does not directly identify whether each food is obtained from the school meal program, but is defined by eating occasion, place, food source, and day of week as reported by each participant (Li & Hooker, 2010). The CDC survey does not grant exploratory questions to provide detailed

information relevant to the study of childhood weight and health concerns, such as inquiring about the number of hours devoted to particular sports and accessibility to well-equipped parks and recreation facilities (Li & Hooker, 2010).

The authors concluded that socioeconomics, school type, household, and environmental variables affect children's BMI and likelihood of being overweight (Li & Hooker, 2010). Children from low socioeconomic (SES) households, eligible for NSLP and SBP in public schools are associated with higher BMI and more likely to be overweight than those attending private schools (Li & Hooker, 2010). Free or reduced-cost lunch or breakfast programs in public schools are positively correlated with children's BMI (Li & Hooker, 2010).

However, in lower SES households, school type does not have a significant effect on the probability of being overweight (Li & Hooker, 2010). Children taking part in the NSLP or SBP have a higher probability of being overweight (Li & Hooker, 2010). This finding further indicates the positive association between the NSLP and SBP and weight (Li & Hooker, 2010). Children participating in sports team or sports lessons have lower BMI and less likely to be overweight (Li & Hooker, 2010). The non-intervention study is delivered by several investigators and no inter-rate reliability is reported. The evidence is graded as level III and of high quality.

Further research in a serial cross-sectional design by Hoelscher et al. (2010) assessed childhood obesity in thirty low-income Travis County schools in central Texas during a four-year CATCH Program; named Coordinated Approach to Child Health Basic Plus (CATCH BP) Trial and CATCH BP and Community (CATCH-BPC); measuring BMI, physical activity, and diets. Students used modified questionnaires,

McKenzie et al. (1991) System for Observing Fitness Instruction Time (SOFIT), to assess physical activity levels and lesson contexts in physical education classes. Researchers applied the School Physical Activity and Nutrition (SPAN) to measure participant's physical activity, dietary habits and food consumption, self-efficacy, outcome expectations, height, and weights (Thiagarajah et al., 2008). Of the thirty CATCH BP and BPC measurement schools, 1,107 fourth graders participated in a self-administered survey along with measurement of height and weight (Hoelscher et al., 2010). Additionally, third, fourth, and fifth grade students are randomly selected for direct observations of activity during physical education class (Hoelscher et al., 2010).

Researchers found that incorporating a community-enhanced program reduces the prevalence of overweight children in low-income student populations (Hoelscher et al., 2010). The findings indicate obesity in 53% female; 61% Hispanic, and 14% African American; and the average age of the populations is 9.9 years (Hoelscher et al., 2010). Hoelscher et al. (2010) compared results from spring 2007 to 2008, the rate of overweight and obesity decreased by 1.3% ($p = 0.33$) in BP schools, whereas students from BPC schools decreased 8.3% ($p < 0.005$). No differences between CATCH BP and CATCH BPC schools are found for mean age, gender distribution, racial or ethnical composition, economically disadvantaged students, academic achievement indicators, BMI, and overweight or obesity for spring 2007 (Hoelscher et al., 2010).

The CATCH BP schools show an average BMI of 20.62 for a student population of 599; 458 attending the largest school district (Hoelscher et al., 2010). The mean age of students is 10.0; involving 299 females and 255 males; 85 African American, 339 Hispanic, and 130 White/other (Hoelscher et al., 2010). Academic achievement indicators

show 90 disadvantaged students, 71.7 passed standardized math test, and 81.2 passed standardized reading test (Hoelscher et al., 2010).

When compared, the CATCH BPC schools show an average BMI of 20.85 for a student population of 553; 421 attending the largest school district (Hoelscher et al., 2010). The mean age of students is 9.85; involving 284 females and 268 males; 76 African American, 382 Hispanic, 95 White/other (Hoelscher et al., 2010). Academic achievement indicators show 88.6 disadvantaged students, 74.7 passed standardized math test, and 80.7 passed standardized reading test (Hoelscher et al., 2010).

According to the Center for Disease Control and Prevention (2009) classifications of obesity, researchers found the student's percentage decrease by 1.3 points (3.1%) ($p = 0.33$) from CATCH BP schools compared to a decrease of 8.3 points (8.2%) ($p < 0.005$) in students enrolled at CATCH BPC schools. Students in the CATCH BPC showed a significant decrease over time in being overweight and obese (Hoelscher et al., 2010). There are statistically significant decreases in the prevalence of overweight and obesity found in the BPC schools among boys (percentage point decreases of -7.8, $p < 0.05$), girls (-9.0%, $p < 0.05$); and Hispanics (-7.5%, $p < 0.05$) (Hoelscher et al., 2010). The differences between conditions are also statistically significant ($p = 0.05$) for all students, and marginal ($p = 0.09$) for girls (Hoelscher et al., 2010).

Positive results are found among dietary and activity behaviors of students enrolled in the CATCH BPC schools (Hoelscher et al., 2010). Significant differences are observed between students in the BP and BPC schools; reporting breakfast consumption, the use of the Unhealthy Food Index, and the percentage of students spending greater than two hours daily using computer devices (Hoelscher et al., 2010). Hoelscher et al.

(2010) suggest the differences have a more positive impact in the CATCH BPC intervention.

The main strengths include the use of a diverse study population, direct assessment of height and weight to obtain BMI, adequate sample size, evaluation at interim time points, and use of validated and pretested measures specific to CATCH (Hoelscher et al., 2010). The Travis County CATCH Program uniquely emphasized lower income populations with a community participatory focus involving large numbers of students and schools (Hoelscher et al., 2010). Study limitations are based on design that contributed to potential bias in selection of the BPC schools, providing the same inputs as the CATCH BP schools as well as additional support from community partnerships, local decision making, and establish capabilities to promote physical activity (PA) and healthy eating (Hoelscher et al., 2010). Hoelscher et al. (2010) implemented a serial cross-sectional versus cohort design lacking a control group and allowed self-reporting of dietary intake, activity, and process measures.

Researchers conclude that future work should emphasize strategies to build community capacity to increase and maintain community involvement with school programs that can be replicated (Hoelscher et al., 2010). This study stresses community involvement in child obesity prevention in low-income settings that address and reduce disparities in environmental and social factors that contribute to higher rates (Hoelscher et al., 2010). Positive results suggest efforts that have an importance impact on child obesity (Hoelscher et al., 2010).

The non-intervention study is delivered by several investigators and no inter-rate reliability is reported. The evidence is graded as level III and of good quality.

Torres et al. (2014) developed a cross-sectional design to develop awareness of associating physical environments with diet quality and weight status in a sample of 165, 12-year-old participants from four public schools in the metropolitan area of San Juan, Puerto Rico. Of the 165 children, 118 (71.5%) are eligible for enrollment in the study (Torres et al., 2014). Food intake is determined using a 24-hour diet-recall questionnaire, with the gathered data being used to assess diet quality and calculate the Healthy Eating Index (HEI)-2010 (Torres et al., 2014). Weight status is categorized using the Center for Disease Control and Prevention (CDC) (Torres et al., 2014).

The final sample is composed of 114 participants; 57% of those participants are females, 43% males, 64% of the children are normal weight, and 36% are overweight or obese (Torres et al., 2014). Fifty eight percent participated in Nutritional Assistance Program (Torres et al., 2014). Seventy one percent of the parents (mother and father) completed at least a high school education, while 29% completed more than a high school education (Torres et al., 2014).

Findings show most children (55.6%) are categorized as having "poor Diet Quality (DQ)," while none of the children are categorized as "good DQ," with no differences by weight status ($p > 0.05$) (Torres et al., 2014). About 30% of the children met the recommended guidelines for moderate and vigorous physical activity and less than 10% of the children met the recommended guidelines for sedentary time, with no differences by weight status or gender ($p > 0.05$) (Torres et al., 2014). There is a significant negative correlation between BMI and the availability of unhealthy foods at home ($r = -0.25$, $p = 0.01$) and a positive correlation between BMI and access to recreational and sports facilities at home ($r = 0.25$, $p = 0.01$) (Torres et al., 2014). There

is a negative correlation between BMI and the use of recreational and sports facilities but not substantially significant ($r = -0.17$, $p = 0.06$) (Torres et al., 2014).

Also, findings reveal that home and school environments had a major influence on body weight in children (Torres et al., 2014). Thirty-six percent of the participating children are overweight or obese (Torres et al., 2014). Nearly 57% had poor diet quality; lowest USDA's Healthy Eating Index (HEI)-2010 component scores for total fruits, whole fruits, total vegetables, whole grains, seafood, proteins, and fatty acids (Torres et al., 2014). However, diet quality is not associated with weight status or physical environment factors (Torres et al., 2014). Compared to others, overweight and obese children report significantly ($p < 0.05$) lower availability of unhealthy foods, the highest access to recreational and sports facilities at home, lower utilization of recreational and sports facilities at school, and reduced participation in the school breakfast program (Torres et al., 2014).

Physical environments are assessed by asking participants about the availability and accessibility of healthy and unhealthy foods, food outlets, and recreational and sports facilities and equipment (Torres et al., 2014). Participant's food intake is assessed using a 24-hour recall and the USDA's Healthy Eating Index (HEI-2010) dietary questionnaire (Torres et al., 2014). The lowest median scores (0) for both males and females are whole fruits, whole grains, seafood and plant proteins, and fatty acids (Torres et al., 2014). However, girls had significantly ($p < 0.05$) higher scores for whole fruits and total vegetables than did boys (Torres et al., 2014). Normal-weight children appeared to have higher scores for total fruits, greens and beans, and empty calories than overweight or

obese children; however, these and other components are not significantly different by weight status ($p > 0.05$) (Torres et al., 2014).

The strengths of this study include using measures, such as the CDC Growth Charts and HEI-2010; which have been previously tested and validated in children (Torres et al., 2014). Incorporating two nutritionists to perform the 24-hour recall provides data consistency (Torres et al., 2014). Limitations are shown in the self-selection of the participants in the study (Torres et al., 2014). The more motivated and health conscious children may have been chosen (Torres et al., 2014). The sample size is limited and the information on diet and physical environment is self-reported without parental involvement (Torres et al., 2014). Parental socioeconomic status is eliminated for a significant number of the participants (Torres et al., 2014).

The authors concluded that overweight or obesity is associated with a low availability of unhealthy foods, high access to recreations and sports facilities after school, low use of the recreational and sports facilities at school, and reduced participation in school breakfast programs (Torres et al., 2014). These findings can help in the development of health-promoting public policies and nutritional interventions to improve participation in school breakfast programs as well as to increase the use of recreational and sports facilities (Torres et al., 2014). More research is needed to develop validated tools for measuring physical education and to explore other environmental factors influencing diet and physical activity in children (Torres et al., 2014).

The non-experimental study is delivered by several investigators and no inter-rate reliability is reported. The evidence is graded as level III and high quality.

In a quasi-experimental design, Taymoori et al. (2008) observed Iranian students to examine the effects of two six-month tailored interventions on potential determinants of physical activity (PA) and PA behavior in an all-female high school. Only 36% of girls (age 12 to 17 years) compared to 61.5% boys, are at adoption stages of PA indicating that they are achieving PA recommendations (Taymoori et al., 2008). Observation reports of low PA of this cultural group warrants intervention and research designed to increase participation of female Iranian adolescents that face unique cultural challenges to achieve adequate health benefits that are more difficult, such as bicycling exercises (Taymoori et al., 2008). Although it is not illegal for Iranian women to do such activities, it is not socially or culturally acceptable (Taymoori et al., 2008). The combination of cultural limitations and physical inactivity in adolescent girls makes research of effective PA interventions with female Iranian adolescents particularly important (Taymoori et al., 2008).

There are no significant differences between groups on any of the demographic or outcome measures at baseline (Taymoori et al., 2008). Progression in the stages is used as one of the criteria of intervention success (Taymoori et al., 2008). A statistically significant difference is found between groups for stage progression at posttest, X^2 (4) = 51.61, p = 0.001, and at follow-up, X^2(4) = 20.2, p = 0.001 (Taymoori et al., 2008). There is a statistically significant increase in the number of participants in both THP and HP groups who progressed through the stages from baseline to follow-up (Friedman X^2 (2) = 49.6, 2 p < .001, and X^2 (2) = 43.1, p = 0 .001), whereas limited progression occurred in the control group (X^2 (2) = 1.90, p = .38) (Taymoori et al., 2008). At the six-month

follow-up the THP group had a larger percentage of participants in the action stages than the HP group (Taymoori et al., 2008).

Changes in outcome variables across time for each of the three groups showed significant interaction effects between groups and time for perceived benefits, self-efficacy, interpersonal norms, social support, counter conditioning, stimulus control, overall time spent being active per week and PA (mean minutes per day), indicating that the groups differed across time (Taymoori et al., 2008). Main effect test for groups at post-intervention, with the baseline values as covariate revealed significant differences for counter conditioning, $F = 11.97$, $p = .000$, $\eta^2 = .16$, stimulus control, $F = 14.82$, $p = .000$, $\eta^2 = .15$, overall minutes PA per week, $F = 31.50$, $p = .000$, $\eta^2 = .29$ and mean minutes PA per day, $F = 39.94$, $p = .000$, $\eta^2 = .34$ (Taymoori et al., 2008). It is noted that the assumption of homogeneity of variance is not met for stimulus control, counter conditioning and mean PA per day (Taymoori et al., 2008). However, equivalent non-parametric analyses revealed similar significant results (Taymoori et al., 2008). Post hoc analyses showed that the differences for counter conditioning and stimulus control are not significant between the THP and HP groups but there are significant differences between the two intervention groups and the control group ($p = .003 – .006$) (Taymoori et al., 2008).

A major strength of the study is the 24-week duration of the intervention with follow-up assessments (Taymoori et al., 2008). Allowing participants to make significant behavior changes in physical activity (Taymoori et al., 2008). Another strength is the involvement of the participants' teachers and mothers (Taymoori et al., 2008). The

researchers intend to change the cultural norms and offer learning strategies to participants through observing others engaged in PA (Taymoori et al., 2008).

There are several limitations of the present study (Taymoori et al., 2008). The data is measured by self-report questionnaire, which introduces the possibility of biased results (Taymoori et al., 2008). Another limitation is the assessment of the validity of the child adolescent activity log (CAAL), requiring further validation with an objective measure in Iranian adolescents (Taymoori et al., 2008). The test-retest reliability of the CAAL is 0.98 (Taymoori et al., 2008). Limitation is also observed due to participant restriction during the intervention stage at baseline (Taymoori et al., 2008). Researchers believe that future studies should expand interventions to include participants at other stages of change at baseline and precontemplation (Taymoori et al., 2008).

In conclusion, the research showed a positive short-term effect for the intervention groups on stage of readiness, potential determinants of PA and on amount of PA, as both intervention groups increased their PA by approximately one hour per day (Taymoori et al., 2008). Researchers found that participants in the THP group reported using more behavioral processes than those in the HP group; no significant differences are found between the THP and HP groups for PA at the post intervention (Taymoori et al., 2008). At the six-month follow-up, researchers found that the PA levels decreased from posttest and fewer students in both intervention groups are in the action stages of behavior changes (Taymoori et al., 2008). There is a significant difference between the HP and control groups for PA that are not present at the six-month follow-up, but some differences between the THP and control groups are still present indicating that this is the stronger intervention (Taymoori et al., 2008).

Iranian girls face many barriers to an active lifestyle, including lack of suitable places to be active, access to facilities and resources, cultural limitations, and the low importance placed on exercising over other activities such as doing homework or home responsibilities (Taymoori et al., 2008). Restructuring the environment for participants to achieve stimulus control by responding to conditioning strategies is an effective intervention with this population (Taymoori et al., 2008). Researchers found that future research and interventions for PA are not only for female Iranian adolescents but also similar cultural and immigrant groups that have been neglected to date in the PA literature (Taymoori et al., 2008). Study results provide the basis for using intensive THP intervention with other demographic groups (Taymoori et al., 2008).

The intervention study is delivered by several investigators and no inter-rate reliability is reported. The evidence is graded as level II and high quality.

Another quasi-experiment model using a multivariate linear regression by Carlson et al. (2008) included 5,316 kindergarten students; consisting of 52.1% girls (2,769) and 45.2% half-day (2,402) enrollment. Using SUDAAN to test the longitudinal association between physical education and item response theory (IRT) scale scores for mathematics and reading stratified by gender; titled Early Childhood Longitudinal Study, Kindergarten Class of 1998 to 1999 (Carlson et al., 2008). An experimental design allowed the manipulation of the physical education exposure to higher levels, but even with exposure to physical education as low as 70 to 300 minutes weekly, a small benefit is observed among girls (Carlson et al., 2008). In one experimental study, an intervention of one hour per day of physical education versus 40 minutes per week for control group shows a

positive effect on academic scores for boys and girls in primary school (Shephard et al., 1984).

Student participation in physical education reported by the classroom teachers as the number of times during the week (never, < 1, 1 or 2, 3 or 4, or daily) and minutes per day (do not participate, 1 to 15, 16 to 30, 31 to 60, or > 60) (Carlson et al., 2008). Physical education estimated minutes per week by multiplying the median frequency by the median duration (except for > 60 minutes per day, where 60 minutes is used) (Carlson et al., 2008). Data is collected during a telephone interview with parents to obtain demographics, family income, child's race and ethnicity, and mother's education (Carlson et al., 2008).

Carlson et al. (2008) longitudinal shows the association between time spent in physical education and academic achievement by observing girls with the highest exposure to physical education (70 to 300 minutes weekly) versus the lowest exposure (0 to 35 minutes weekly), exhibiting small academic benefit for mathematics and reading; no association is observed for boys. Healthy People (2010) proclaimed that exposing kindergarteners to physical education in this representative sample is much lower than the national health objective of daily physical education, with an average of only 12.6% meeting the objective (Carlson et al., 2008).

Carlson et al. (2008) findings between boys and girls accords with results for other researchers who have examined the effects of physical education and school-day physical activity programs on various factors, such as academic scores, cardiorespiratory fitness, and body mass index. When examining the association between physical activity and cardiorespiratory fitness, researchers suggest that gender differences do affect

physical activity; showing lower fitness levels in girls at baseline (Carlson et al., 2008). This difference may explain the benefits of physical education on academic achievement in girls but not in boys; in addition to its physiological effects, physical education can influence other developmental domains, such as the social and cognitive (Carlson et al., 2008).

A major strength of the study is implementation of the longitudinal design; enabling control of baseline scores and grade-level gains in academic achievement as researchers follow students from kindergarten through fifth grade (Carlson et al., 2008). Another strength is asserting the SUDAAN Language Manual (2004); allows repeat measures of data analysis by applying statistical weights that account for the multiple levels of clustering in the complex study design, with robust variance estimators (Carlson et al., 2008).

Study limitations include researchers failing to establish a data collection timeline to include a baseline and scheduled checkpoints (Carlson et al., 2008). Students are exposed to physical education by attending school a few weeks before obtaining a baseline assessment in academic achievement, which excludes the collection of scores in grades second and fourth (Carlson et al., 2008). Including baseline scores allows researchers to effectively control baseline data and monitor academic achievement (Carlson et al., 2008).

Authors conclude that girls enrolled in higher levels of physical education show academic advantages in mathematics and reading whereas academics are not affected in boys (Carlson et al., 2008). Future studies should expand the association of physical activity during physical education as it relates to measures of academic achievement and

factors modifying physical, social, and psychological growth and development as it relates differently in boys and girls (Carlson et al., 2008).

The intervention study is delivered by several investigators and no inter-rate reliability is reported. The evidence is graded as level II and good quality.

Using a two univariate ANCOVA, randomized cross-sectional design, Chaddock et al. (2011) extended a prior study involving 32 pre-adolescence; 9 and 10-year olds, 14 higher-fit children (7 boys, 7 girls) and 18 lower-fit children (8 boys, 10 girls). Participants are recruited from a sports camp in East-Central Illinois to test several influential factors that affect cognitive function such as Kaufman Brief Intelligence (IQ) Test, Attention-Deficit Hyperactivity Disorder (ADHD), pubertal timing, socioeconomic status, handedness, health, MRI session, and physical activity (Chaddock et al., 2011).

Findings show that demographic variables, such as age, IQ, ADHD, Tanner Staging, and socioeconomic status, did not differ between fitness groups at the initial visit and are not correlated during the second visit flanker test performance (all $r < 0.2$, all $P > 0.2$) (Chaddock et al., 2011). Higher-fit participants had higher VO_{2max} scores than lower-fit children ($t_{30} = 10.7$, $P < 0.001$, effect size = 4.0), confirming the aerobic fitness groupings (Chaddock et al., 2011). Higher-fit (mean =1.3 years, $s = 0.5$ years) and lower-fit (mean = 1.3 years, $s = 0.4$ years) participants did not differ in the length of time between initial and follow-up testing ($t_{30} = 0.5$, $P > 0.6$) (Chaddock et al., 2011).

Participant's demographic and fitness data from the initial visit did not differ between fitness groups at the initial visit and are not correlated with follow up flanker test performance (all $r < 0.2$, all $P > 0.2$) (Chaddock et al., 2011). Higher-fit participants had higher VO_2max scores than lower-fit children ($t_{30} = 10.7$, $P < 0.001$, effect size = 4.0),

confirming the aerobic fitness groupings (Chaddock et al., 2011). Higher-fit (mean = 1.3 years, s = 0.5 years) and lower-fit (mean = 1.3 years, s = 0.4 years) participants did not differ in the length of time between initial and follow-up testing ($t_{30} = 0.5$, $P > 0.6$) (Chaddock et al., 2011).

Research findings show children with lower aerobic fitness levels are disadvantaged in their recognition memory performance relative to higher-fit children; the to-be-remembered faces and houses are encoded relationally, which confirmed predictions (Chaddock et al., 2011). The nature of the current task placed great demands on managing the different instructional requirements at encoding, engaging relational memory binding processes, and making strategic use of relational memory representations in recognition test trials amenable to the use of both relational and non-relation item memory cues (Chaddock et al., 2011). The behavioral methods used in this study do not permit direct conclusions about the specific neural circuitry implicated in the fitness-related findings, but neuroimaging investigations are expected to show that lower-fit children are unable to fully engage prefrontal hippocampal circuitry (Chaddock et al., 2011).

A major strength of the study is the use of ANOVA variances to analyze task performances such as response accuracy and reaction time (RT) by using a 2 (aerobic fitness group: higher-fit and lower-fit) x 2 (compatibility: compatible and incompatible) x 2 (congruency: congruent and incongruent) x 2 (test session: initial test and follow-up test). ANCOVA covariance is conducted to compare bilateral basal ganglia volumes as a function of aerobic fitness group, with total intracranial volume (mm^3) as a covariate to control for variation in head size (Chaddock et al., 2011). Another strength is found when

using the Spearman correlations to examine the hypothesized relationship between specific basal ganglia volumes and flanker task performance at initial testing and follow-up testing (Chaddock et al., 2011).

Further research is needed using neuroimaging techniques (Chaddock et al., 2011). Observing the relationship between aerobic fitness and memory performance, higher-fit and lower-fit children exhibit differential hippocampal volumes, which have comparable effects on relational and non-relational memory (Chaddock et al., 2011). The study provides additional steps to understand the relationship between fitness and childhood cognition (Chaddock et al., 2011). Using a cross-sectional design raises the possibility that the observed fitness-related behavioral differences are caused by another factor, such as motivation, genes, personality characteristics, nutrition, and intellectual stimulation (Chaddock et al., 2011). Researchers should continue to explore the level of response conflict in which lower-fit children are unable to maintain performance levels and allocate resources effectively in response to increased task demands (Chaddock et al., 2011).

Implementing randomized clinical trials is necessary to account for potential selection bias and to establish a direct relationship between aerobic fitness and the executive control of memory in children (Chaddock et al., 2011). It is possible that part of the performance differences observed across conditions is due to fatigue, learning, or a combination of both (Chaddock et al., 2011). Future investigations may consider counterbalancing the order of the task blocks to test this idea (Chaddock et al., 2011).

Randomized clinical trials are necessary to account for potential selection bias, establish a direct relationship between aerobic fitness, and the executive control of

memory in children (Chaddock et al., 2011). The nature of the current task place great demands on managing the different instructional requirements of encoding, engaging relational memory binding processes, and making strategic use of relational memory representations in recognition test trials amenable to the use of both relational and non-relational memory cues (Chaddock et al., 2011).

Chaddock et al. (2011) indicated that physically inactive lifestyle may negatively affect cognitive function. The eligibility criteria and requirements used in their study incorporate practice strategies that can be modeled in the school setting while monitoring the participation of the NSLP, BMI, and academic performance (Chaddock et al., 2011). Unfortunately, childhood inactivity continues to rise with opportunities for physical activity being reduced or eliminated in favor of academic subjects, as educators encounter increased pressure to improve scholastic performance (Chaddock et al., 2011). Specifically, the present results raise the possibility that physical activity during childhood encourages cognitive development (Chaddock et al., 2011). Educational and health care policy leaders should consider the role of aerobic fitness to improve the cognitive potential of children (Chaddock et al., 2011).

The experiment is delivered by several investigators and no inter-rate reliability is reported. The evidence is graded as level II and good quality.

A quasi-experimental cross-sectional study developed by Florin et al. (2011) involving 11,012 high school adolescents, grades 9 to 12 (age 14 to 17). Body mass index (BMI) and academic performance data are available from 15,214 eligible subjects (72.4%) using the Center for Disease Control and Prevention (CDC) 2003 Youth Risk Behavior Survey (YRBS) to evaluate NSLP participants (Florin et al., 2011). One

hundred and fifty-eight of 195 sampled schools across the United States participated in the national survey with an overall response rate of 67% (Florin et al., 2011).

Research methods included a three-stage cluster survey and assessing academic performance using self-reporting of grades (Florin et al., 2011). The primary independent variables are overweight status, as defined by objective medical criteria, and subjective self-perception of weight status (Florin et al., 2011). BMI calculation using metric conversion is self-reporting; height (inches) and weight (pounds) (Florin et al., 2011). Additional variables include the following self-reported data: age, sex, race or ethnicity; American Indian or Alaska Native, Asian, Black or African American, Hispanic or Latino, Native Hawaiian, Pacific Islander, White, or other (Florin et al., 2011). YRBS survey data allowed important variables such as physical activity, television, video games, and depression by understanding the misinterpretation of relationships between overweight, the perception of being overweight, and academic achievement (Florin et al., 2011). The available data allowed a thorough examination of the subject's perception of being overweight, independent of medically defined weight status (Florin et al., 2011). This study highlights the importance of weight perception in understanding health and social outcomes in adolescents, adding academic performance to the growing list of outcomes affected by how an adolescent perceives his or her weight (Florin et al., 2011).

The primary independent variable medically categorized body mass index (BMI) as overweight (BMI $\geq$ 85th percentile), obesity (BMI $\geq$ 95th percentile), and participants' perception of their weight status (Florin et al., 2011). Students completed determining perceptions affecting actuality using self-administered questionnaires in the classroom,

which recorded their responses on a computer-scanned booklet maintaining validity of self-reports (Florin et al., 2011).

Strengths of the study's data allowed researchers to examine the outcome of adolescent perception of overweight independent of medically defined weight status (Florin et al., 2011). Researchers are able to examine the relationship in a larger sample of adolescents compared in prior studies, most of which are smaller studies in local geographic regions (Florin et al., 2011). The study showed limitations in socioeconomic status (SES), study design, and result outcomes (Florin et al., 2011). The inability to adjust for SES is a significant limitation because data suggests a relationship between low SES and being overweight, but are not always consistent (Florin et al., 2011). The data is cross-sectional, and therefore no suggestion of informality (Florin et al., 2011). All data is self-reported, which has the potential for recall and response bias for all variables (Florin et al., 2011).

Another limitation is shown in the YRBS results not distinguishing between race and ethnicity (Florin et al., 2011). As a result, reports of higher grades in medically overweight youth ($p < .001$) and perceived overweight youth ($p = .001$) are low; even after adjusting demographics, depression, television, video game use, and physical activity (Florin et al., 2011). Being perceived as overweight has more significant determinant of academic performance ($p = .012$) when compared to medically defined obesity ($p = .174$) (Florin et al., 2011). Florin et al. (2011) proved adolescent academic performance is influenced by overweight perception, without considering actual weight, implying negative correlation between obesity and academic achievements.

Researchers conclude that adolescents' perception of themselves as overweight may play a more important role than actual overweight status in predicting their ability to achieve academically (Florin et al., 2011). Providing programs that improve adolescent emotional well-being, should be viewed as essential to academic performance (Florin et al., 2011). School officials allocating resources for schools, physical education, and nutrition to explore adolescent perceptions of themselves, self-esteem, and mood to improve academic performance (Florin et al., 2011).

The experiment is delivered by several investigators and no inter-rate reliability is reported. The evidence is graded as level II and good quality.

A quasi-experimental design is asserted by Käll, Malmgren, Olsson, Linden, & Nillson (2015) involving proxy versions of KIDSCREEN to obtain health-related quality of life (HRQoL) data and the Strength and Difficulties Questionnaires (SDQ) to assess emotion and behavior from two of four schools in Molndal, Sweden, totaling 545 students; consisting of 122 (one intervention school) and 423 (three control schools) (Käll et al., 2015). For this study, 349 students (65%), 182 (52%) in the intervention school and 167 (48%) in one of the control schools, 79 fifth and sixth grade students are recruited, consisting of a submaximal oxygen consumption test and magnetic resonance imaging of the brain (Käll et al., 2015).

Käll et al. (2015) investigated whether the curriculum-based physical activity intervention, enabled by a governmental investment, is correlated with children's academic achievement, psychological well-being, HRQoL, physical fitness, and structural development of the brain. Girls attending the intervention school are likely to pass national tests in Swedish (odds ratio 5.7) and mathematics (odds ratio 3.2), fourth to

sixth graders report lower conduct problems ($p < .05$), less hyperactive behavior ($p < .05$), and higher emotional problems ($p < .05$) than boys (Käll et al., 2015). Boys in the intervention group had higher estimated maximal oxygen uptake ($p < .05$) than the control group; no differences observed in hippocampal structure (Käll et al., 2015). Curriculum-based physical activity in schools may improve the academic achievement and psychological health of children, particularly for girls (Käll et al., 2015).

An important strength of the current study is its controlled quasi-experimental design, which increases the validity of the association between physical activity level and academic achievement (Käll et al., 2015). Researchers minimized the risk of selection bias by investigating three schools to serve as a reference group instead of one (Käll et al., 2015). Higher scores indicate better HRQoL (Käll et al., 2015). Ravens-Sieberer, Herdman, Devine, et al. (2014) declares KIDSCREEN as a reliable and valid measure of HRQoL.

Limited observations pertain to the quasi-experimental design, showing vulnerability to selection bias by permitting the allocation of children from one school to the other (Käll et al., 2015). Utilizing a randomized design would have significantly reduced the risks of systematic differences between intervention subjects and controls (Käll et al., 2015). Measuring changes over time allows a more powerful hypothesis testing instead of conducting scheduled national testing and physical activity interventions (Käll et al., 2015).

Käll et al. (2015) found no difference in general perceived HRQoL between groups; concluded physical activity had a positive effect on psychological distress assessed with the SDQ. Girls in the intervention group are academically stronger than

girls in the control group and reported less hyperactivity (Käll et al., 2015). One possible behavioral benefit among girls in fourth to sixth grade in the intervention school is that the extended physical activity alleviated stress and enhanced their concentration and classroom behavior to a greater extent than in boys, which may have contributed to their academic proficiency (Käll et al., 2015).

Socioeconomics is an important determinant of cognitive function, structural development of the brain that influences achievement, and physical activity during adolescence (Käll et al., 2015). Researchers conclude that government investment to enhance curriculum-based physical activity has the potential to improve children's academic outcome; particularly in girls, who develop psychologically from extended school-based physical activity (Käll et al., 2015). School administrators, personnel, and policymakers should be encouraged to create school-based intervention programs that promote participation in physical activities (Käll et al., 2015).

Developing cooperative relationships with sports clubs is a successful approach to obtain physical activity (Käll et al., 2015). Researchers sought correlating evidence to link physical activity levels to health status and educational outcome (Käll et al., 2015). Political commitment to increase the physical activity level among school children is an alternative to improve children's academic achievement (Käll et al., 2015).

The non-intervention study is delivered by several investigators and no inter-rate reliability is reported. The evidence is graded as level II and good quality.

Step 9: Synthesize overall strength and quality of evidence

Based on the JHNEBP Synthesis and Recommendation Tool (Appendix D) the recommendations for change suggests good and consistent evidence to consider pilot of change or further investigation.

Step 10: Develop recommendations for change based on evidence synthesis

Based on the evidence synthesis, consider pilot of change and further investigate. Recommendations are as follows:

- Increase healthy awareness
- Reduce medical issues
- Teach portion control
- Promote physical exercise
- Increase fruit and vegetable intake
- Decrease canteen snacks and beverages that do not meet USDA standards

Literature Synthesis

The JHNEBP guidelines and tools are used to synthesize the literature and to answer the following research question: What are the mean differences in pre-and-post intervention for BMI, dietary patterns, and physical activity among students enrolled in the NSLP?

Ten scholarly articles are examined to research the major influences associated with childhood obesity such as academics, dietary habits, and physical activity (as shown in Figure 2.1). The overall evidence is graded as follows: six studies rated level II, five rated level III, and one rated level V. Four studies ranked high quality and eight ranked as good.

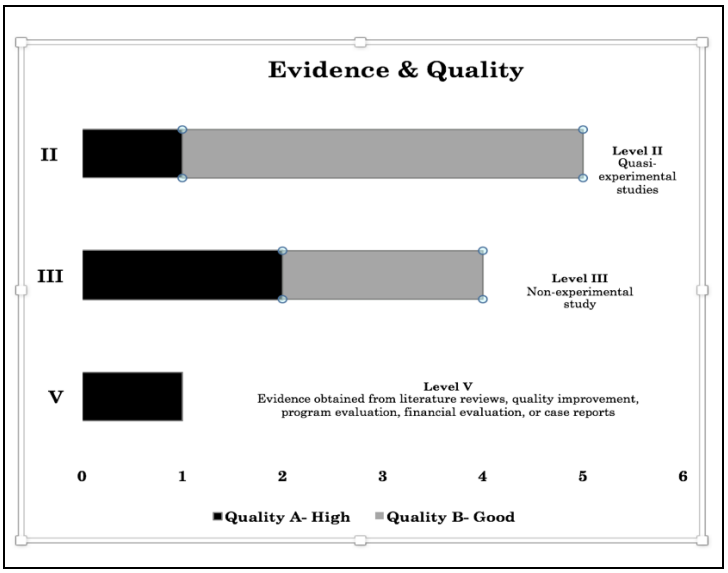

Figure 2.1 Evidence & Quality Levels of Literature Review

Overall, the literature is appraised as high with good quality. Based on the synthesis, the overall strength of the evidence to translation is considered good and consistent; suggesting pilot of change or further investigation.

Through prior research studies, the DNP can assess and compare two groups of students; consuming meals from the cafeteria and school canteen. Bhatia, et al. (2011) illustrated the discriminatory effects of competitive foods and stigma in school nutrition program. Cullen & Chen (2017) showed the impact of food choices and physical activity on BMI. Li & Hooker (2010) examined the effects of BMI of children from households eligible for the NSLP and SBP.

Expanded research is implemented to review the associated factors effecting physical activities. Carlson et al. (2008) and Käll et al. (2015) conducted research involving physical activities or education and academic achievement. Hoelscher et al. (2010) evaluated obesity in thirty low-income Travis County schools in central Texas

measuring BMI, physical activity, and diets. Chaddock et al. (2011) observed the relationship between aerobic fitness and memory performance. Taymoori et al. (2008) observed determinants of physical activity (PA) and PA behavior in an all-female Iranian high school.

Further studies are also examined to focus on adolescent's insight on weight. Florin et al. (2011) emphasized the importance of weight perception in the adolescent age group. Torres et al. (2014) developed a study to increase awareness that associates physical environments with diet quality and weight status in metropolitan public schools of San Juan, Puerto Rico.

The purpose of this DNP quality improvement project is to implement a food choice and physical activity educational program for improving BMI, physical activity levels, and dietary patterns among high school students ages 14 to 18. Learning intake recommendation allowances and physical activity requirements, students are guided to achieve expected healthy goals within their school environment.

CHAPTER SUMMARY

Grove et al. (2013) states that nursing research is a scientific method that validates existing knowledge while generating new knowledge that directly impacts the delivery of evidence-based nursing. Research has proven that physically active students tend to have better grades, school attendance, cognitive performance, and classroom behaviors (CDC, 2010; Michael, Merlo, Basch, et al., 2015). Understanding factors such as academics and socioeconomics, the APN observes major influences that are affected by the relationships between dietary patterns, physical activity, and body mass. Environmental factors of

school-based programs focus to enhance nutritional quality of foods available in schools, improve the duration and quality of physical education, increase physical activity before, during, and after school as well as build evidence-based wellness programs (Roger Wood Johnson Foundation, 2016).

Implementing JHNEBP (2016), the evidence search recommends a pilot of change or further investigation. Empowering children to develop lifelong habits by ensuring their environment is geared to promote good health (Alliance for a Healthier Generation, 2016). The APN uses prior evidence to become a driving force to develop an educational plan in the practice setting; while transitioning into a doctoral nursing practice (DNP) role.

CHAPTER 3

METHODOLOGY

The purpose of the quality improvement project is to compare individual food choices with the National School Lunch Program following an educational program on food choices and physical activity to high school students. Outcomes measured will include body mass index (BMI), physical activity level, and dietary choices pre-and post-intervention among high school students. This chapter will present the methodology for conducting the project to include the design, sampling, data management, and protection of human subjects.

Description of Setting

The project will take place in a local secondary Nationally Accredited Science, Technology, Engineering, and Mathematics (STEM) Accredited high school that offers Career and Technical Education (CATE), International Baccalaureate (IB), and dual-enrollment programs. The school population consists of approximately 1,170 students, grades 9 to 12, and 83 teachers (SDE, 2017). The student population is nearly 85% African American, 12% Caucasian, and the remaining 3% are American Indian, Asian, and Hispanic ethnic groups; 90% qualify for free or reduced lunch (School Family, n.d.).

The project takes place in a large southeast county in a southern state that reflects these demographics (Neighborhood Link, 2017):

- Total population is 13,717- White 4,375, Black 9,068, Hispanic 555, Asian 141, Hawaiian 20, and Indian 101.

- There are 8,169 residents living in their home at least 5 years.
- Median age is 38.
- Residing 6,560 men and 7,157 women.
- Median age for men is 37 while for women the median age is 39.

Economically, Neighborhood Link (2017) reported the employability and average income for residents (in the zip code area of the study):

- Employ 6,126 residents (over the age of 16).
- Annual household income is $52,058.
- Family income is $53,683, median $40,095; which is less than the national average.
- Income for men is $30,654 and $21,017 for women.
- House value is $108,700.
- Contain 86 businesses, 981 employees, and $33,550,000 annual payroll total.

County Health Rankings (2016) illustrates 27% of the area's resident's commute from the suburban landmarks. Neighborhood Link (2017) report traveling to and from work:

- Average 28.2 minutes.
- Total 6,047 commuters - 5,097 drive alone, 846 carpool, 25 public transit, and 30 ride bikes or walk.

As of July 2016, zip code area of study data and demographics reveal (US Home Town Locator, 2017):

- The total number of households is 5,078 with an average size of 2.68.
- Reside 3,576 family households with an average of three members.
- Reside 5,589 total housing units, 3,835 homeowners, and 1,243 renters.

- Projected growth rates for year 2020 show 0.55% population, 0.46% households, 0.29% families, and 1.27% median household income.

The school environment is protected by two School Resource Officers (SRO) and the County Sheriff's Department (RCSD) on the premises. There are two County Emergency Medical Service (EMS) stations within 3.5 miles and a Fire Station located behind the school; 0.3 miles.

TRANSLATION

Design of the Evidence-Based Project

A cross-sectional study design is used to compare mean differences in BMI, dietary preferences, and physical activity among the participating students who consume the NSLP meals in the cafeteria and school-based canteen. Weekly meal intake and physical activity are self-recorded and entered by each participant on the nutrition log and USDA SuperTracker system. Participant's nutritional and physical activity behavior are assessed using a research specific modified version of the 2010 Youth Risk Behavior Survey (YRBS). Walking steps are tracked using Smart devices. The BMI is self-reported during pre-and post-intervention.

Unit of Analysis

The demographic data collected includes age and gender; ethnicity as an option using the YRBS. Other data measurements include BMI, food choices, and walking steps of participants during pre-and post-intervention. No student identification or social security numbers will be collected that can be traced to participant.

According to the Obesity Action Coalition (2016), BMI measurements are as follows:

- Obesity is categorized as 35 or greater.
- Overweight is categorized as 30 or greater.

The US Department of Health and Human Services (2015) categorizes walking steps as the following levels of physical activity:

- <5,000 steps/day = “Sedentary Lifestyle”
- 5001-7,499 steps/day = “Low Active”
- 7,500-9,999 steps/day = “Somewhat Active”
- >or=10,000 steps/day = “Active”
- >12,500 steps/day = “Highly Active”

Sample

The sample consists of 84 high school students, grades 9 to 12. Based on power analysis, it is anticipated that at least 70 participants are needed to conduct the project. Since this is a quality improvement project, parental consent is not required.

Description of Intervention

The intervention for this DNP project is a quality improvement process. Based on the USDA Dietary Guidelines for Americans (2016), the SuperTracker helps participants plan, analyze, and track dietary and physical activity. By personalizing goals through virtual coaching and journaling, participants can determine what and how much to eat; track foods, physical activities, and weight.

The primary focus of the 4-week study is to track the daily nutritional and physical activity; mostly Monday through Friday of student participants in a NSLP schools. At the launch of the study, participants are formally introduced to the study and

its protocol. Participants are provided a scale to obtain height and weight measurement to personalize their registered SuperTracker accounts (as shown in Figure 3.1 and 3.2).

Step 11: The DNP spearheads the SWC to determine the fit, feasibility, and appropriateness of recommendation to proceed with this research. Descriptive statistics is computed on the variables. Frequency tables are described for categorical variable. Mean, standard deviation, and range is computed for ordinal and continuous variables. In the analysis, expected mean squares are calculated and the appropriate combination is used for hypothesis tests with specific functions of the repeated measures. General linear model analyses in SAS (GLM and MIXED procedures) is used to examine the effects of: 1) Time, 2) Intervention, and 3) Time by intervention interaction for BMI outcome. Chi square or fisher exact test is used for categorical variables with outcome (Canteen). The level of statistical significance is set at 0.05. Excel spreadsheet and SAS (9.4) is used to set up, enter, and analyze the data once imported from SuperTracker.

For an effect size to capture and analyze data, delta values are typically in the range of 0 - 1. Values of effect size = 0.10, 0.25, and 0.40 or greater correspond to "small", "medium", and "large" effects (Cohen, 2013). The power calculation indicates at least 80% power for alpha=0.05, and medium effect size, for n=64 for within-between–subject effects. The power calculation indicates that there are at least 80% power for alpha=0.05, medium effect size, Rho ranges from 0 to 0.9, and for n=64 for within–subject. For between-subject with this sample size, there are 80% power for alpha=.05, effect size=.3 (larger than medium effect size), Rho range from 0 to .6. To account for dropout (20%) and potential loss to follow-up, the sample size is increased to 77 subjects per group.

Protection of Human Subjects

The Institutional Board Review at the University of South Carolina (Appendix D) and the school district's Research Committee supports and approves the quality improvement project; which is reported retrospectively (Appendix E). A research proposal is submitted to the school district by the SWC requesting approval by describing the research purpose, design, methods, and significance (Appendix E). Participants involved in this project are on a voluntary basis; without compensation.

Step 12: An action plan is created by SWC after synthesizing evidence, the DNP reviewed the objectives of Operation F.L.A.S.H. with the health, health science education, and nutrition teachers, to register and orient them to the USDA SuperTracker online system by analyzing the components of the nutrition log. After the teachers utilized the system for one week to test the features then the DNP met with Operation F.L.A.S.H. participants to review program objectives, check Smartphone devices for physical activity application, analyze the components of the nutrition log, complete SuperTracker registration, and review module components.

Participants utilize the system for one week to ensure understanding. Teachers participating in the Operation F.L.A.S.H project met weekly to review nutrition logs. Study implementation date and timeline is established by the School Wellness Committee.

Step 13: The DNP secures support and resources to implement the project action plan by ensuring names, school district, student numbers, or social security numbers will not be collected; therefore, maintaining anonymity of participants. Students are numbered (as #1, #2, and #3) for data entry. Data will be collected into an encrypted flash drive for

Excel spreadsheet importation for analyses. Once the project is completed, all data will be destroyed. No one else will have access to the data except the investigator.

Barriers and Support

According to the USDA (2016), the following are best practices that are implemented to reduce barriers and increase support for participants using the SuperTracker:

- Create an account and track for about a month prior to tracking

Allow participants to demonstrate features such as History Charts and My Weight Manager that show progress over time

- Provide sample profile, meal, and physical activity information

Some participants may not be comfortable entering their own profile information, foods, or activities in a group setting.

- Incorporate audience

SuperTracker's features may seem overwhelming when participants are not given time to practice hands-on learning.

- Create a "judgement-free zone"

Some participants may be nervous about being judged based on their dietary choices. Participants are more likely to engage in a "judgment free zone".

- Emphasize SuperTracker's "tiered level of involvement"

Creating accounts and providing information to a website is sometimes a turnoff and can be a barrier for using web applications.

- Test technology in advance of the training

Certain webinar technologies operate on a slight delay and are not compatible

with certain website features, especially when using dialog boxes or videos.

Participants also provided the researcher with their personal login information to assist with login difficulties. During the 4-week intervention, weekly email reminders are sent to participants, while encouraging them to track as accurately as possible and browse the SuperTracker website for other health-related resources.

Design of the Evidence-Based Project

A cross-sectional study design is used to compare mean differences in BMI, dietary preferences, and physical activity among the participating students who consume the NSLP meals in the cafeteria and school-based canteen. Weekly meal intake and physical activity are self-recorded and entered by each participant on the nutrition log and USDA SuperTracker system. Participant's nutritional and physical activity behavior are assessed using a research specific modified version of the 2010 Youth Risk Behavior Survey (YRBS [Appendix F]). Walking steps are tracked using Smart devices. The BMI is self-reported during pre-and post-intervention.

Unit of Analysis

The demographic data collected includes age and gender; ethnicity as an option using the YRBS. Other data measurements include BMI, food choices, and walking steps of participants during pre-and post-intervention. No student identification or social security numbers will be collected that can be traced to participant.

According to the Obesity Action Coalition (2016), BMI measurements are as follows:

- Obesity is categorized as 35 or greater.
- Overweight is categorized as 30 or greater.

The US Department of Health and Human Services (2015) categorizes walking steps as the following levels of physical activity:

- <5,000 steps/day = “Sedentary Lifestyle”
- 5001-7,499 steps/day = “Low Active”
- 7,500-9,999 steps/day = “Somewhat Active”
- >or=10,000 steps/day = “Active”
- >12,500 steps/day = “Highly Active”

Sample

The sample consists of 84 high school students, grades 9 to 12. Based on power analysis, it is anticipated that at least 70 participants are needed to conduct the project. Since this is a quality improvement project, parental consent is not required.

Description of Intervention

The intervention for this DNP project is a quality improvement process. Based on the USDA Dietary Guidelines for Americans (2016), the SuperTracker help participants plan, analyze, and track dietary and physical activity. By personalizing goals through virtual coaching and journaling, participants can determine what and how much to eat; track foods, physical activities, and weight.

The primary focus of the 4-week study is to track the daily nutritional and physical activity; mostly Monday through Friday of student participants in a NSLP schools. At the launch of the study, participants are formally introduced to the study and its protocol. Participants are provided a scale to obtain height and weight measurement to personalize their registered SuperTracker accounts (as shown in Figure 3.1 and 3.2).

Figure 3.1 Adapted from United States Department of Agriculture (2017).

Figure 3.2 Adapted from United States Department of Agriculture (2017).

Instruments

- Health-O-Meter (scale/stadiometer)
- Nutrition Log Sheets
- Computer-Desktop/Laptop
- Printer
- Smartphone Device with downloaded Pedometer Program
- Standard Fit-Bit or Pedometer (if Smartphone inaccessible)

- Internet Accessibility
- Microsoft Office Programs; Excel, Word
- Edmodo Network (Edmodo, 2017)

Step 14: The DNP leads the SWC to implement an action plan to determine the launch for Operation F.L.A.S.H. At baseline and week 4, a self-report of the participant's measurements for Anthropometric, nutritional, and physical activity. Dietary and physical activities are monitored using a weekly log (Appendix G) and the USDA SuperTracker. Participants are informed of their progress weekly. Logs are reviewed and imported into the investigator's Excel spreadsheet for data analysis.

Tracking Measurements

Anthropometric. Participant's height is recorded using a stadiometer. Wearing lightweight clothing, the participant's weight is recorded in pounds using a calibrated floor scale. Once measurements are recorded, BMI's are calculated as verified in the CDC's BMI calculator (CDC, 2016) and then participants are placed in their proper percentile according to the BMI-for-age-growth chart (CDC, 2016).

Nutritional and Physical Activity. Data on the outcome and physical activity behaviors are collected at week one of the study and again at 4 weeks. Physical activity levels are evaluated using a modified version of the YRBS for students attending a targeted public school in grades 9 to 12. Participants are required to recall their nutritional intake and physical activities using the nutrition logs (Appendix G) and enter their data into the SuperTracker system (as shown in Figure 3.3 and 3.4) for the week prior within different environments; while during and out of school.

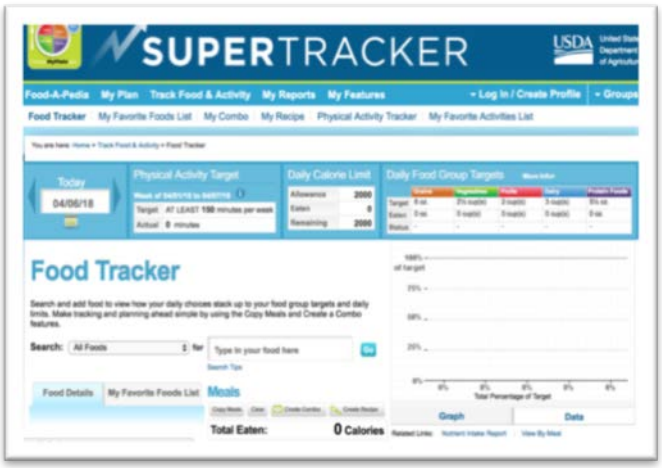

Figure 3.3 Adapted from United States Department of Agriculture (2017).

Figure 3.4 Adapted from United States Department of Agriculture (2017).

Discussion Group. Incorporating discussion groups allowed the researcher to determine the feasibility and acceptability of a web-based nutrition and physical activity tracker. The groups are conducted in a classroom format, which orchestrated an open-forum discussion; allowing participants to listen and answer questions of their comfort level. Developing a group allowed participants to have equal opportunity to give feedback on their experience in the study. To gain a better understanding of the information collected, the researcher monitored participants in Edmodo (virtual [as shown in Figure 3.5]) and class discussion groups related to the SuperTracker lessons; educating participants on dietary and physical activity levels to remain healthy.

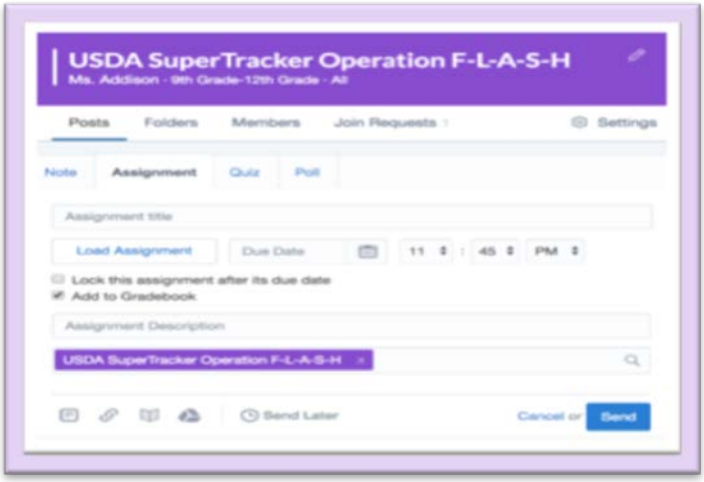

Figure 3.5 Adapted from Edmodo.

Step 15: Outcomes are evaluated over the course of 4-weeks by the DNP, primary investigator (PI), verifying each participant's SuperTracker profile two times per week, on Thursdays and Sundays. Every Thursday the PI sends Edmodo messages to participants reminding them to record food and physical activity (walking steps) daily on nutrition logs and update their information in the SuperTracker system for the week by the following Sunday; which the PI has access to each participant's account and record the number of days tracked and total steps walked for that week.

The PI averages weekly tracking and walking steps then notifies participants via email on Monday mornings of the leader of each category for the week prior. Figure 3.6 display a personalize report to assist participants to reach their goals.

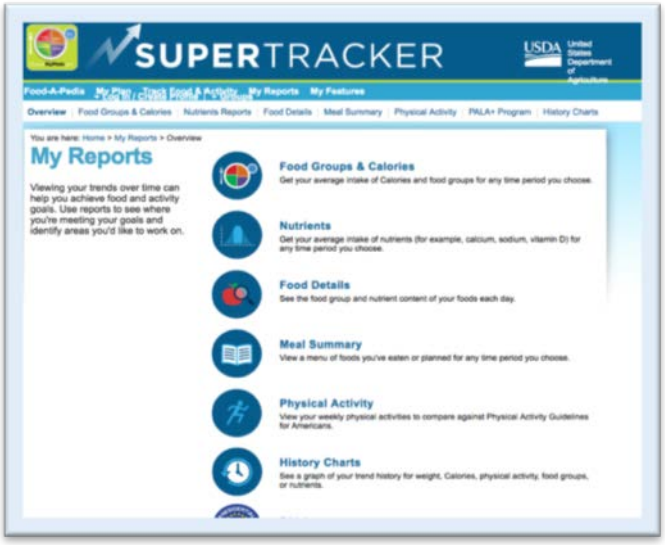

Figure 3.6 Adapted from United States Department of Agriculture (2017).

Outcomes to Be Measured

Measured outcomes include: BMI, food choices, and walking steps. Demographics include the students' age, gender; and ethnicity as optional data. All data is collected and integrated into a spreadsheet, called Operation F.L.A.S.H. SuperTracker.

- **Body Mass Index (BMI):** Measurements on the dataset that should be used for any analysis to include only measured height and weight.
- **Daily Meal Patterns.** Composed of breakfast, lunch, dinner, and snack.
- **Physical Activity (PA)**. Categorized as moderate, vigorous intensity, and muscle strengthening (CDC, 2015).
- **Walking Steps**: Categorized as total steps recorded by pedometer readings (USDHHS, 2015).
- **YRBS.** Youth Risk Behavior Survey (USDHHS, 2017).

Step 16: Outcomes are reported to students (stakeholders) through Edmodo messages stating participants obtaining the highest daily walking (per step) averages. The

winners are announced weekly. The DNP presents research findings to the SWC to finalize information and then conclude information for university defense with committee members. Formal copies of project findings and recommendations will be forwarded once the project is concluded.

Step 17: After extensive review of research recommendations and limitations, the DNP identified and leads the next steps of SWC to expand the study for continuance of data collection and expansion of sample size.

Step 18: The DNP plans to disseminate findings to the University of South Carolina research committee, ProQuest, SWC members, local school administration, and district research committee as requested. The DNP plans to publish this work in scholarly journals of professional organizations of membership, such as Chi Eta Phi Sorority, Inc. *JOCEPS, Journal of School Health,* or Association for Technical Education *Techniques Magazine.*

CHAPTER SUMMARY

According to the USDA (2016), high school students are increasingly in control over decisions that influence health and wellness, as well as behaviors learned throughout childhood to young adulthood; which is carried into adult life. The researcher developed a 4-week cross-sectional, quality improvement study incorporating the John Hopkins Nursing Evidence-Based Model to compare and monitor the behaviors of students in a NSLP environment.

Applying the 18-step framework, the DNP produces an evidence model that evolves leadership abilities, expands research, and heightens clinical expertise by

applying the components of practice, evidence, and translation. Based on the Dietary Guidelines for Americans (USDA, 2016), the SuperTracker personalizes nutrition and fitness goals through virtual coaching and journaling. Students learn to promote healthy lifestyle habits through group discussions; which foster support systems and collaboration.

CHAPTER 4

RESULTS

The purpose of the quality improvement project is to compare individual food choices with the National School Lunch Program and physical activity following an educational program on food choices and physical activity to high school students. Outcomes measured will include body mass index (BMI), physical activity level, food choices, and nutritional adherence pre-and post-intervention among high school students. The doctoral prepared Advanced Practice Nurse (APN) will evaluate these variables utilizing the John's Hopkins Evidence-based Practice Model (JHEBPM) and the United States Department of Agriculture (USDA) SuperTracker.

JHEBPM is a theoretical framework used to guide the direction of this project to develop practice questions, search for evidence, and translate an action plan. As a member of the School Wellness Committee, the DNP and team leader recruited inter-professional members, such as administrators; principal and assistant principal; teachers of various subjects-Health, Health Science Education, Nutrition, Physical Education, and Science; and a medical doctor. As a collaborative team, members developed and refined the EBP question, defined the scope of the EBP question and identified stakeholders, determined responsibility for project leadership, and outlined the schedule of the team meetings.

The evidence of utilizing the USDA SuperTracker System is presented by the DNP as a result of internal observation of student's reactions to the changes and dislike

of the cafeteria food; which is a healthier choice. Students are bringing fast food or purchasing multiple servings of canteen meals as a substitute without portion controls. The DNP provided the team with comprehensive literature that supports this level of investigation with summarization and synthesis.

Translation of the action plan, the DNP orients the team to the USDA SuperTracker system for 2 weeks to ensure students have devices to record physical activity (steps) to enter into the system; in preparation of the 4-week program launch, Operation F.L.A.S.H. (Fit-Learners-Always-Stay-Healthy). During Week 1 (baseline/pre-intervention) and week 4 (post-intervention), the researcher recorded height and weight measurements to determine BMI and entered into the USDA SuperTracker. The 2017 Youth Risk Behavior Survey (YRBS) questionnaire specific to age will be administered once. Dietary and physical activities are monitored using a weekly log and the USDA SuperTracker. Participants are informed of their progress weekly. After the 4-week observation, the secured logs are reviewed and imported into the investigator's Excel spreadsheet for data analysis. The DNP evaluated the outcomes to stakeholders by identifying the corrective measures to resolve barriers, improve support, and enhance motivation of participants.

Description of the Sample

Operation F.L.A.S. H. is composed of 14 to 17 years-old adolescents; grades 9 to 12. The body mass index (BMI) and physical activity level are obtained on the initial visit for all participants during the month of February 2018 in Week 1 (n = 84). The post-intervention sample population included BMI and physical activity reassessment during the month of February 2018 in Week 4 (n = 57). The participants are categorized in two

dietary preference groups-Cafeteria and Canteen. The physical activity level is outlined in five categories-Sedentary, Low Active, Somewhat Active, Active, and Highly Active.

The author identified the following variables for the pre-intervention and post-intervention samples in the data: age, gender, BMI, dietary preferences, and physical activity levels. The sample included a pre-and post-intervention convenience sample of adolescent participants, 14-17 years of age, who are recruited at a National School Lunch Program participating high school. Of the sample (n = 84), 92.86% female (n = 78) and 7.14% male (n = 6). The sample ranged in ages: Age 15 (n = 31) is the largest (36.90%) age group followed by Age 17 (33.33%), Age 16 (28.57%), and Age 14 (1.19%).

Table 4.1: Frequency Distribution: Operation F.L.A.S.H. Pre-Intervention

Variables	N	%
Age		
14	1	1.19
15	31	36.90
16	24	28.57
17	28	33.33
Sex		
Female	78	92.86
Male	6	7.14
Dietary Preferences Week 1		
Cafeteria	47	55.95
Canteen	37	44.05

Most of the participants preferred to eat in the Cafeteria (n = 47, 56%) rather than the Canteen (n = 37; 44%). The pre-intervention (Week 1) population sample characteristics aligned with those of the total population and comparable to the post intervention group (Week 4). Table 4.1 summarizes the pre-intervention sample by age, gender, and dietary preferences.

Data Analysis

Data showed there is no change in the participants' preference to eat in the Cafeteria (n = 47) rather than the Canteen (n = 37). Comparable to the pre-intervention group (n = 84), physical activity participation is less in the post-intervention group (n = 54); noting that 27 participants not adhering to report activity information.

The pre-intervention data for physical activity showed the majority (92.86%) of the sample is categorized as Sedentary (n = 78) followed by Low Active (n = 3) 3.57%, Somewhat Active (n = 1) 1.19%, Active (n = 2) 2.38%, and no Highly active participants. When compared to the pre-intervention group, the post-intervention data showed a decrease (80.70%) in Sedentary (n = 46) and increase percentages for Low Active participants 14.04% (n = 8) and Somewhat Active participants 3.51% (n = 2); indicating a positive improvement in these three activity levels. However, the percentage decreased (1.75%) for Active participants (n = 1). There are no Highly Active participants for physical activity. Table 4.2 summarizes the pre-and post-intervention population by physical activity level.

Table 4.2: Frequency Distribution: Operation F.L.A.S.H. Pre-and Post-Intervention

	Pre-Intervention Week 1		Post-Intervention Week 4	
Variables	N	%	N	%
Physical Activity Level (steps)				
Sedentary (0-5,000)	78	92.86	46	80.70
Low Active (5,001-7,499)	3	3.57	8	14.04
Somewhat Active (7,500-9,999)	1	1.19	2	3.51
Active (10,000-12,499)	2	2.38	1	1.75
Highly Active (> 12,500)	0	0	0	0

In Week 1, the total pre-intervention participants in the Cafeteria group (n = 47) and Canteen group (n = 37) decreased by Week 4. However, the Cafeteria group consistently remained the larger group through the study observation. Participants in the Cafeteria group (Week 1- 37480.66; Week 4- 35875.79) showed a greater mean average than the Canteen group (Week 1- 34684.57; Week 4- 31700.46) for total steps for each week of the study. The mean average for BMI increased in both the Cafeteria (Week 1- 26.11; Week 4- 26.78) and Canteen groups (Week 1- 30.11; Week 4- 33.99) over time.

In Table 4.4, the result of the Matched paired t-test for parametric testing indicated that there is a statistical significance for mean total steps by diet ($p = 0.0487$). However, the result of non-parametric test did not reveal any significant statistical difference for total steps ($p = 0.0730$). The mean average for BMI is lower in the Cafeteria group during the initial and post assessment. The mean average for physical activity levels measured by total steps decreased over time in both the Cafeteria and Canteen groups. The result of Matched paired t-test for parametric and Wilcoxon sign rank test for Non-parametric indicated that there is no statistical significant for mean changes of BMI by diet ($p = 0.4054$ for parametric and $p = 0.0846$ for non-parametric.

Table 4.3 N, Mean, SD, and Range for Steps and BMI for weeks

Variables	N	Mean	SD	Min –Max
Total steps [a]				
Week 1	84	36249.05	10069.49	10257.00-77191.00
Week 2	60	34110.58	11529.47	7947.00- 70326.00
Week 3	63	34542.41	13250.74	4228.00- 74448.00
Week 4	57	34117.75	11849.12	2681.00- 73106.00
Body Mass Index (BMI) [b]	84	27.87	10.59	16.10-94.90
Week 1	84	29.96	23.84	16.80-234.80
Week 4				

a. Matched paired t-test for week 1 and week 4 p =.0487 and Wilcoxon Sign (p =.0730)

b. Matched paired t-test for week 1 and week 4 p =.4054 and Wilcoxon Sign (p =.0846

Table 4.4 N, Mean, and SD for Steps and BMI for weeks by Diet

Variables	Cafeteria			Canteen		
	N	Mean	SD	N	Mean	SD
Total steps[a]						
Week 1	47	37480.66	11530.53	37	34684.57	7706.51
Week 2	35	34946.37	13660.94	25	32940.48	7743.24
Week 3	33	35076.97	15328.44	30	33954.40	10743.94
Week 4	33	35875.79	13472.44	24	31700.46	8876.08
Body Mass Index (BMI) [b]	47	26.11	7.19	37	30.11	13.53
Week 1	47	26.78	7.69	37	33.99	34.71
Week 4						

a. Matched paired t-test for week 1 and week 4 p = 0.0487 and Wilcoxon Sign (p = 0.0730) by diet

b. Matched paired t-test for week 1 and week 4 p = 0.4054 and Wilcoxon Sign (p = 0.0846) by diet

Table 4.5 displays a variety of results for Mixed model shows results indicating time for BMI and total steps in a two-way ANOVA with repeated measures showing results for diet, time, and time*diet. The results did not reveal any statistical significant effects for diet ($p = 0.0781$), time ($p = 0.3691$), and time*diet ($p = 0.5259$) interaction effects for BMI. In addition, the results did not reveal any significant effects for diet ($p = 0.2559$), time ($p = 0.1261$), and time*diet ($p = 0.9391$) interaction effects for total steps.

Table 4.5 Type 3 Tests of Fixed Effects

Variables	Effect	Num DF	Den DF	F Value	Pr > F
Fixed Effects for BMI by Time and Diet	diet1	1	82	3.18	0.0781
	time	1	82	0.82	0.3691
	time*diet1	1	82	0.41	0.5259
Fixed Effect for Steps by Time and Diet	diet1	1	82	1.31	0.2559
	time	3	174	1.93	0.1261
	time*diet1	3	174	0.13	0.9391

Analysis of PICO/Project Questions

Body mass (BMI), dietary preferences, and physical activity are the established metrics of effectiveness to address the project question quantitatively. The post-intervention measure is assessed 1-month post-intervention implementation and compared to the pre-intervention BMI, dietary preference, and physical activity proportions. The author analyzed the pre-intervention and post-intervention BMI, dietary preference, and physical activity proportions and other data, applying the appropriate statistical tools to include descriptive statistics and inferential statistics.

The PICOT for the study is the following: What are the mean differences in pre- and post-intervention BMI, dietary preferences, and physical activity among students

enrolled in the NSLP? A comprehensive literature review preceded the development of an evidence-based process change to improve BMI and physical activity adherence. The post-intervention measure is assessed 1-month post-intervention implementation and compared to the pre-intervention BMI, dietary preferences, and physical activity proportion.

Results revealed there are no changes in dietary preferences for Cafeteria (55.95%) and Canteen (44.05%) in the pre-and post-intervention groups. Group sample sizes of 84 in Group 1 and 54 in Group 2 showed a reduction of 27 participants. Results demonstrated no significant statistical differences for the time (p-value =.1196) using a one-way ANOVA with repeated measures on time (Table 4.5). Other results indicated no significant statistical differences for diet (p-value = .0.2559), time (p-value = 0.1261), and time*diet (p-value = 0.9391) using a two-way ANOVA with repeated measures on two factors (Table 4.5).

There is no statistically significant difference in physical activity for total steps between the pre-intervention group and the post-intervention group. However, using the Matched paired t-test for week 1 and week 4 (p = .0487), there is a significant difference between physical activity (Table 4.3) and physical activity and diet preference (Table 4.4). Participants mean average of steps decreased in both the Cafeteria and Canteen Group over time (Table 4.4). Table 4.3 showed the mean BMI increasing from Week 1 to Week 4; participants remained in the overweight category. However, Table 4.4 showed the mean BMI having a slight increase (0.67) in Cafeteria Group (Week 1-26.11; Week 4-26.78) and significant increase (3.88) in Canteen Group (Week 1-30.11; Week 4-

33.99). The Canteen Group remained in the overweight category and the Canteen Group increased from overweight to obese category.

This large effect post-intervention supports prior studies and answers the PICOT that the best practice to improve BMI, dietary preferences, physical activity, and adherence to implementing evidence-based interventions in a nutrition program:

- Provide an assessment tool for understanding the adherence measurements,
- Assess and address student barriers in the home and community,
- Offer ongoing rewards and ending of program incentives,
- Provide one to one patient education,
- Incorporate technology for student tracking physical activity and nutrition progress/results,
- Restructure the current process.

Limitations

There are several limitations related to the project improvement process. One disadvantage is that the evaluation data analysis is observed on participants during a 4-week time frame; with a relatively small sample population. The second limitation has inconsistencies between the proportion sample sizes (as indicated by power analyses) between pre-and post-intervention. The sample size for BMI achieved 80% power to detect a difference with a significant level of 0.05. However, the sample size for total steps and diet did not meet 80% power to detect a difference with a significant level of 0.05. Moreover, there is a noted 32% decrease in adherence post intervention. The third limitation is the participants self-report of dietary intake and physical activity using the SuperTracker. Although the researcher verified that participants understood correct

measures to enter food and physical activity, self-reporting methods can skew results and introduce bias.

In retrospect, the researcher had to remind students to turn in nutrition logs and on multiple occurrences the USDA SuperTracker site updated information, which prohibited participants to enter or delete prior information. Being that the study is limited to 4-week process, participants might have perceived time constraints in completing data online or re-entering data. These factors negatively affected post-intervention proportion rate and are summarized as non-adherence data tracking.

Adherence of Data Collection

There is no change in the pre-and post-intervention population (n = 84) for age and gender. The dietary preferences remained the same within each group; Cafeteria (n = 47) and Canteen (n = 37). Comparable to the pre-intervention group (n = 84), the post-intervention group (n = 54), shows a reduction of 27 participants not adhering to the recording requirements of BMI and physical activity for total steps; resulting in a 32% decreased from Week 1 to Week 4.

Summary of Findings

Body mass, dietary preferences, and physical activity measurements using total steps are obtained from participants in a NSLP high school. The sample population included a total of 84 adolescents, age 14-17; comprised of 92.86% female (n = 78) and 7.14% male (n = 6); are assessed during the pre-and post-intervention phase of the study. The data shows that 55.95 % of participants prefer to eat in the Cafeteria (n = 47) rather than the 44.05% in the Canteen (n = 37).

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

This chapter includes a summary of the project findings and implications for practice, education, and policy, as well as recommendations for further research. The purpose of the quality improvement project is to compare individual food choices with the National School Lunch Program (NSLP) and physical activity following an educational program on food choices and physical activity to high school students.

Summary of the Project

Utilizing the John Hopkins Nursing Evidence-Based Practice (JHNEBP) framework, the DNP collaborated to establish practice questions, searched the evidence, and translated an action plan to improve quality measures to identify barriers and motivate students to become physically active and to eat healthy. The project is designed to evaluate the efficacy using an evidence-based process and acquire additional knowledge regarding best practices to combat obesity and improve BMI. The project is the foundation for similar research of its kind to further investigate organizational and process outcomes, such as nutrition quality and physical fitness.

Recommendations

Implications for Practice

Utilizing the JHNEBP provides the DNP with the necessary tools to promote leadership in developing best-practice measures in practice through evidence and translation of knowledge. This quality improvement study provided the DNP the

opportunity to design an action plan and evaluate new practice approaches utilizing the JHNEBP model as an active member of the School Wellness Committee (SWC). Implementing the 4-week evidence-based study design provided the monitoring of dietary habits and physical activity levels of students in a NSLP environment. The DNP observed study participants behavior patterns in their normal environment.

Obtaining baseline data, the DNP has the opportunity to monitor BMI and physical activity measurements as well as categorize participants according to their meal preferences, such as in the Cafeteria or Canteen. During the course of the study, the DNP monitors the application and adherence of nutrition education as students enter their food intake and physical activity steps into the USDA SuperTracker. In post-intervention phase, data is presented to the SWC to promote team awareness and accountability to evaluate outcomes, identify barriers, and improve further initiatives.

Implications for Nursing Education

DNP programs are designed to prepare nursing experts to focus on scientific and research methods of innovative and evidence-based practice measures. DNP graduates are skilled in developing quality improvement strategies and maintaining organizational changes and policies. The DNP is knowledgeable to recognize the areas of focus in the school practice setting that needs to be addressed by conducting internal observation of the student's reactions to the NSLP changes; resulting in disliking cafeteria food.

Evidence-based programs are aimed to prepare graduates with research abilities to obtain disciplined knowledge, engage in practice, and provide leadership for evidence-based practice. In the school setting, the DNP is in a position to apply their clinical expertise to resolve identifiable problems and complications of obesity. The DNP graduate provided the School Wellness Committee team with the results of an external

evidence; comprehensive literature reviews that supports a school-based investigation. As a leader, the DNP orients the team on the use of the USDA SuperTracker system, as well as plan a nutrition education program. Utilizing knowledge of nutrition, the DNP provides students with lessons that focus on increasing fruits and vegetable intake, controlling caloric intake, promoting physical fitness, decrease BMI, and disease prevention.

Implications for Policy

Health policy influences multiple care delivery issues, including health disparities, cultural sensitivity, ethics, the internationalization of health care concerns, access to care, quality of care, health care financing, and issues of equity and social justice in the delivery of health care. DNP graduates are prepared to design, influence, and implement health care policies that frame health care financing, practice regulation, access, safety, quality, and efficacy (IOM, 2003). Reviewing SWC and Alliance for Healthier Generation (2016) guidelines, the DNP is able to compare recommendations as outlined by The State of Obesity's (2016) South Carolina policies for obesity prevention to assess and evaluate current practice parameters.

According to The State of Obesity (2016), licensed Early Childhood Education (ECE) programs are required to:

- Make drinking water available to children
- Have healthy eating policies
- Licensing laws linked to the Child and Adult Care Food Program (CACFP) standards that automatically update
- Provide meals and snacks that meet dietary guidelines

- Have time for daily physical activity
- Limits for screen time in ECE settings, or have regulations requiring ECE centers to set limits
- Guidelines for South Carolina schools are outlines as followed (The State of Obesity, 2016):
- Elementary, middle, and high school students are required to participate in physical education
- Elementary school students are required to participate in a minimum amount of physical education time
- Statutes or regulations on Safe Routes to School
- 60.5% of eligible schools adopted community eligibility provision
- 52% school districts participate in farm-to-school activities
- 99.9% school food authorities meeting updated meal nutrition standards

The State of Obesity (2016), also conferred that South Carolina's communities:

- Adopted a complete street policy
- Healthy food finance
- 20.7% of children are food insecure
- 15.3% of the population is food insecure
- 16.0% of residents participate in the Supplemental Nutrition Assistance Program (SNAP)

The DNP also enforces the JHNEBP model to collaborate a team-based approach utilizing the SuperTracker in the school setting to monitor nutritional and physical activity behavior of students. This research data provides the DNP with the necessary

feedback to determine additional resources for the students, school and community. Understanding policy, the DNP can involve significant stakeholders regulating the access of healthy foods and safe communities for students to continue health education measures outside of school. As a member of the School Wellness Committee, the DNP will implement practices to improve protocols to comply with regulatory requirements of the USDA and NSLP.

Implications for Research

Organizational and systems leadership is a critical characteristic for the DNP graduate to improve healthcare outcomes (AACN, 2006). Preparation to address nursing practice issues, both current and future, involves a scientific foundation concentrating on natural and social sciences. As the DNP graduate recognize obese adolescence in the practice surroundings increased, along with observation of negative feedback to menu changes and unhealthy food choices; sparks the need for further investigation and research.

The DNP understand principles of practice management to meet the needs of the population within the practice setting. Applying the curriculum, the DNP integrates research into practice by designing and leading an evidence-based quality improvement project to educate adolescents on the effects of food choices and the lacking physical activity by promoting adherence. DNP training is applied and distributed in all phases of the study, which will impact the transformation of future research.

Further Research Recommendations

The researcher recommends that future projects similar to this should extend for at least a 4-month time frame. The time expansion would allow the evidence-based interventions to have more generalizable data; such as physical activity and BMI results.

The researcher implemented this evidence-based process at one school site within the district. Time expansion would also afford additional participation from the other district high schools with the same food choices. The researcher could then apply other variables such as ethnicity, economic status, grade point averages, and parental BMI.

Program expansion would provide the SWC with the necessary information to improve nutrition education for the student population. In the post-intervention phase, 32% of participants did not comply with data recording of physical activity levels, which suggests that further inquiry is needed to examine the reason for lack of adherence. Future research would benefit from the attainment of both qualitative and quantitative data to evaluate barriers and processes of evidence-based practice measures.

CHAPTER SUMMARY

The quality improvement data demonstrated there is no significant difference in BMI and physical activity levels among high school students who eat meals in the NSLP cafeteria and school canteen. The results of this project help to substantiate prior organizational studies that examine the effects of BMI, dietary patterns, and physical activity in the adolescent age group in the community and school settings. This project is the basis for future research involving childhood obesity and the development lifestyle changes.

One of the major roles of the DNP in school nutrition is to lead organizational transformation in the NSLP environment and oversee outcomes designed to prepare children to learn healthy behaviors for a lifetime. Incorporating the JHNEBP model and

knowledge of state polices for obesity prevention, the DNP can implement best practice measures district-wide.

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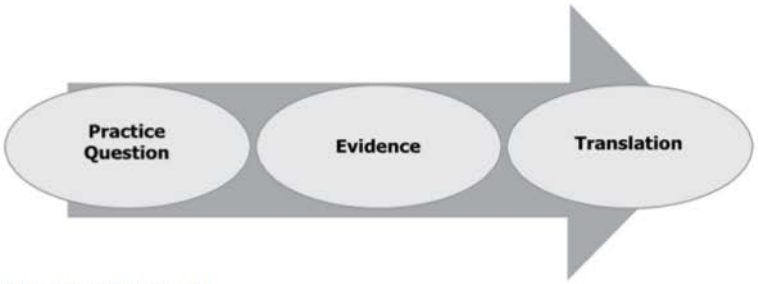
APPENDIX A.

JOHNS HOPKINS NURSING EVIDENCE-BASED PRACTICE
PET MANAGEMENT GUIDE

Johns Hopkins Nursing Evidence-Based Practice

Appendix A

PET Management Guide



PRACTICE QUESTION

Step 1: Recruit interprofessional team
Step 2: Define the problem
Step 3: Develop and refine the EBP question
Step 4: Identify stakeholders
Step 5: Determine responsibility for project leadership
Step 6: Schedule team meetings

EVIDENCE

Step 7: Conduct internal and external search for evidence
Step 8: Appraise the level and quality of each piece of evidence
Step 9: Summarize the individual evidence
Step 10: Synthesize overall strength and quality of evidence
Step 11: Develop recommendations for change based on evidence synthesis

- Strong, compelling evidence, consistent results
- Good evidence, consistent results
- Good evidence, conflicting results
- Insufficient or absent evidence

TRANSLATION

Step 12: Determine fit, feasibility, and appropriateness of recommendation(s) for translation path
Step 13: Create action plan
Step 14: Secure support and resources to implement action plan
Step 15: Implement action plan
Step 16: Evaluate outcomes
Step 17: Report outcomes to stakeholders
Step 18: Identify next steps
Step 19: Disseminate findings

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APPENDIX B.

JOHNS HOPKINS NURSING EVIDENCE-BASED PRACTICE INDIVIDUAL EVIDENCE SUMMARY TOOL

Johns Hopkins Nursing Evidence-Based Practice
Individual Evidence Summary Tool

EBP Question: What are the mean differences in pre-and post-intervention in BMI, dietary patterns, and physical activity among students enrolled in the NSLP?

Date: 11/30/2017

Article #	Author & Date	Evidence Type	Sample, Sample Size & Setting	Study findings that help answer the EBP question	Limitations	Evidence Level & Quality
1	Bhatia, Jones & Reicker (2011)	Quality Improvement Study	2,579 low-income students 1 middle and 2 high schools	By eliminating à la carte' options and integrating all meal offerings and service areas within the NSLP, daily participation of qualified students eating the NSLP lunch increased substantially at one high school but decreased modestly at the other two sites; 21% to 58% Among students who qualified for reduced-price meals, participation increased by 23%, 38%, and 154%, respectively, at the three sites	NSLP lunch environment, minimize identification of low-income participants, and students' perceptions of stigma or motives for NSLP NSLP lunch environments may allow identification of low-income participants	V High Quality

2	Cullen & Chen's (2017)	Qualitative Study	7,800 participants ages 5 to 18	The mean breakfast intake did not meet the federal breakfast pattern; accounting for 21% of the daily energy intake, less than 0.50 cup of fruit, or 100% fruit juice is consumed, and only about 70% of the dairy products Only 27% of daily energy intake is disbursed from the school lunch meal with low vegetable and protein consumption NSLP and SBP meals supplies almost one-half of the energy intake (47%), which includes the major food groups (40.6%) for total vegetables (40.6%) to milk (77.1%).	NHANES data did not directly identify whether foods are obtained from the school meal program, but defined by eating occasion, place, food source, and day of week as reported by each participant	III Good Quality

3	Li & Hooker (2010)	Multiple Regression Study	62,880 participants ages 6 to 17	Children with employed parents or caregiver are associated with 0.294 decrease in BMI Parents with a high school education are associated with an average reduction in BMI of 0.517 compared to children whose parents' education level is lower than high school Parents with college and above education level are linked to a 1.279 reduction in the child's BMI value Households where Spanish is the primary language, the mean value of BMI is 0.680 higher than in corresponding households where English is the primary language	NHANES data does not directly identify whether each food is obtained from the school meal program, but is defined by eating occasion, place, food source, and day of week as reported by each participant CDC survey does not grant exploratory questions to provide detailed information relevant to the study of childhood weight and health concerns, such as inquiring about the number of hours devoted to particular sports and accessibility to well-equipped parks and recreation facilities	III High Quality

				Children of physically active parents have mean BMI values 0.199 lower than inactive parents' children Parental smoking behavior has a positive association on the child's BMI; mean 0.500 higher than a nonsmoking parent's child One-hour increase in watching TV increases a child's BMI by 0.148 on average Children participating in sports teams or lessons have lower BMI and less likely to be overweight after school or on weekends as compared to those who do not; mean BMI 0.751		

4	Hoelscher et al. (2010)	Serial Cross-Sectional Design	554 students 299 females; 255 males 85 African American, 339 Hispanic, 130 White/other	Findings indicate obesity in 53% female; 61% Hispanic, 14% African American; and the average age of the populations is 9.9 years Significant differences are observed between students in the BP and BPC schools reporting breakfast consumption, the Unhealthy Food Index, and percentage of students spending greater than 2 hours daily using computer devices	Based on design that contributed to potential bias in selection of the BPC schools, providing the same inputs as the CATCH BP schools as well as additional support from community partnerships, local decision making, and establish capabilities to promote PA and healthy eating Serial cross-sectional versus cohort design lacking a control group and allowed self-reporting of dietary intake, activity, and process measures	III Good Quality

5	Torres et al (2014)	Cross-Sectional Design	165 participants 12-year-old	36% of the participating children are overweight or obese Nearly 57% had poor diet quality; lowest USDA's Healthy Eating Index (HEI)-2010 component scores for total fruits, whole fruits, total vegetables, whole grains, seafood and plant proteins, and fatty acids Overweight and obese children report significant ($p < 0.05$) lower availability of unhealthy foods, highest access to recreational and sports facilities at home, lower utilization of recreational and sports facilities at school, and reduced participation in the school breakfast program	Limitations are shown in the self-selection of the participants in the study More motivated and health conscious children may have been chosen The sample sizeis limited and the information on diet and physical environmentis self-reported without parental involvement	III High Quality

6	Taymoori et al. (2009)	Quasi-Experimental Design	115 participants 57 females; 58 males ages 12 to 17	Changes in outcome variables across time for each of the three groups showed significant interaction effects between groups and time for perceived benefits, self-efficacy, interpersonal norms, social support, counter conditioning, stimulus control, overall time spent being active per week and PA (mean minutes per day), indicating that the groups differed across time	The data is measured by self-report questionnaire, which introduces the possibility of biased results Another limitation is the assessment of the validity of the child adolescent activity log (CAAL), requiring further validation with an objective measure in Iranian adolescents The test-retest reliability of the CAAL is 0.98 Limitation is also observed due to participant restriction during the intervention stage at baseline	II High Quality

7	Carlson et al (2008)	Quasi-Experiment Model	5,316 kindergarten students	Examine the association between physical activity and cardiorespiratory fitness, researchers suggest that gender differences do affect physical activity; showing lower fitness levels in girls at baseline This difference may explain the benefits of physical education on academic achievement in girls but not in boys; in addition to its physiological effects, physical education can influence other developmental domains, such as the social and cognitive	Failure to establish a data collection timeline to include a baseline and scheduled checkpoints Students are exposed to physical education by attending school a few weeks before obtaining a baseline assessment in academic achievement, which excludes the collection of scores in grades second and fourth	II Good Quality

8	Chaddock et al. (2011)	Randomized Cross-Sectional Designs	32 pre-adolescents ages 9 to 10 years	Lower aerobic fitness levels are disadvantaged in their recognition memory performance relative to higher-fit children; the to-be-remembered faces and houses are encoded relationally, which confirmed predictions	Cross-sectional design raises the possibility that the observed fitness-related behavioral differences are caused by another factor, such as motivation, genes, personality characteristics, nutrition, and intellectual stimulation Researchers should continue to explore the level of response conflict in which lower-fit children are unable to maintain performance levels and allocate resources effectively in response to increased task demand	II Good Quality

9	Florin et al. (2011)	Quasi-Experimental Cross-Sectional Study	11,012 high school adolescents grades 9 to 12 age 14 to 17	Adolescents' perception of themselves as overweight may play a more important role than actual overweight status in predicting their ability to achieve academically Being perceived as overweight has more significant determinant of academic performance ($p = .012$) when compared to medically defined obesity ($p = .174$) Adolescent academic performance is influenced by overweight perception, without considering actual weight, implying negative correlation between obesity and academic achievements.	Limitations in socioeconomic status (SES), study design, and result outcomes Inability to adjust for SES is a significant limitation because data suggests a relationship between low SES and being overweight, but are not always consistent The data is cross-sectional, and therefore no suggestion of informality All datais self-reported, which has the potential for recall and response bias for all variables	II Good Quality

10	Käll, Malmgren, Olsson, Linden, & Nillson (2015)	Quasi-Experimental Design	545 participants 5 to 6th grade students 2 schools in Molndal, Sweden	Found no difference in general perceived HRQoL between groups; concluded physical activity had a positive effect on psychological distress assessed with the SDQ. Girls in the intervention group are academically stronger than girls in the control group and reported less hyperactivity One possible behavioral benefit among girls in fourth to sixth grade in intervention school is that the extended physical activity alleviated stress and enhanced their concentration and classroom behavior to a greater extent than in boys, which may have contributed to their academic proficiency	Limited observations pertain to the quasi-experimental design, showing vulnerability to selection bias by permitting the allocation of children from one school to the other Utilizing a randomized design would have significantly reduced the risks of systematic differences between intervention subjects and controls	II Good Quality

				Socioeconomics is an important determinant of cognitive function, structural development of the brain that influences achievement, and physical activity during adolescence		

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APPENDIX C.

JOHNS HOPKINS NURSING EVIDENCE-BASED PRACTICE SYNTHESIS AND RECOMMENDATIONS TOOL

Johns Hopkins Nursing Evidence-Based Practice
Synthesis and Recommendations Tool

EBP Question: What are the mean differences in pre-and post-intervention BMI, dietary patterns, and physical activity among students enrolled in the NSLP?

Date: 11/30/2017

Category (Level Type)	Total Number of Sources/Level	Overall Quality Rating	Synthesis of Findings Evidence That Answers the EBP Question
Level II •Quasi-experimental studies •Systematic review of a combination of RCTs and quasi-experimental studies, or quasi-experimental studies only, with or without meta-analysis	**5**	**4 High** **1 Good**	Iranian girls face many barriers to an active lifestyle: Lack of suitable places to be active Access to facilities and resources Cultural limitations Low importance placed on exercising over other activities such as doing homework or home responsibilities
Level III •Non-experimental study •Systematic review of a combination of RCTs, quasi-experimental, and non-experimental studies, or non-experimental studies only, with or without meta-analysis •Qualitative study or systematic review of qualitative studies with or without meta-synthesis	**4**	**2 High** **2 Good**	•Providing the opportunity to select more fruits and vegetables during meals may increase student fruit and vegetable consumption •Lower SES households, school type does not have a significant effect on the probability of being overweight •Children taking part in the NSLP or SBP have a higher probability of being overweight •This finding further indicates the positive association between the NSLP and SBP

			and weight incorporating a community-enhanced programs reduces the prevalence of overweight children in low-income student populations •Significant differences are observed between students in the BP and BPC schools reporting breakfast consumption, the Unhealthy Food Index, and percentage of students spending greater than two hours daily using computer devices •Overweight or obesity is associated with a low availability of unhealthy foods, high access to recreations and sports facilities after school, low use of the recreational and sports facilities at school, and reduced participation in school breakfast programs
Level V •Evidence obtained from literature reviews, quality improvement, program evaluation, financial evaluation, or case reports •Opinion of nationally recognized expert(s) based on experiential evidence	**1**	**High**	•Eating à la carte meals is varied substantially less than the number in the NSLP lines at all sites; because all students paid cash, qualified students purchasing à la carte meals could not be enumerated •Aerobic fitness and specific brain volumes are associated with cognitive health at the initial time of fitness testing as well as play a role in future cognitive performance

Recommendations Based on Evidence Synthesis and Selected Translation Pathway
Good and consistent evidence: consider pilot of change or further investigation

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APPENDIX D.

UNIVERSITY OF SOUTH CAROLINA
IRB APPROVAL

UNIVERSITY OF
SOUTH CAROLINA

OFFICE OF RESEARCH COMPLIANCE

INSTITUTIONAL REVIEW BOARD FOR HUMAN RESEARCH
DECLARATION of NOT RESEARCH

Twanda Addison
College of Nursing
1601 Greene Street
Columbia, SC 29208

Re: **Pro00076056**

Dear Ms. Addison:

This is to certify that research study entitled ***Utilization of the USDA SuperTracker System in High Schools: A Quality Improvement Project*** was reviewed on **2/27/2018**, by the Office of Research Compliance, which is an administrative office that supports the University of South Carolina Institutional Review Board (USC IRB). The Office of Research Compliance, on behalf of the Institutional Review Board, has determined that the referenced research study is not subject to the Protection of Human Subject Regulations in accordance with the Code of Federal Regulations 45 CFR 46 et. seq.

No further oversight by the USC IRB is required. However, the investigator should inform the Office of Research Compliance prior to making any substantive changes in the research methods, as this may alter the status of the project and require another review.

If you have questions, contact Arlene McWhorter at arlenem@sc.edu or (803) 777 7095.

Sincerely,

Lisa M. Johnson
ORC Assistant Director
and IRB Manager

APPENDIX E.

SCHOOL DISTRICT RESARCH PROPOSAL AND APPROVAL

RESEARCH PROPOSAL

UTILIZATION OF THE USDA SUPERTRACKER SYSTEM IN HIGH SCHOOLS: A QUALITY IMPROVEMENT PROJECT

by

Twanda D. Addison

Doctor of Nursing Practice Student

College of Nursing

University of South Carolina

Spring 2018

IMPACTING [redacted]

The students and teachers in [redacted] can directly benefit from this research by learning lifelong dietary and physical activity behaviors that prevents incidences of obesity and other chronic disease. Establishing wellness committees and programs in Healthy [redacted] Schools affords students to learn in nutritious environments by providing National School Lunch (NSLP), School Breakfast (SBP), and promote physical fitness practices. Healthy lifestyle adaptation is a lifelong nutritious and fitness practices that require thorough assessment of behaviors and resources in the student's home, school, and community involvement.

PURPOSE

The purpose of the quality improvement project is to compare individual food choices with the National School Lunch Program and physical activity following an educational program on food choices and physical activity to high school students. Outcomes will include body mass index (BMI), physical activity level, food choices, and adherence to recording nutritional content during pre-and post-intervention among high school students.

The basis of the quality improvement study is the utilization of the USDA SuperTracker online system and the John Hopkins Nursing Evidence-Based Model to compare and monitor the behaviors of students in a NSLP environment. Alliance's Healthy Schools Program (2016) sustains healthy change in schools proving positive impact on student health. Focusing on the NSLP, the advanced practice nurse (APN) can monitor and apply evidence-based practice measures in the high school setting.

RESEARCH DESIGN

Research Question

- What are the mean differences in pre-and post-intervention BMI, dietary patterns, physical activity, and recording adherence among students enrolled in the NSLP?

Hypotheses

- Do students who make healthier food choices engage in more physical activity?
- Do NSLP students have lower BMI than canteen students?
- Are food portions monitored more closely for students in NSLP schools?

Operational Terms

- **Adolescent:** Children ages 12 to 19 (CDC, 2017)
- **Body Mass Index (BMI):** A number calculated by dividing a person's weight in kilograms by his or her height in meters squared; which is used to determine obesity (OAC, 2016).
- **Canteen:** School approved foods or fundraiser items purchased outside of the cafeteria that meets the USDA Guidelines.
- **Logged Food:** Recording of food and drink for breakfast, lunch, dinner, and snack.
- **MyPlate:** USDA food patterns for the 2010 Dietary Guidelines for Americans; a colorful visual representing the five food groups (USDA, 2017).

- **National School Lunch Program (NLSP):** Nation's second largest food and nutrition assistance program; approved by the USDA (ERS, 2017).
- **Nutrition Lessons:** Designed to encourage high school students to build healthier meals and increase physical activity using course nutrition standards and the SuperTracker interactive tool (USDA, 2017).
- **Obesity:** A child is defined as "affected by obesity" if their body mass index-for-age (or BMI-for-age) percentile is greater than 95%, categorized as a body mass index (BMI) of 35 or greater (OAC, 2016).
- **Overweight:** A child is defined as "overweight" if their BMI-for-age percentile is greater than 85% and less than 95%, categorized as a body mass index (BMI) of 30 or greater (OAC, 2016).
- **Personal Food Choices:** High calorie, carbohydrate, sugar foods and drinks with no limitations.
- **Physical Activity (PA):** Moderate level of exercise calculated 30 minutes a day for five days a week.
- **School Breakfast Program (SBP):** Provides nutritious meals to students at participating schools; USDA approved (ERS, 2017).
- **Subject:** High school student, who are working to meet South Carolina graduation requirements, grades 9 to 12 (SDE, 2017).
- **SuperTracker:** United States Department of Agriculture's food, physical activity, and weight tracking tool (USDA, 2017).

Participants will be monitored in a whole group using the USDA SuperTracker and classroom nutrition lessons measuring pre-and post-intervention BMI, food choices, physical activity, and daily recording adherence of nutritional intake and activity levels.

DATA COLLECTION

The quality improvement project, Operation F.L.A.S.H. will be obtained from approximately 70 to 80 for analysis. The participants will be involved in this project on a voluntary basis only without compensation and may withdraw at any time. Data will include BMI measurements; without physical contact to include calculations of height and weight; food choices, activity tracking, and adherence to recording nutritional information during pre-and post-intervention. Participants have the option to provide demographic data, such as age, ethnicity, and gender. No student numbers or social security numbers will be collected that than can be traced back to the participant.

Measuring Instruments

- Health-O-Meter (scale/stadiometer)
- Nutrition Log Sheets
- Computer- Desktop/Laptop
- Printer
- Smartphone Device with downloaded Pedometer Program
- Standard Fit-Bit or Pedometer (if Smartphone inaccessible)
- Internet Accessibility
- Microsoft Office Programs; Excel, Word
- Edmodo Network (Edmodo, 2017)

Based on power analysis, it is anticipated that at least 70 participants are needed to conduct the project. For an effect size to capture and analyze data, delta values are typically in the range of 0- 1. Values of effect size = 0.10, 0.25, and 0.40 or greater correspond to "small", "medium", and "large" effects, Cohen (2013). The power calculation indicates that there is at least 80% power for alpha=0.05, and medium effect size, for n=64 for within-between–subject effects. The power calculation indicates that there are at least 80% power for alpha=0.05, medium effect size, Rho ranges from 0 to 0.9, and for n=64 for within–subject. For between-subject with this sample size, there are 80% power for alpha=.05, effect size=.3 (larger than medium effect size), Rho range from 0 to .6. In order to account for dropout (20%) and potential loss to follow-up, the sample size is increased to 77 subjects.

The retrospective data analysis review will begin in March 2018. Participant's time will be minimal during January to February 2018. Subjects are required to utilize Smartphones or pedometers to obtain the correct number of steps, record pedometer readings and food choices daily using nutrition logs to enter information into the SuperTracker system; requiring 15 to 20 minutes daily. Nutritional lessons will take place during class; meeting the state and national standards for Health Education, Health Science Education, and Nutrition courses.

When selecting a [redacted] High School, the nursing researcher desired to select [redacted] based on it being:

1. A large campus with multiple walking areas for increased physical activity without interrupting the normal school day schedule.
2. An active School Wellness Committee.

3. A School-Based Canteen during lunch.

4. A STEM Accredited School.

5. A school that offers Health Education, Health Science Education, and Nutrition; where teachers can work collaboratively as well.

Nutritional education lesson will be conducted only in the Health Education, Health Science Education, and Nutrition classrooms at [redacted] High School. No other recruitment or advertisement, such as flyers, will be permitted.

The participants will be asked to do the following:

1. Complete a school modified 2017 State and Local Youth Risk Behavior Survey (YRBS).
2. At baseline and week 4, the researcher will meet with participants to record body mass measurements.
3. Dietary food choices and physical activities will be monitored using a weekly log and the USDA SuperTracker.
4. Participants will be informed of their progress weekly.
5. Logs are reviewed and imported into the investigator's Excel spreadsheet for data analysis.

Potential Risks/Discomforts

The potential risks that may occur are as follows:

1. Subjects may forget login information; such as username, passwords, and group codes.
2. Information entered into the system may be deleted from the SuperTracker system; due to a computer "glitch."

Corrective Measures

1.The principal investigator will keep the subject's username and passwords secured.

2. Group codes will remain visible for subjects throughout the classroom during discussions.

3. Subjects will record food choices and physical activity on nutrition log and print entered information from the SuperTracker system weekly.

All information gathered electronically on a computer with a secure password; in a password protected file. All identifying information will be removed containing participant's names. All dated information will be kept for one year.

Benefits

Incorporating the USDA SuperTracker in NSLP schools may help researchers understand adolescent behaviors that promote healthier food choices and physical activities.

RESEARCH RESULTS

According to the National Conference of State Legislatures (2014), obesity is a major chronic care condition affecting 17% of today's youth. More than 12 million children and adolescents, age 2 to 19, are obese and over 23 million are either obese or overweight (National Survey of Children's Health, 2014). Active Living Research (2015) confirms that one in three children in the United States are overweight or obese and 48% of high school students attend only one physical education class weekly.

The State of Obesity (2016), reports in 2013 that 13.9% of South Carolina's high school students are obese, ranking 10th of 52 states. Unintended by the No Child Left Behind Act (NCLB), the Institute of Medicine (2016) reports a decrease in physical

activity time in public school curricula report approximately 50% of school administrators decrease time from physical education and recess to enhance reading and mathematical skills. Mandated by Congress, the United States Department of Agriculture Efforts (2015) provide enriched learning environments targeting obesity and providing nutritious meals by establishing the National School Lunch Program (NSLP); first authorized by the National School Lunch Act (NSLA) of 1946. Operating in more than 96,000 public and nonprofit private schools, the NSLP provides low cost and free lunches meeting nutritional standards to more than 31 million children daily (2015).

Alliance for a Healthier Generation (AHG) Model (2016) creates healthy environments where students, particularly disadvantaged, can learn and flourish. Transforming [redacted]'s Coordinated School Health Advisory Council (CSHAC) policies, the APN will spearhead the School (SNS) Wellness Committee at [redacted] High School. The APN desires to develop a scholarly project using the Johns Hopkins Nursing Evidence-Based Practice (JHNEBP) model that can expand the 18-step framework to examine adolescent obesity, identify potential solutions, and propose interventions.

Providing nutritional education, students understand the importance of monitoring body mass to combat obesity; which allows progression of academics as they transition into adulthood. Descriptive statistics will be computed on the variables. Frequency tables will be described for categorical variable. Mean, standard deviation, and range will be computed for ordinal and continuous variables. In the analysis, expected mean squares will be calculated and the appropriate combination will be used for hypothesis tests with specific functions of the repeated measures. General linear model analyses in SAS (GLM

and MIXED procedures) will be used to examine the effects of: 1) Time, 2) Intervention, and 3) Time by intervention interaction for BMI outcome. Chi square or fisher exact test will be used for categorical variables with outcome (Canteen). The level of statistical significance will be set at 0.05. Excel spreadsheet and SAS (9.4) will be used to set up, enter, and analyze the data once imported from SuperTracker.

Jennifer Coleman, Ph.D.
Executive Director

Accountability, Assessment, Research and Evaluation
Stevenson Administration Building

March 20, 2018

Twanda D. Addison

Hopkins, South Carolina 29061

Dear Ms. Addison,

The Research Committee of School District One has ***approved*** your research project regarding **"Utilization of the USDA SuperTracker System in High Schools: A Quality Improvement Project"** for the duration of the 2017-2018 school year only. You may conduct your project at limited to the students in your existing Health Education classes. This approval is contingent upon use of the updated student survey provided on March 15, 2018. You may not conduct your research during testing, both state testing and school end of year exams.

Please maintain the confidentiality of the data and do not make public the name of the district or school. We ask that you provide us with a copy of your completed research.

Sincerely,

Jennifer Coleman

Dr. , Ph.D., Chair
Research Committee

Cc: Dr. Principal

APPENDIX F.

RESEARCH MODIFIED
YOUTH RISK BEHAVIOR SURVEY

2017 State and Local
Youth Risk Behavior Survey

Directions

Participants,

Please answer the following questions that highlights your response to personal response to nutrition and physical activity by completely marking a circle. Questions 4 and 5 are optional, therefore you are not REQUIRED to answer.

1. **How old are you?**
   - A. 12 years old or younger
   - B. 13 years old
   - C. 14 years old
   - D. 14 years old
   - E. 16 years old
   - F. 17 years old
   - G. 18 years old or older

2. **What is your sex?**
   - A. Female
   - B. Male

3. **In what grade are you?**
   - A. 9th grade
   - B. 10th grade
   - C. 11th grade
   - D. 12th grade
   - E. Ungraded or Other grade

4. **Are you Hispanic or Latino**? ***(Optional)***
   - A. Yes
   - B. No

5. **What is your race?** ***(Select one or more responses; which are optional)***
   - A. American Indian or Alaska Native
   - B. Asian
   - C. Black or African American
   - D. Native Hawaiian or Other Pacific Islander
   - E. White

6. **How tall are you without shoes on?**

Height	
Feet	**Inches**

7. **How much do you weigh without your shoes on?**

Weight
Pounds

8. **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 punch, Kool-Aid, sports drinks, or other fruit-flavored drinks).***
   A. I did not drink 100% fruit juice during the past 7 days
   B. 1 to 3 times during the past 7 days
   C. 4 to 6 times during the past 7 days
   D. 1 time per day
   E. 2 times per day
   F. 3 times per day
   G. 4 or more times per day

9. **During the past 7 days, how many times did you eat fruit? (*Do not count fruit juice*).**
   A. I did not eat any fruit during the past 7 days
   B. 1 to 3 times during the past 7 days
   C. 4 to 6 times during the past 7 days
   D. 1 time per day
   E. 2 times per day
   F. 3 times per day
   G. 4 or more times per day

10. **During the past 7 days, how many times did you eat green salad?**
   A. I did not eat any green salad during the past 7 days
   B. 1 to 3 times the past 7 days
   C. 4 to 6 times during the past 7 days
   D. 1 time per day
   E. 2 times per day
   F. 3 times per day
   G. 4 or more times per day

11. **During the past 7 days, how many times did you eat potatoes? (*Do not count French fries, fried potatoes, or potato chips).***
    A. I did not eat potatoes during the past 7 days
    B. 1 to 3 times during the past 7 days
    C. 4 to 6 times during the past 7 days
    D. 1 time per day
    E. 2 times per day
    F. 3 times per day
    G. 4 or more times per day

12. **During the past 7 days, how many times did you eat carrots?**
    A. I did not eat any carrots during the past 7 days
    B. 1 to 3 times during the past 7 days
    C. 4 to 6 times during the past 7 days
    D. 1 time per day
    E. 2 times per day
    F. 3 times per day
    G. 4 or more times per day

13. **During the past 7 days, how many times did you eat other vegetables? (*Do not count green salad, potatoes, or carrots).***
    A. I did not eat other vegetables during the past 7 days
    B. 1 to 3 times during the past 7 days
    C. 4 t0 6 times during the past 7 days
    D. 1 timer per day
    E. 2 times per day
    F. 3 times per day
    G. 4 or more times per day
14. **During the past 7 days, how many times did you drink a can, bottle, or glass of soda or pop, such as Coke, Pepsi, or Sprite? (*Do not count diet soda or diet pop).***
    A. I did not drink soda pop during the past 7 days
    B. 1 to 3 times during the past 7 days
    C. 4 to 6 times during the past 7 days
    D. 1 time per day
    E. 2 times per day
    F. 3 times per day
    G. 4 or more times per day
15. **During the past 7 days, how many glasses of milk did you drink? *(Count the milk you drank in a glass or cup, from a carton, or with cereal. Count half pint milk served at school as equal to one glass).***
    A. I did not drink milk during the past 7 days
    B. 1 to 3 glasses during the past 7 days
    C. 4 to 6 glasses during the past 7 days
    D. 1 glass per day
    E. 2 glasses per day

F. 3 glasses per day
G. 4 or more glasses per day

16. **During the past 7 days, on how many days did you eat breakfast?**
    A. 0 days
    B. 1 day
    C. 2 days
    D. 3 days
    E. 4 days
    F. 5 days
    G. 6 days
    H. 7 days

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

18. **On an average school day, how many hours do you watch TV?**
    A. I do not watch TV on an average school day
    B. Less than 1 hour per day
    C. 1 hour per day
    D. 2 hours per day
    E. 3 hours per day
    F. 4 hours per day
    G. 5 or more hours per day

19. **On an average school day, how many hours do you play video or computer games or use a computer for something that is not school work?** ***(Count time spent on things such as Xbox, PlayStation, an iPad or other tablet, a smartphone, texting, YouTube, Instagram, Facebook, or other social media).***
    A. I do not play video or computer games or use a computer for something that is not school work
    B. Less than 1 hour per day
    C. 1 hour per day
    D. 2 hours per day
    E. 3 hours per day
    F. 4 hours per day
    G. 5 or more hours per day

20. **In an average week when you are in school, on how many days do you go to physical education (PE) classes?**

A. 0 days
B. 1 day
C. 2 days
D. 3 days
E. 4 days
F. 5 days

21. **During the past 12 months, on how many sports teams did you play? (*Count any teams run by your school or community group).***
    A. 0 teams
    B. 1 team
    C. 2 teams
    D. 3 or more teams
22. **On an average school night, how many hours of sleep do you get?**
    A. 4 or less hours
    B. 5 hours
    C. 6 hours
    D. 7 hours
    E. 8 hours
    F. 9 hours
    G. 10 or more hours
23. **During the past 12 months, how would you describe your grades in school?**
    A. Mostly A's
    B. Mostly B's
    C. Mostly C's
    D. Mostly D's
    E. Mostly F's
    F. None of these grades
    G. Not sure
24. **Where do you MOSTLY eat LUNCH during the school day?**
    A. Cafeteria
    B. Canteen

APPENDIX G.

OPERATION F.L.A.S.H.
FOOD & PHYSICAL ACTIVITY LOGS

Operation F.L.A.S.H.

Name: **Date:** **Class Block:**

FOOD LOG

Write down what you had to eat for the week in the chart below then enter selections into the USDA SuperTracker system.

	BREAKFAST	SNACK	LUNCH	SNACK	DINNER
Monday					
Tuesday					
Wednesday					
Thursday					
Friday					
Saturday					
Sunday					

Operation F.L.A.S.H.

Name: **Date:** **Block:**

Physical Activity Chart

Write down any physical activity and total walking steps completed in the chart below then enter selections into the USDA SuperTracker system.

Day of the Week	Physical Activity
Monday	
Tuesday	
Wednesday	
Thursday	
Friday	
Saturday	
Sunday	