THESIS

HEALTHY HEARTS, HEALTHY LIFESTYLES CLUB: AN AFTER-SCHOOL INTERVENTION TO PROMOTE CARDIOVASCULAR HEALTH IN ELEMENTARY STUDENTS

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ABSTRACT

HEALTHY HEARTS, HEALTHY LIFESTYLES CLUB:
AN AFTER-SCHOOL INTERVENTION TO PROMOTE
CARDIOVASCULAR HEALTH IN
ELEMENTARY STUDENTS

Obesity and its comorbidities play an immense role in the development of cardiovascular disease (CVD). With its reputation as the number one cause of death in the United States, prevention and attenuation of risk factors for cardiovascular disease is of vital importance. Risk factors have been found in children as young as 6 years old, eliciting public health interventions aimed at addressing these risk factors before they develop into adulthood disease. **PURPOSE:** We developed an after-school pilot intervention program entitled Healthy Hearts, Healthy Lifestyles Club at Lopez Elementary School in Fort Collins, Colorado. The goal of this initiative was to educate 4th and 5th grade students on heart healthy lifestyles, including physical activity, dietary behaviors, and stress awareness. We also sought to encourage the students to "educate" their families about these behaviors. **METHODS:** We utilized information gathered from parent and student focus groups to design and implement an after-school program once a week for five weeks for 5th grade students and again for eight weeks for both 4th and 5th grade students. The curriculum consisted of various physical activity games, healthy snack preparation, and lessons on heart health and building leadership qualities to foster heart health knowledge, a necessary precursor to transformation in behavior. Changes in heart health knowledge and behaviors were analyzed through self-reported pre and post-tests given to students and their

parents/guardians. **RESULTS:** A total of 11 students participated in Part I of the program, (Pre-test: n=11 fifth grade students, n=9 parents/guardians; Post-test: n=9 fifth students, n=4 parents/guardians), and 17 students participated in Part II of the program, (Pre-test: n=7 fourth grade students, n=5 fifth grade students, n=10 parents/guardians; Post-test: n=7 fourth grade students, n=6 fifth grade students, n=4 parents/guardians). Students and their parents/guardians showed improvement on several health knowledge and behavior parameters, namely increased recognition of unsaturated fat as a healthier option, (Part I: 33.3% to 44.4% students; Part II: 40% to 60% fourth grade students, 0% to 25% fifth grade students), and enhanced ability to provide examples of saturated and unsaturated fats, (Part I: 50% to 75% parents/guardians; Part II: 66.7% to 100% parents/guardians). Additionally, more participants reported zero days of high fat food consumption, (Part I: 11.1% to 33.3% students, 25% to 50% parents/guardians), more reported eating 5 servings of fruits and vegetables every day (Part I: 50% to 75% parents/guardians; Part II: 80% to 100% fourth grade students, 33.3% to 100% parents/guardians), and performing exercise on additional days of the week (Part II: 60% to 80% fourth grade students). **CONCLUSIONS:** Multi-component after-school programs may be viable channels through which CVD risk factors can be targeted in youth. Tailoring heart health knowledge to promote healthy behaviors in students may elicit improved knowledge and behaviors within the family.

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CHAPTER I

INTRODUCTION

Effectively addressing obesity and its comorbidities are at the focus of a multitude of public health initiatives, and have been for the past several decades (NHLBI, 1998). Interventions to target behavior change are the norm in this arena. Narrowing in on one major disease whose roots can stem from poor health choices is of utmost importance when its risk factors are seen in children.

Cardiovascular disease (CVD) risk factors such as obesity have been seen in children as young as 6-11 years old (Ali et al., 2011). One explanation for this trend stems from the high prevalence of obese and overweight children in the United States. According to the American Heart Association, 31.8% of children ages 2-19 fall into the category of obese or overweight, with 16.9% classified as obese (Go et al., 2013). A major concern is the lack of physical activity among children, which can contribute to the development of CVD. Physical inactivity becomes increasingly more common as children age: 42% of children aged 6-11 admittedly fell short of the guidelines of 60 minutes of moderate or vigorous physical activity at least five days per week in 2009, while 92.0% of adolescents aged 12-15 did not achieve these parameters (Troiano et al., 2008). Additionally, children aged 6-11 were found to have a less than ideal Healthy Eating Index score of 54.7 out of 100, which measured adherence to the 2005 Dietary guidelines for Americans (AHA, 2012).

There are many risk factors that correlate with CVD, ranging from lifestyle to family history. As older children already demonstrate lifestyles that may contribute to CVD risk, it is imperative to target behaviors in children at a younger age, in order to alter the path toward disease and create a greater health span for this generation. Thus, there are many

interventions addressing particular risk factors within this population. These cover a broad spectrum of the social ecological model, working to change individual lifestyles, friendship and familial behaviors, and public policy (Dechman, 2010; Pearson, 2011). Previous and current interventions include in school or after-school programs, such as the San Diego Family Heart Project, which targeted low-income families in order to improve CVD risk at the social and individual level, and the CARDIAC project, a West Virginia initiative which began by offering child screenings, including body mass index, lipid, and blood sugar measurements (Belcher, 2010; Nader et al., 1989; Northrup, Cottrell, & Wittberg, 2008). Stemming from the CARDIAC initiative, the L.I.F.E. (Lifestyle Improvements in the Family Environment) program offered educational items, incentivized student and family programs, and enhanced physical education classes, all through school nurse and teacher collaborations (Northrup et al., 2008). Additionally, a program entitled the Children First Study, offered in a Brazilian school, analyzed the effect of weekly cardiovascular health lessons on the students' parental CVD risk factors, focusing on the link between child knowledge and familial behaviors (Fornari et al., 2013). Ongoing interventions include nationwide initiatives, such the American Heart Association (AHA) and National Football League program entitled NFL Play 60, encouraging schools to increase students' physical activity to the recommended dosage (AHA, 2013a). Another current program, known as Heartpower!, offers classroom-based activities through the AHA to educate students on heart health (AHA, 2013b). Localized initiatives in Northern Colorado consist of the Coalition for Activity and Nutrition to Defeat Obesity (CanDo), providing resources in the form of "toolkits" to promote comprehensive wellness programs in schools, and the Healthy Hearts Club, offering heart health education and screening

programs to students in elementary and high schools (CanDo, 2013; Clark, Hinterberg, & Rodermel, 2009; Dvorak, Puccetti, & Martinez, 2011; UCH, 2012). These interventions demonstrate the school as a fitting environment to address CVD risk factors for the following reasons:

1. Students spend the majority of their time at school
2. The school is already a learning environment
3. Relevant personnel exist in the school (i.e., school nurses and physical education instructors)
4. Other members of the family, such as parents, can be reached through their students (Clark et al., 2009; Fornari et al., 2013; Northrup et al., 2008).

However, much needs to be done when prevalence rates of major CVD risk factors, such as obesity, remain high.

Obesity rates for Colorado children ages 10-17 grew from 9.9% in 2003 to 14.2% in 2007, placing Colorado 23rd out of 50 states (NSCH, 2012). This growth in child obesity prevalence was the 2nd highest in the nation (AHWC, 2012).

To assess the cardiovascular profiles of children and teenagers in Northern Colorado, the Poudre Valley Health System, recently renamed University of Colorado Health, currently provides a screening and intervention program targeted at fourth and tenth grade students. Data from the 2010-2011 school year revealed 12% of fourth graders were overweight, with an additional 9% classified as obese. Intermediate levels of total cholesterol (>170 to 200 mg/dL) were found in 24% of fourth graders, while 4% had high levels (higher than 200 mg/dL) of this parameter. Fourth grade students screened over the past ~20 years have an average of 10.6% exhibiting high cholesterol levels.

Although the most recent year shows improvement from the average, the percentage of students with high cholesterol increased from the 2009-2010 school year (3%). Additionally, analysis of screening data over the years shows 68.2% of children with five risk factors for CVD had an overweight family member.

To address growing obesity rates and unfavorable cholesterol levels among youth in Colorado, we implemented an intervention focused on a comprehensive scope of CVD risk factors among elementary school children. Our program utilized effective practices from both previous and current interventions to create an after-school program designed to educate students about heart healthy behaviors. The initiative launched was entitled Healthy Hearts, Healthy Lifestyles Club, and consisted of the following purpose and hypotheses:

Purpose: The purpose of the Healthy Hearts, Healthy Lifestyles Club is to educate 4th and 5th grade students on heart healthy lifestyles, including physical activity, dietary behaviors, and stress awareness. We also sought to encourage the students to "educate" their families about these behaviors.

Hypothesis 1: Fourth and 5th grade students will show improvements in heart health knowledge and heart healthy behaviors as seen by their self-reported changes from pre-tests to post-tests.

Hypothesis 2: Family members of these 4th and 5th grade students will also show improvements in heart health knowledge and heart healthy behaviors as seen by their self-reported changes from pre-tests to post-tests.

The program utilized feedback from focus groups with parents and students, as well as the theoretical constructs of Social Cognitive Theory and Social Network Theory,

and incorporated a curriculum that was designed to include a mixture of physical activity, nutritious snacking, and heart healthy lessons for fourth and fifth grade students. The methods and outcomes of the Healthy Hearts, Healthy Lifestyles Club are described in detail below, as well as future directions for public health ventures within this population. Collaborative efforts in this field will hopefully reduce the public health burden of cardiovascular disease in Colorado.

CHAPTER II

LITERATURE REVIEW

A. Cardiovascular Disease

Cardiovascular disease (CVD) comprises any disease of the circulatory system, including, but not limited to, stroke, hypertension, heart disease, vein and peripheral artery diseases, and ischemic and pulmonary diseases (Go et al., 2013). A report from the American Heart Association depicts the high prevalence of CVD, indicating 83.6 million, or more than 1 in 3, adults have at least one form of this disease. Almost half of these adults are under the age of 60 (Go et al., 2013). Further dissection of these statistics reveals 77.9 million American adults are hypertensive (systolic blood pressure > or = 140 mm/Hg, and/or diastolic blood pressure > or = 90 mm/Hg, or taking antihypertensive drug therapy), while 31.9 million adults over the age of 20 have high total serum cholesterol levels (> or = 240 mg/dL) (Go et al., 2013).

Mortality reports note CVD (including congenital flaws) was the underlying cause of 1 in 3 deaths in 2009, and it is currently listed as a contributor to 54.6% of deaths in the United States (Go et al., 2013). Cancer fell second to heart disease, which was recorded as the number one cause of death during this year (Kochanek, Xu, Murphy, Minino, & Kung, 2011). The death rate for CVD was 236.1 per 100,000 in 2009, not including those born with congenital deficiencies (Go et al., 2013). It has been estimated that approximately 1 American dies every 40 seconds of CVD (Go et al., 2013).

Furthermore, CVD has contributed to considerable costs, from pharmaceuticals to medical procedures, to lowered productivity, totaling nearly 312.6 billion dollars in 2009, a combination of both direct and indirect costs due to this disease (Go et al., 2013). This is

substantially greater than the year prior, where costs totaled 297.7 billion dollars (Roger et al., 2012). Moreover, heart disease was shown to elicit the greatest costs in 2009, more so than any other chronic condition (Go et al., 2013). Based on a report from the American Heart Association, the costs accrued from CVD are expected to escalate significantly, with an anticipated total of 1094 billion dollars in 2030 (Heidenreich et al., 2011).

Prevalence of three major CVD categories spanned 1.6-8.2% by state and U.S. territories in 2010, according to the Behavioral Risk Factor Surveillance System (Office of Surveillance, 2010). Colorado, although lower than many states, still had a prevalence of 3.2% for myocardial infarctions, 3.1% for angina or coronary heart disease, and 1.7% for stroke (Office of Surveillance, 2010). Prevalence rates of coronary heart disease spanned 3.7-8.2% by state in the same year; Colorado, specifically, had a prevalence rate of 5.0% (MMWR, 2011a). Colorado exhibited a death rate of 136.5 per 100,000 from heart disease and 35.2 per 100,000 from cerebrovascular diseases in 2009 (Kaiser, 2011a, 2011b; Kochanek et al., 2011).

The prevalence of Colorado adults diagnosed with high blood cholesterol levels in 2011 was 33.5%, the lowest out of the U.S. states and territories (BRFSS, 2011). Additionally, they were second only to Utah with the lowest percentage of inhabitants with high blood pressure, at 25.0% (BRFSS, 2011). Costs incurred by Colorado Medicaid patients with hypertension were approximately 132.2 million dollars (in 2007 dollars), not to mention costs for heart disease and stroke, which were 40.9 and 87.1 million dollars, respectively (CDPHE, 2011).

Overall, these rates are favorable in comparison to the rest of the country; however, one quarter to one third of the state's adults present at least one common risk factor for cardiovascular disease. The economic burden is also large, as millions of dollars are spent in care for patients in Colorado. In order to combat this, risk factors for CVD and the manner in which these risks can be controlled must be addressed.

B. Cardiovascular Disease Risk Factors

There are several components that put one at risk for cardiovascular disease. Aside from congenital deformities, these elements range from genetic sources to behavioral and lifestyle choices. The following offer a brief consideration of a few of these factors.

1. Obesity and Overweight

Overweight is defined as a body mass index (BMI) of 25-29.9 kg/m^2 and obesity as a BMI of 30 kg/m2 or greater (ASA, 2010; Go et al., 2013). Additionally, obesity can be further categorized into three classes, with disease risk increasing directly with a higher class number, as shown below (ACSM, 2013).

Table 1: Classification of Disease Risk Based on Body Mass Index (BMI) and Waist Circumference

		Disease Risk Relative to Normal Weight and Waist Circumference	
		Men, < or =102 cm	**Men, >102 cm**
	BMI (kg/m^2)	**Women, < or =88cm**	**Women, >88 cm**
Underweight	<18.5	---	---
Normal	18.5-24.9	---	---
Overweight	25.0-29.9	Increased	High
Obesity, class			
I	30.0-34.9	High	Very high
II	35.0-39.9	Very high	Very high
III	> or =40	Extremely high	Extremely high

*ACSM's Guidelines for Exercise Testing and Prescription, 9th Ed., p. 63

Waist circumference is also associated with health risks as depicted in the table above; fat located around the abdomen, is related to obesity's comorbidities, which will be discussed below (ACSM, 2010, 2013). Men with a waist circumference of 100 cm (39.5 in) or greater and women with a waist circumference of 90 cm (35.5 in) or greater are at increased risk (ACSM, 2013). Furthermore, body composition can be determined via different methods, including skin fold testing, hydrodensitometry, and dual energy x-ray absorptiometry. Body fat percentages obtained through these methods elucidate risk for health issues based on the amount of adiposity one contains. Although ideals for body fat composition are not consistent, generally values higher than 22% for men and 32% for women (based on age) can lead to health risks associated with overweight and obesity (ACSM, 2013).

The prevalence of adults classified as obese in the 2007-2008 NHANES study was 33.8%, and when joined with those in the overweight category, was 68.0% (Flegal, 2010). This same percentage carried over in the NHANES 2007-2010 results; showing no reduction in this epidemic (Go et al., 2013; Landsberg et al., 2013). These data are more objective measures, as this survey incorporates both interviews as well as physical measurements (CDC, 2013). Based on BMI measurements, Colorado residents reported an overweight prevalence of 35.4%, and, although the lowest in the country, an obesity prevalence of 20.7% based on 2011 self-report data from the Behavioral Risk Factor Surveillance System (BRFSS, 2011; Go et al., 2013). In a study done by Finkelstein and colleagues, U.S. obesity prevalence was estimated through the year 2030. Utilizing components such as unemployment rates, availability of fast food restaurants, and prices of healthy food items compared with unhealthy choices, they hypothesized that at best, the

obesity prevalence would be 39.5%, if these variables remained the same (based on 2008 values), and at worst, 50.7%, as seen through a linear regression trend upwards in these variables throughout the years (Finkelstein et al., 2012).

In 2006, the estimated cost of obesity, as paid for by Medicare, Medicaid, and private insurance companies, was $147 billion, based on 2008 dollars (Finkelstein, Trogdon, Cohen, & Dietz, 2009). Each of these entities took on greater costs over an eight-year period, and these costs were associated with a high body mass index (Finkelstein et al., 2009). According to this study, Medicare, Medicaid, and private insurance companies paid out 9.1% per year toward obesity, which was an increase from 6.5% per year in 1998 ($147 billion)(Finkelstein et al., 2009). The greater payout was due to greater obesity prevalence and not specific cost increases during this time (Finkelstein et al., 2009). Additionally, those classified as obese paid $1,429 or 42% more per year in health care costs than their normal weight counterparts (CDC, 2011a; Finkelstein et al., 2009).

Despite eliciting an economic drain, obesity and overweight have been linked to major health consequences, including cardiovascular disease. Obesity has long been shown to predict CVD and has been correlated with coronary heart disease, heart failure, and stroke (CDC, 2011a; Go et al., 2013; Hubert, Feinleib, McNamara, & Castelli, 1983); as well as lead to other risk factors for cardiovascular disease, such as hypertension, dyslipidemia, and insulin resistance (CDC, 2011a; Go et al., 2013). For every 1 kg/m^2 rise in BMI, subjects in the Framingham Heart Study showed a 5% or 7% increased chance of heart failure in men and women, respectively (Kenchaiah et al., 2002; Lavie, Milani, Ventura, & Romero-Corral, 2010).

Higher BMI measurements have been associated with greater hypertension prevalence, which have corresponded to stroke or coronary deaths (Dyer & Elliott, 1989). Additionally, myocardial infarction events and mortality risk from coronary heart disease have been linked to rises in body mass index (NHLBI, 1998).

As previously mentioned, high waist circumference measurements are associated with increased health risk and serve as one criterion to a diagnosis of the metabolic syndrome (Alberti et al., 2009; Silva, Stanton, & Grande, 2013). The metabolic syndrome consists of numerous unfavorable parameters associated with both CVD and type 2 diabetes. These include a high waist circumference measurement; triglycerides equal or greater than 150 mg/dL; high density lipoprotein-cholesterol levels (HDL-C) lower than 40 mg/dL in males and lower than 50 mg/dL in females; hypertension (systolic equal to or greater than 130 mm Hg and/or diastolic equal to or greater than 85 mm Hg); and fasting glucose equal to or greater than 100 mg/dL (Alberti et al., 2009; NIDDKD, 2012). If one does not already have CVD or type II diabetes, a diagnosis of the metabolic syndrome is a risk factor for both diseases (Alberti et al., 2009). However, a diagnostic component of the metabolic syndrome, the appropriate procedure for measuring waist circumference, is still under debate (Alberti et al., 2009; Silva et al., 2013). However, it currently remains one of the five criteria for the metabolic syndrome, as three of the five components must be met to receive a diagnosis of this disease (Alberti et al., 2009).

In order to curb the risks for cardiovascular disease accompanying obesity and overweight, certain steps must be taken. Weight loss has been shown to improve or prevent the onset of certain CVD risk factors (Go et al., 2013). Two important methods to weight reduction include increasing physical activity and improving nutrition: decreasing

caloric intake where necessary and enhancing nutrient density when possible. Physical inactivity, however, is widespread throughout the U.S., as shown below. Altering this can produce a domino effect on health by improving body composition and lowering risk for CVD.

2. Physical Activity

Physical activity has shown to be protective against cardiovascular disease; decreasing the chances of becoming overweight or obese, and lowering body fat percentage or BMI if one is already at risk (Go et al., 2013; Schoenborn & Stommel, 2011). Clear physical activity guidelines became more common following World War II, as a shift from manual labor and a concomitant increase in CVD prevalence occurred (Erlichman, Kerbey, & James, 2002). The 2008 Physical Activity Guidelines for Americans (and the current American College of Sports Medicine guidelines) stated the minimum physical activity for adults should include 150 minutes per week of moderate intensity aerobic exercise, or 75 minutes per week of vigorous aerobic exercise, or a combination of the two; two days per week should include strength training, incorporating seven large muscle groups each day (ACSM, 2010, 2013; Schoenborn & Stommel, 2011). A study by Schoenborn and Stommel showed overall mortality risk was decreased by 27% in those with no previous chronic disease through engagement in 300 minutes of aerobic activity per week. In the same manner, mortality risk was decreased by nearly half (46%) in those with chronic conditions, including CVD (Schoenborn & Stommel, 2011). Risk reduction occurred for those who met the aerobic guidelines of 150 minutes per week, and was improved when the strength training guidelines were also met (Schoenborn & Stommel, 2011). In another study, those engaging in only 30 minutes of moderate exercise for ~seven days per week or

20 minutes of vigorous exercise three times per week had a 27% and 32% lower mortality risk, respectively; even those participating in physical activity but not meeting the recommended guidelines had decreased risk (Leitzmann et al., 2007).

More specifically, physical inactivity has long been recognized as a risk factor for cardiovascular disease, separate from other risk factors (Wang, Pratt, Macera, Zheng, & Heath, 2004). An analysis of coronary heart disease deaths showed even a minor increase in physical activity (2.3%) delayed or averted 17,445 deaths (Ford et al., 2007; Go et al., 2013). A trial performed by Rankovic and colleagues determined physical activity reduced inflammation associated with atherosclerosis (and the progression of coronary heart disease) indicated by C-reactive protein and Vascular Cell Adhesion Molecule-1, even in those who had ischemic heart disease (Rankovic et al., 2009). In a study following those with peripheral artery disease, treadmill and resistance training improved not only brachial artery flow mediated dilation, but the subjects' ability to walk up stairs and achieve a better quality of life (Go et al., 2013; McDermott et al., 2009).

Although the benefits for cardiovascular health obtained from physical activity have been widely shown, many Americans have not met the recommended guidelines. Based on the 2008 criteria for aerobic exercise and the National Health Interview Survey in 2011, 32% of adults were classified as inactive, and 19% were not active enough to acquire health benefits (NHIS, 2011). When addressing combined aerobic and strength training physical activity, only 21% of adults met both criteria, while only a staggering 4% met the strength training recommendations (NHIS, 2011).

High amounts of sedentary activity, or physical inactivity, contributed to increase CVD risk, as well (Go et al., 2013). In a meta-analysis covering 1970 to 2011, two hours of television viewing per day, a sedentary activity, was related to 38 per 100,000 cases of CVD deaths per year (Grontved & Hu, 2011).

The economic cost related to physical inactivity when correlated with CVD is substantial. Not including indirect medical expenses, the cost in 2001 was $23.7 billion (Go et al., 2013; Wang et al., 2004). If physical activity guidelines had been met, that dollar figure would have been used for another purpose. More recently, the lack of physical activity has shown a greater rise in economic payouts. According to the Centers for Disease Control and Prevention, the United States contributed approximately $75 billion annually towards medical bills related to this preventable cause (CDC, 2011b) . Due to the low volume of physical activity and the high prevalence of sedentary activity, CVD, and economic costs, new and improved interventions become necessary to alter these negative behaviors.

3. Nutrition

Healthy weight maintenance, which reduces the risk of obesity and its comorbidities such as cardiovascular disease, is, in its simplest terms, a balance of energy intake and output (Go et al., 2013; Leibel, Rosenbaum, & Hirsch, 1995; Mozaffarian, Hao, Rimm, Willett, & Hu, 2011). Energy intake consists of dietary components, both food and drink that bring energy, or calories, into the body (Go et al., 2013). Energy output is characterized by energy usage for regular bodily processes needed to live (resting energy expenditure), the energy needed to break down and utilize food (the thermic effect of feeding) and other physical activities performed throughout the day (Leibel et al., 1995).

Entities such as resting energy expenditure and amount of fat free mass vary between individuals and also influence whether one is in weight maintenance, or whether the person will gain weight, or lose weight (Go et al., 2013; Mariman, 2012).

As previously discussed, physical activity has been associated with decreased risk for obesity and overweight, as well as risk factors for CVD. This is due to its significant role in energy balance, weight maintenance, and the preservation or increase in fat free mass, which elicits a greater resting energy expenditure value (Go et al., 2013; Leibel et al., 1995; Mariman, 2012). As shown above, however, Americans are severely lacking when it comes to reaching adequate physical activity levels, and the nutrition component is not currently where it should be.

The American Heart Association has determined certain dietary parameters that, if met, constitute a decreased risk for CVD in the realm of nutrition (Lloyd-Jones et al., 2010). The five primary guidelines include the following:

- Consume 4.5 cups or more per day of fruits and vegetables
- Consume 2 or more 3.5 ounce servings per week of fish (more specifically, oily fish)
- Consume 1.1 grams or more of fiber-rich whole grains per every 10 grams of carbohydrate ingested at 3 or more 1 ounce servings per day
- Consume less than 1500 milligrams of sodium per day
- Consume less than or equal to 450 kilocalories (or 36 ounces) of sugar-sweetened beverages per week
  (Lloyd-Jones et al., 2010)

For adults and children to determine where they fall in regards to these guidelines, incorporating 0 or 1 of these nutritional metrics is defined as "Poor", 2 or 3 metrics as "Intermediate", and 4 or 5 metrics as "Ideal" in terms of lowering CVD risk (AHA, 2012).

When the above healthful foods are not consistently part of the diet, other items such as sugary beverages and foods, as well as highly processed foods may displace these cardioprotective nutrients and contribute to a greater energy intake than energy output (Mozaffarian et al., 2011).

According to the 2012 American Heart Association update, only 0.3% of adults met the "Ideal" nutritional criteria, and 20.7% fell within the "Intermediate" category, leaving 79.0% incorporating 0 or 1 of the above guidelines daily (AHA, 2012). The intake of sugar-sweetened beverages indicated 33.3% (White Women) consumed more than the recommended limit, while 75.8% (Mexican American men) went beyond the limit of no more than 36 ounces per week (Go et al., 2013). Only 32.2-55.1% of Americans met the sweets or desserts recommendation of 2.5 servings per week (Non-Hispanic White Women having the lowest percentage and Mexican American Men having the highest percentage) (Go et al., 2013).

Americans show an inverse relationship with the components of energy balance, as their intake exceeds their output. Once again, interventions targeted at altering this equation to prevent a rise in obesity prevalence, resolve risk factors for cardiovascular disease, and aid those already dealing with risk factors or chronic diseases, become imperative. Reducing energy intake while simultaneously raising physical activity levels, and further addressing factors that inhibit proper weight maintenance, should be primary goals of these interventions (Mariman, 2012).

4. Tobacco Habits

Smoking is another behavioral factor related to cardiovascular disease risk. It has been touted as one of the most amendable risk factors, especially when all-cause mortality

is taken into account (Danaei et al., 2009). According to the National Center for Health Statistics, 467,000 deaths were attributable to smoking tobacco in 2005 (Danaei et al., 2009). When seen through the lens of disease, close to one third of deaths associated with smoking were from cardiovascular disease (Danaei et al., 2009; Go et al., 2013). The 2011 Behavioral Risk Factor Surveillance System (BRFSS) found 21.1% of Americans were smokers (BRFSS, 2011). In the same year, Colorado reported a smoking prevalence of 18.3% (BRFSS, 2011). Although these rates rose only slightly on a nationwide level since 2005 (smoking prevalence of 20.5%) and declined in Colorado (smoking prevalence of 19.8%), the fact that one-fifth of the population has maintained smoking habits must be addressed through public health initiatives to eliminate this major CVD risk factor (BRFSS, 2005).

5. Hypertension

Hypertension is classified as a systolic blood pressure equal to or greater than 140 mm Hg and/or a diastolic blood pressure equal to or greater than 90 mm Hg as noted by a doctor two separate times, or the need for antihypertensive medication to keep blood pressure at normal levels (ACSM, 2010, 2013; Go et al., 2013). Well over half of initial heart attacks, strokes, and coronary heart failure are associated with hypertension (69%, 77%, and 74%, respectively) (Go et al., 2013). Every 20 mm Hg increase in systolic blood pressure or 10 mm Hg increase in diastolic blood pressure doubles CVD risk for adults ages 40-70 (ACSM, 2013). This remains true across the blood pressure spectrum of 115/75 to 185/115 mm Hg (ACSM, 2013).

Hypertension was the 13th leading cause of death in the United States in 2010. The death rate from this disease for adults over age 20 was 8.6 out of 100,000; the age-adjusted death rate was 8.0 out of 100,000 (NVSR, 2013).

Across the 2005-2008 NHANES study, 68 million American adults, or 31%, were diagnosed with hypertension (MMWR, 2011b). However, hypertension has frequently gone widely undiagnosed. NHANES data from 2005-2006 reported only 78% of adults were cognizant of their high blood pressure, with men and Mexican Americans as the two groups with the lowest awareness (Ostchega, Yoon, Hughes, & Louis, 2008). Due to the high correlation of hypertension with other CVD events, public health campaigns must be leveraged at those groups especially.

High blood pressure can be both prevented and controlled through the implementation of healthy nutrition measures (as shown above), achievement or maintenance of a normal weight, and a commitment to physical activity (ACSM, 2010, 2013; Forman, Stampfer, & Curhan, 2009). However, abnormal lipid levels are additional elements of the cardiovascular system that must be attended to.

6. Dyslipidemia

Dyslipidemia refers to blood lipid levels associated with increased risk for cardiovascular disease. These include low-density lipoprotein cholesterol (LDL-C) equal to or greater than 130 mg/dL; high-density lipoprotein cholesterol (HDL-C) lower than 40 mg/dL in men and lower than 50 mg/dL in women; total cholesterol levels equal to or above 200 mg/dL; or triglycerides equal to or greater than 150 mg/dL, or the aid of medication to keep lipid levels within healthy ranges (ACSM, 2010, 2013; Go et al., 2013).

Unfavorable levels of LDL-C have been associated with the development of coronary heart disease (Grundy et al., 2004). Low HDL-C numbers have been considered risk factors for heart disease and stroke, although, higher numbers have been deemed negative risk factors; offering protection against cardiovascular disease (ACSM, 2010, 2013; Go et al., 2013). Elevated triglycerides levels have also elucidated greater risk for heart disease and stroke (Go et al., 2013).

According to data compiled by the National Center for Health Statistics, 27.4% of men and women over age 20 reported high total cholesterol levels (240 mg/dL or above or on medication to lower cholesterol) in 2007-2010 (NCHS, 2012). LDL-C prevalence was 28.2% from 2009-2010 National Heart Lung and Blood Institute findings (Go et al., 2013). During the same timeframe, the prevalence of low HDL-C levels was 31% for men and 12% for women (MMWR, 2012). In a 2007-2010 NHANES review, 27% of adults had high triglyceride levels (Go et al., 2013).

When such prominent risk factors for CVD can be controlled through both medical and behavioral changes, and are not eradicated, the direction of public health should point toward interventions, amassing knowledge and diagnosis, and increasing access to treatment (Schober, Makuc, Zhang, Kennedy-Stephenson, & Burt, 2011).

7. Family History

Maternal and/or paternal history of cardiovascular disease is an uncontrollable risk factor for the offspring (ACSM, 2013). Fortunately, the other risk factors previously discussed have a behavioral component that can lower one's chances of a cardiovascular event. However, since family history is a risk factor despite the presence of other risks, it must be addressed (Lloyd-Jones et al., 2004).

In an analysis of the data from the Framingham Heart Study and the Framingham Offspring Study, children of at least one parent who had an early onset cardiovascular event, were more likely to have an event themselves when they reached adulthood (Lloyd-Jones et al., 2004). The criteria of early onset consisted of a CVD event younger than 55 years in fathers or 65 years in mothers; meeting these criteria increased the odds ratio for men to have an event (2.6; 95% CI=1.7-4.1) or women to have an event (2.3; 95% CI=1.3-4.3) (Lloyd-Jones et al., 2004). Another study by Bachmann et al. recognized premature coronary heart disease (onset before age 50) in male subjects from the Cooper Center Longitudinal Study was associated with greater risk for death in their male offspring from the same cause or other cardiovascular diseases (Bachmann, Willis, Ayers, Khera, & Berry, 2012).

Based on the NHANES 2007-2010 survey years, 12.6% of adults older than 20 had either a parent or sibling suffering from a myocardial infarction or angina before they were 50 years old (Go et al., 2013). In Colorado, a 20-year analysis of cardiovascular parameters in fourth grade students revealed significant prevalence of CVD risk factors already established in children, and these were connected to the same risk factors present in their family members (Nelson, Dvorak, Kioussopoulos, & Luckasen, 2012).

In order to combat these risk factors for cardiovascular disease, the American Heart Association created a definition for the term cardiovascular health, wherein both behavioral and medical parameters were given recommended ranges (Lloyd-Jones et al., 2010). Once this was defined, the focus turned toward existing CVD risk factors and preventative actions.

With an emphasis on prevention, it is highly plausible that cardiovascular disease can be avoided (Weintraub et al., 2011). However, risk factors for CVD have been seen in populations as young as fourth grade and earlier (Ali et al., 2011; Dvorak, 2010). Thus, attention must not only be directed toward adults, but to the younger generations in order to reduce the prevalence of this number one killer.

C. Cardiovascular Disease and Children

Cardiovascular disease is rarely present in children; however, the risk factors discussed above find their roots in childhood (Daniels et al., 2012). Recently, the National Heart, Blood, and Lung Institute compiled guidelines regarding prevention and treatment of cardiovascular risk factors in youth. They noted many risk factors for CVD seen in childhood continue into adulthood if behaviors are not changed (Daniels et al., 2012). Thus, they recommended risk recognition and subsequent targeted interventions for youth to alter this trajectory.

For example, obesity in youth has been correlated with adulthood obesity; confirming the need to address this risk factor in childhood. A longitudinal study performed in Bogalusa, Alabama noted body mass index (BMI) measurements as well as triceps skin fold numbers in childhood were related to measurements seen in adulthood (Freedman et al., 2005). Children 2-5 years old and classified as overweight were four times more likely to become overweight adults in comparison to their normal weight counterparts (Freedman et al., 2005). Although elevated BMI measurements in children have been related to risk factors in adulthood, especially in the obese category, these measurements are limited, as they say nothing of actual adiposity. Those falling within the overweight category as children have not shown such clear trends in the development of

risk as adults. Thus, this team analyzed children who also had waist to hip ratio data collected; those with intermediate or high measurements had even greater odds ratios of developing risk factors as adults (Freedman, Dietz, Srinivasan, & Berenson, 2009). These results showed more defined relationships between childhood adiposity and adulthood CVD risk factors, such as dyslipidemia and hypertension (Freedman et al., 2009).

There are still gaps, however, in the literature to elicit the meaning of body composition measurements in children. It is recommended, when possible, to collect BMI, skin fold, and waist circumference information, as each of these methods can produce different information on adiposity. However, the charts for youth BMI, delineating underweight, healthy weight, overweight, and obese, must be used to classify youth for the time being, as classifications for waist circumference and skin fold measurements have not yet been fully defined for children (Pate, Oria, & Pillsbury, 2012).

Based on the most recent NHANES data, the prevalence of obese 6-11 year olds was 18.0%, according to BMI measurements (Fryer, Carroll, & Ogden, 2012). This was a significant rise from decades previous, where the same age cohort had an obesity prevalence of 6.5% in the 1976-1980 NHANES study (Fryer et al., 2012).

Obesity in children is classified as falling above the 95th percentile for age and gender (Daniels et al., 2011). This is an obvious risk factor that must be addressed in youth, targeting behavioral habits that may lead to the continuation of obesity into adulthood.

Interventions have focused specifically on physical activity and nutritious eating habits. According to accelerometer data in the 2003-2004 NHANES survey, only 42% of students age 6-11 met the guideline of 60 or more minutes per day of moderate to vigorous

physical activity (Troiano et al., 2008). There was a decline in these numbers as age increased, possibly contributing to adverse CVD risk factors that continue into adulthood, as physical inactivity has been found to be a stand-alone risk factor for CVD events (Go et al., 2013; Yusuf et al., 2004). Eight percent of teens adhered to 60 minutes of physical activity per day, and fewer than 5% of adults participated in 30 minutes of physical activity per day (Troiano et al., 2008). Additionally, no children met the ideal healthy diet requirements outlined in the previous section, based on NHANES 2007-2008 data (AHA, 2012). Only 8.5% achieved "Intermediate" scores, leaving 91.5% of children falling into the "Poor" category for a healthy diet (AHA, 2012).

Along with lifestyle interventions focused on physical activity and nutrition, tobacco resistance education should be prominent in interventions for children. Statistics reports from 1999-2004 showed 24.0% of students age 12-17 had smoked an entire cigarette at least once, and the majority tried their first cigarette between ages 11-14, with some starting as early as age 10 or younger (Fryer, Merino, Hirsch, & Porter, 2009). Additionally, 13.0% of these students had smoked within the past 30 days when they answered this survey (Fryer et al., 2009).

As seen above, tobacco usage greatly increases the risk for CVD, and providing young students with the health knowledge and benefits of refraining from tobacco could eliminate this serious risk factor. Because students report smoking habits as early as age 10 or younger, interventions in these earlier age groups may prove beneficial (Fryer et al., 2009).

In addition to behavioral risk factors, children have presented other risks such as high blood pressure or dyslipidemia. In a study analyzing several CVD risk factors present in teenagers, high LDL-C and blood pressure, along with smoking and high BMI, were correlated with carotid artery intima-media thickness they presented in adulthood (Raitakari et al., 2003). This has shown to be a precursor to further coronary artery disease, portraying the pathogenesis of CVD beginning early in life (Raitakari et al., 2003). An additional study by this group noticed every 10 mm Hg rise in blood pressure in childhood was related to a 0.008 mm growth in thickness (Raitakari et al., 2009). Even non-HDL assessments in youth have been associated to this increased risk in adulthood (Frontini et al., 2008). This measurement took total cholesterol minus HDL-C, and served as a notable risk factor for coronary artery disease in adulthood (Frontini et al., 2008).

Although the majority of children showed "Ideal" levels of total cholesterol and blood pressure measurements according to 2007-2008 NHANES data, 24.8% and 17.7% of children still fell in the "Intermediate" or "Poor" categories for total cholesterol and blood pressure, respectively, proving the need for interventions addressing these less than optimal numbers (AHA, 2012).

Finally, a history of CVD events, as well as risk factors, within the family must be addressed for children. In a 20-year analysis of CVD screenings of youth in Colorado, 68.2% of those who presented five out of six risk factors had an overweight family member and 24% had a family member who smoked, exhibiting a direct relationship between the number of risk factors seen in both children and their family members (Nelson et al., 2012).

D. Previous and Current Interventions

To address cardiovascular disease risk factors in both adults and children, AHA created goals to achieve by the year 2020. These goals included a 20% reduction of deaths attributable to CVD and stroke, as well as a 20% increase in cardiovascular health status (as defined below) across the country (Go et al., 2013). To obtain these aims, the AHA and the American Stroke Association (ASA) put forth "Life's Simple 7" to help Americans measure where they fall in their quest to achieve cardiovascular health (ASA, 2010). These seven components were designed for both adults and children, addressing tobacco usage, BMI, physical activity, healthy diets, total cholesterol, blood pressure, and fasting glucose measurements (ASA, 2010). For each component, one could determine if they fell into the "Poor", "Intermediate", or "Ideal" category (ASA, 2010). Life's Simple 7 is an easy way for Americans to quickly determine their health status; however, their measurements for each of these categories must be known. Interventions offering measurements and education about the meaning of each parameter then become necessary.

Previous interventions have attempted to do this, through targeting different risk factors for cardiovascular disease, such as obesity, physical inactivity, and unhealthy eating. However, many of these programs addressed only these specific risks, rather than their relation to the broader scope of cardiovascular disease development.

Numerous CVD events were linked to atherosclerosis, a process begun in early childhood; these included stroke, heart attack, and peripheral artery disease (Daniels et al., 2011). Several risk factors observed in childhood were linked to a more rapid expansion of atherosclerosis and consisted of elevated lipid, blood pressure, and BMI measurements (Berenson et al., 1998).

Although linked, these risk factors do not exclusively lead to cardiovascular disease, but the reduction or primordial prevention of these elements early in life may protect against CVD events in adulthood (Daniels et al., 2011). Since risk factors can be assessed in children when atherosclerosis is minimal, comprehensive interventions aimed at addressing many risk factors in youth become essential to preventing adult CVD events. However, knowledge gained from a review of interventions that targeted only one risk factor was still influential in the development of our intervention, as successes and failures of each program were taken into account.

A recent analysis on several types of physical activity intervention programs and their outcomes revealed startling results. These interventions all utilized accelerometers as an objective way to track children's physical activity throughout the day. Together, these programs only succeeded in children performing an extra ~4 minutes per day of physical activity (Metcalf, Henley, & Wilkin, 2012). Although there were many different types of physical activity interventions examined, both home and school based and those that included family members and behavioral change models, changes in physical activity levels were meager (Metcalf et al., 2012). One such intervention by Kriemler and colleagues included two addition physical education classes and although school day activity levels improved for children, they showed no statistically significant improvements in all-day physical activity levels (Kriemier, 2010). Another intervention performed by Taylor and collaborators worked to increase physical activity levels through "community activity coordinators," who worked to get children moving more during the school day and afterwards (Taylor, 2007). Although students had higher physical activity levels than control schools after one year, this did not persist after year two (Taylor, 2007).

Another review of physical activity interventions found similar results, however it stated the fewer schools used in an intervention (i.e., the lesser the scope of children targeted at once) the more effective the program, according to BMI measurements (Heitmann, Koplan, & Lissner, 2009).

An experiment that analyzed children's eating behaviors in the U.K. deemed more fruits and vegetables were consumed at school and in day care settings, potentially due to the controlled environment and the eating regulations placed on those institutions (Mak et al., 2012). Another intervention that was hosted within the school system succeeded in curbing the overweight incidence rate in experimental schools as opposed to control schools: 7.5% compared to 14.9%, respectively, after two years (Foster et al., 2008). This intervention was employed within 5 elementary schools, and consisted of a holistic approach, starting with a school-wide health analysis performed by the teachers, administrators, parents, and so forth. It then incorporated dietary education for the students, school staff and family dietary education training, marketing throughout the school, and incentives for the students, ranging from bicycles to calculators, won through a raffle drawing (Foster et al., 2008). Due to success seen from interventions performed within the school system, our program sought to provide education about healthy eating behaviors in the school environment.

One current program created by the National Heart Lung and Blood Institute, under the umbrella of the We Can! Initiative to increase physical activity and healthy eating in children came under review. The program is called CATCH (Child and Adolescent Trial for Cardiovascular Health) Kids Club and consists of a physical activity and healthy eating program to be implemented in after-school settings by educators. The curriculum is touted

to be easy to implement. However, assessment of the program sites revealed no increases in consumption of high fiber cereals or whole wheat breads and moderate physical activity performances (NHLBI, 2007). The majority of students (85%) participated in moderate physical activity at the outset of the intervention; and there were no changes to this percentage when outcome evaluations were performed. Additionally, this program did not see any screen time reductions and out of 154 health aspects tested, only 34 showed significant changes (NHLBI, 2007). Unfavorable results from this program could be related to those implementing the program. The curriculum may not be as easy to teach or understand as it has been advertised to be. Also, evaluations at these sites were not uniformly or routinely conducted and were mainly from self-reported data. Future programs can learn from these oversights and incorporate adequately trained personnel, as well as a rigid program evaluation timeline.

Although the school has been touted as a beneficial place to target health parameters in youth, there are certain advantages and obstacles in implementing programs either during the school day or in an after-school setting. In-school programs may reach more students, as poor attendance would not be an issue (Yin et al., 2005; Madsen et al., 2009). Students are already in the school environment, thus the program does not have to recruit participants and may be able to target more students at once. Additionally, this type of program does not take away from other after-school activities that may be beneficial to the student, such as participation on a sports team. However, the advantage of the after-school program is that it does not interfere with already defined curricula, and teachers do not have to concede their time with the students during the school day (Madsen et al., 2009). Additionally, the after-school program may prove beneficial when

the target audience is minority children. Two studies in particular showed lower BMI z-scores for those participating in after-school programs (Madsen et al., 2009; Choudhry et al., 2011). One study for African American children in Chicago, entitled Power-Up, offered dietary and physical activity lessons and allowed parents to be involved in lessons as they arrived to pick up their children (Choudhry et al., 2011). The other study, which incorporated several minority groups in an already established after-school soccer program, saw excellent attendance rates (ranging from 84-90%), and saw a decline in obesity prevalence (33% down to 27%) (Madsen et al., 2009). This offers the suggestion that community-based initiatives aimed at activities students already enjoy, may prove as beneficial environments for public health initiatives (Madsen et al., 2009).

E. What Needs to Change

As stated in the previous section, programs implemented within the school and focused on impact with less children targeted at once, rather than outreach to many students, proved to be most successful. We designed a pilot program that was hosted at the school, but occurred after school hours in order to complement, rather than take away from, normal school activities and lessons. Additionally, based on the CATCH initiative, the following program sought to promote standardized program evaluation, both at the beginning and at the end of each installment of the project.

In order to aid future efforts, the low average physical activity increases in the meta-analysis above must be addressed. Our intervention added one specific novel focus to the after-school based program: peer mentoring. None of these programs reviewed suggested the presence of a peer-mentoring component, and this could be a lacking entity.

There has been a strong effect of peer relationships and social networks on behavior, as described in the following section, and programs must leverage this knowledge to be successful (Christakis & Fowler, 2009; Fowler & Christakis, 2008).

1. Theoretical Models

Many health initiatives have their roots in theories of behavior. Why do people do what they do, and how can that be changed for the better? Programs then will blend psychological, sociological, and anthropological studies into their design.
The expectation is that these disciplines will enable health promoters to approach problems with an effective framework, thus aiding the success of their programs.

A widely used theoretical basis for many prevention programs is the Social Cognitive Theory (SCT). SCT has components of both individual and social influences on behavior. Self-efficacy is a major factor that SCT addresses. Self-efficacy is the perceived ability or confidence one has to achieve a given goal or aim (Bandura, 1989; Edberg, 2010). When addressing health behaviors, self-efficacy plays a role in one's ability to make a healthy decision. Several factors influence self-efficacy, and this is where the social aspect of the theory comes into play. Modeling behaviors shown by others, receiving positive feedback from peers or leaders, and watching others succeed all help someone to have the self-efficacy to perform the same action. The atmosphere of an after-school club can develop the students' self-efficacy to make healthy choices. Watching and modeling after fellow peers as well as the club's facilitators could help students feel enabled to make positive choices outside of the club environment. Also, receiving rewards or incentives as well as encouragement for healthy behavior choices could empower students to recognize their ability to make these choices on their own.

Another model gaining attention in health promotion programs is the Social Network Theory (SNT). The premise of SNT is that "relationships between and among individuals are important, as is how the nature of those relationships influences beliefs and behavior" (Edberg, 2010). Essentially, those in one's social group, whether friends, family, etc., will influence behaviors, (including health behaviors) both good and bad. This theory, then, is useful for programs seeking to create relationships and an atmosphere fostering healthy behaviors with peers who influence each other in a beneficial manner. SNT focuses on the influence one's social group has on their behaviors and is recently becoming a target of both epidemiological studies and public health program planning (Christakis & Fowler, 2009). When analyzing social networks, there are key people who are more connected and have greater influence over the social group than others. If public health programs are targeted to these individuals, the "spread" of healthy behaviors is more likely to occur, according to this theory (Christakis & Fowler, 2009; Fowler & Christakis, 2008).

Interconnected with the Social Network Theory, is the concept of peer mentoring. Several studies have shown that those within one's social group, especially the closest ties (siblings, friends, spouses, and parents), have considerable influence over each other. More specifically, these analyses have revealed the likelihood of becoming obese, the adoption of eating patterns, and the implementation of sedentary behaviors were linked to close social network ties (Andrews, Silk, & Eneli, 2010; Christakis & Fowler, 2007; Pachuki, Jacques, & Christakis, 2011). Another program, known as the TEENS study, utilized peer leaders in the 7th grade to help teach healthy eating behaviors to their classmates and found students appreciated opportunities to lead (Story, Lytle, Birnbaum, & Perry, 2002). More comprehensive findings showed peer leaders helped fellow 6th grade students raise their

physical activity levels, with significant increases in female students (Barr-Anderson et al., 2012). Similarly, a study evaluating the effect of social networks in elementary school children found students tailored their personal physical activity behaviors based on the actions of their friends (Gesell, Tesdahl, & Ruchman, 2012). Additionally, a study performed within a wide age range of Canadian students employed 4th-7th grade student to be "Healthy Buddies" for Kindergarten through 3rd grade children. The older students were first taught about healthy eating, physical activity, and appropriate body image; then they taught these messages to their younger counterparts. They also participated in physical activities with the younger students. Within a year, the older students had lesser weight gains than a control group of the same age, and both older and younger cohorts demonstrated enhanced knowledge and viewpoints about healthy behaviors (Stock et al., 2007). The addition of peer mentoring to SNT in health promotion initiatives can further establish a social norm of healthy behaviors, which the students could take with them after completion of an intervention.

Working to involve the family in the intervention is an additional goal. A few studies have incorporated this aspect into their programs. The Power-Up program for Chicago youth, referred to previously, gave parents and their children homework assignments based on the lessons the students learned at the after-school program (Choundhry et al., 2011). Parents BMI z-scores dropped, however they did not attend many functions offered to the entire family (Choundhry et al., 2011).

The Children First Study in Brazil targeted parental cardiovascular risk factors through an educational intervention with their children during school and found those with children in the intervention significantly decreased their risk, especially in the intermediate/high risk group: 91% dropped out of this category in the intervention group as opposed to 13% in the control group (Fornari et al., 2013). Thus, children may be conduits through which their parents can be reached.

2. Healthy Hearts Club

The Healthy Hearts Club project began in 1993, initiated by cardiologist, Dr. Gary Luckasen. The club consists of a four-day intervention in several Northern Colorado elementary and high schools, spanning four school districts. Schools with high rates of students on free and reduced lunch programs are the primary target for this intervention. The first three days in the elementary schools comprise the educational component, where health professionals lead lessons on healthy eating, physical activity, tobacco avoidance, and lipid profile components. Health providers offer blood profile screenings on the fourth day and gather BMI measurement data. Through this, they determine the presence of such CVD risk factors as high total cholesterol, high total cholesterol/HDL ratios, high blood pressure, and family members presenting risk factors for CVD.

Information garnered from these screenings are compiled into yearly reports, enabling the health professionals to capture developments over time and comparisons of children tested in both fourth and tenth grade. Data from the 2010-2011 school year revealed 12% of fourth graders were overweight, 9% were obese, 24% had intermediate levels of total cholesterol (>170 to 200 mg/dL), and 4% had high levels (higher than 200 mg/dL) of this parameter. Additionally, of all fourth grade students screened by the

Healthy Hearts Club over the past ~20 years, an average of 10.6% exhibited high cholesterol levels. Although the most recent year shows improvement from the average, the percentage of students with high cholesterol increased from the 2009-2010 school year (3%). Additionally, analysis of screening data over the past two decades show 68.2% of children with five risk factors for CVD had an overweight family member. Thus, the current intervention was designed to offer additional education to children who participated in the Healthy Hearts Club, as an initial step to curbing these adverse risk factors.

CHAPTER III

METHODS AND PROCEDURES

A. Development of the Intervention

1. Focus Groups

Fourth grade students from Bauder (Fort Collins, Colorado) and Sara Milner (Loveland, Colorado) who participated in the Healthy Hearts Club in the 2010-2011 school year and were found to be at risk for cardiovascular disease based on the screenings for lipids, blood pressure, and body mass index (BMI) were invited, along with their families, to focus groups. "At Risk" was defined as a BMI higher than the 85th percentile for age according to the Centers for Disease Control BMI calculator, blood pressure higher than the 90th percentile (based on age, sex, and height) or equal to or higher than 120 mmHg systolic or 80 mmHg diastolic blood pressure, or total cholesterol higher than 170 mg/dL. We also included students who reported a family history of elevated cholesterol or blood pressure, overweight, obesity, or diabetes, family members who smoke, or students who eat fewer than five servings of fruit and vegetables each day. The purpose of these groups was to garner feedback directly from the most at risk population about what type of intervention they would be willing to participate in so as to ensure a more successful intervention. Once this occurred, we could then open the intervention up to children at all risk levels, so as not to target only those with the greatest risk.

We conducted three separate focus groups among these at-risk families at both schools. The focus groups consisted of Dads (N=7, N=8), Moms (N=9, N=10), and children (N=10, N=11) and were conducted in November 2011 and February 2012, respectively.

The focus groups revealed the families were busy and would not have time to attend an intervention; however, they wanted their children to be involved in something focused around healthy eating and exercise that was offered at the school.

Based on this feedback, our goal was to design an intervention that would be housed at the school. Because the families indicated they did not have time for an intervention, we wanted to design a program that would include the children as change agents within the family so as not to lose an opportunity to educate the entire family.

B. Population

The population targeted in this pilot intervention program included fifth grade students in Lopez Elementary School in Fort Collins, Colorado. Lopez has worked in conjunction with the University of Colorado Health by offering CVD screenings to their students as fourth graders. Additionally, students at Lopez elementary school participate in The Leader in Me initiative, promoting leadership skills and mentoring opportunities for students (Covey, 2012; Lopez, 2012). Further, Lopez elementary school feeds into Rocky Mountain High School in Fort Collins, where 10% of students qualify for free or reduced lunches (NCES, 2013). This allows for the possibility of future peer mentoring partnerships with high school students who may have similar socioecological determinants as these elementary students.

Focusing on fifth grade students for this program enabled educational review of healthy cardiovascular lifestyles they received as fourth graders when exposed to the Healthy Hearts Club. Fifth graders could participate in the program whether or not they had received screenings from the Healthy Hearts Club as fourth graders. This insured both those at risk for CVD were included, as well as those not (yet) displaying risk factors. At the

outset, the program targeted fifth graders, and during the following semester, incorporated fourth graders as well. At this point, the fifth graders could serve as healthy lifestyle mentors to their younger peers.

1. Ecological Determinants

Lopez Elementary School students are exposed to a variety of social factors that may influence the adoption or rejection of healthy behaviors. A major social influence affecting Lopez Elementary School students is the Leader in Me campaign. This is a nationwide program adopted by several schools that incorporates leadership qualities into every aspect of learning. The students are taught the principles of the 7 Habits of Highly Effective People book through a three-year plan. During first year, the students are trained to be leaders, the second year allows them chances to apply those skills, and the third year consists of personalized consultations to elicit a broad impact beyond the schools (Covey, 2012). This atmosphere of leading and mentoring already present at Lopez makes it a great place to implement a new program. If these leaders can adopt this program and make healthy lifestyle changes, then they may be able to create a new culture of healthy living they carry into adulthood. As social scientists Fowler and Christakis note, when determining where to begin an intervention, especially if money is limited, it may be beneficial to do so with people who are prone to influencing others (Fowler & Christakis, 2008).

The political tone surrounding Lopez Elementary School consists of a team effort approach. When deciding on enrichment and after-school club programs to offer, the principal receives input from parental and student groups, as well as staff members. Parents are encouraged to aid in decision-making efforts that affect their children, creating

an expectation of family involvement. The ideal the staff upholds is a mantra of "Leaders today…leading tomorrow!" (Lopez, 2012). The staff and parents at Lopez more readily accept suggested extracurricular programs that coincide with this major priority of the school.

The demographics at Lopez Elementary School allow for a suitable assessment of differing groups. Race and ethnicity data from the 2011-2012 school year stated 73.56% of students were white, 2.36% were black, and 15.18% were Hispanic (Lopez, 2012). Additionally, 24% of Lopez students were eligible for free and reduced lunches (NCES, 2012).

C. Intervention

Based on the preceding assessment performed by the Healthy Hearts Club and results from the focus groups, an after-school program with the title Healthy Hearts, Healthy Lifestyles Club was implemented. The program was initially targeted to fifth grade students. This occurred for five weeks, and then the fourth grade students were invited to the club for an additional eight weeks of the same school year, with Phase I occurring October 16 through November 13, 2012 and Phase II occurring in January 22 through March 12, 2013. The purpose of the initial implementation with fifth grade students was to educate them of the factors that keep their hearts healthy, and prepare them with leadership skills to mentor the younger fourth grade students. Housed in the theoretical frameworks of SCT, SNT, and peer mentoring described above, this program utilized the influence of these fifth grade students to advocate healthy behaviors to their fellow peers, as well as younger students in the fourth grade.

As previously stated, these students had experience in learning and adopting leadership qualities, and this after-school program worked in conjunction with their curriculum by offering an outlet to practice leadership. Additionally, the significant amount of students qualifying for free and reduced lunches, as well as the range of ethnicities at Lopez allowed for the possibility of a heterogeneous group of participants.

1. Pilot After-School Program, Part I

During the first phase of the study, the after-school program was implemented one time per week for 65 minutes and offered to all fifth grade students. They could join whether or not they had received screenings from the Healthy Hearts Club as fourth graders so all children had access to this learning opportunity. Fifth graders were recruited though flyers and small presentations in the classrooms by program facilitators, as well as posters advertising the club present in their hallways. An example of a recruitment flyer is located in Appendix A. Parental and student consent forms were signed and returned, as well as information on student food allergies and transportation home after the program. These were obtained at the outset of the first day of the intervention. Students and at least one parent or guardian completed written pre-tests, addressing questions of current diet status and education, as well as comprehension of healthy lifestyle behaviors. The test can be viewed in Appendix B. The pre-tests were developed by the University of Colorado Health for their Healthy Hearts Club program and utilized again for this study. Students completed these before activities ensued the first day of the club. Students brought the parental tests home that evening and returned them at the club session the following week. There were two club facilitators, which consisted of one graduate student and one undergraduate practicum student.

The curriculum was designed to include a mixture of physical activity, nutritious snacking, and heart healthy lessons. A teacher and former graduate student in Health and Exercise Science, as well as the graduate student facilitator, created the curriculum. Furthermore, lessons on building leadership qualities and moments to engage in peer mentoring were presented. The 65 minutes of each club meeting included at least 10 minutes of physical activity. These activities incorporated several methods of movement, game-playing, and sporting events to allow children a comprehensive view of physical activity and offer suggestions for integration of physical activity in their daily lives. One example was a Card Walk game, where students completed laps around the playground, receiving a playing card at the completion of each lap. At the end of the allotted time, they totaled the cards received (numbered cards equal the points they were worth, face cards were ten points apiece) to determine the winner.

A day at the program also included a healthy snack time. These consisted of healthy snacks brought in for the students, or a time where they were given ingredients to create their own snacks. For instance, students were given peanuts, almonds, raisins, dried apples, cinnamon, and dark chocolate chips and were able to create their own trail mix.

Additionally, students learned different ways to keep their hearts healthy and reduce cardiovascular disease risk. This occurred through different activities or small lessons taught by the program facilitators or to each other by the students themselves (and directed by the program facilitators). These included MyPlate lessons that taught the different food groups and serving sizes of each, as well as ways students could eliminate sugar from their diets.

Students incorporated daily club norms, which were sayings created by the students to remember what was discussed that day in the class. These included sayings such as "If you exercise right, your heart rate will go up," (an actual club norm created after discussing target heart rate and exercise intensity).

Students also learned about leadership qualities and how these related to keeping themselves healthy, as well as helping others achieve healthy lifestyles. Characteristics such as perseverance and confidence were discussed and students gave ideas as to how these can affect healthy behavioral choices.

Finally the students received a take-home activity each week to perform with their family members. They returned these each week for an incentive, which will be discussed below. These activities included creating a family obstacle course and implementing a family fruit and vegetable taste test. They were aimed to help students incorporate what they learned at the club into their actual lives, as well as initiate discussions with parents and other family members on how to live in a healthier manner.

The students received incentives for club attendance, returning completed take-home activities, winning physical activity games, or for excellent participation, defined by paying attention and attempting to answer questions during the lessons. They received a sticker for each of these, and at the conclusion of the five weeks, those with the highest sticker amounts received prizes, such as healthy snacks, tote bags, and recipe booklets.

The club members and the facilitators hosted a Family Fun Night at the end of the five weeks with the fifth grade students. The concept of the Family Fun Night was to engage parents, siblings, and other family members who were invited to attend, in order to reach the family through their students as demonstrated in the Children First Study

(Fornari et al., 2013). A flyer to announce the Family Fun Night is included in Appendix E. There were 12 in attendance, including club and family members. These club members led stations that addressed the lessons they acquired throughout the club, and family members had the chance to gain additional knowledge and ideas to implement healthy lifestyles at home, and students had the opportunity to explain the information they had gained. There was also an award ceremony during the Family Fun Night, where all club members received a small prize, and those with the most stickers received additional prizes.

On the final day of the club (Week 5), students took a post-test to assess differences between baseline and post-intervention knowledge. They brought the test home for the parents to assess if changes in knowledge were disseminated to the family, not only the club participant. Parents were instructed to bring these completed tests to be collected at the Family Fun Night. They were also given postmarked envelopes in case they failed to return the tests as aforementioned.

2. Pilot After-School Program, Part II

With the second phase of program implementation, all fourth graders at Lopez Elementary School were invited to participate, regardless of participation in the Healthy Hearts Club screenings. Recruitment flyers were given again to all fifth grade students, as well as fourth grade students. The same consent form process was implemented with the students and their parents or guardians. These were also obtained at the outset of the first day of the intervention.

This phase lasted for eight weeks, and there were three club facilitators, with the addition of a second undergraduate practicum student, to aid with a greater number of students in the club. This time, students brought their pre-tests home to allow more time

for activities during the first after school session, and there were instructions for the parents to refrain from aiding their children on the tests. Parents were given a pre-test to complete as well, and students returned these to the club facilitators. Part II of the program was similar to Part I, lasting 65 minutes, once a week, with the inclusion of physical activities, healthy snacks, leadership quality discussions, and lessons on creating and keeping a healthy cardiovascular system. An example of the weekly curriculum is available in Appendix D.

Additionally, Part II included the initiation of mentors, or as they were described to the students, "buddy groups". This was to incorporate the unique aspects of Social Network Theory, through the further development of social ties. These were cohorts of two or three children, with at least one fifth grade student in the group. The students were placed in these groups through input from the fifth grade students as well as the club facilitator's discretion, in order to include "personal connection," which has been seen as vital to mentoring relationships (Straus, Johnson, Marquez, & Feldman, 2013). The students would meet in these groups at various points during the club meeting times, for pursuits ranging from discussion of take-home activities, to trivia teams, to groups for physical activities. The goal was to create environments where excitement about healthy activities and leadership from the fifth grade students in this manner could foster healthy lifestyles as social norms within this particular social group (Bandura, 1989; Christakis & Fowler, 2009; Fowler & Christakis, 2008).

Incentives were rewarded at the midpoint (after four weeks) and again at the end of Part II of the club for students with the most stickers. Stickers were acquired for the return of student and parent pre-tests, take-home activities, club attendance, and contest

achievements. This second set of incentives was distributed at another Family Fun Night, where parents and siblings were invited to attend. There were 15 in attendance, and once again, club participants instructed their family members on the lessons learned in the club in the form of different stations, including healthy heart activities, healthy snack making, and physical activity sessions. A list of the activity at each station is provided in Appendix F. Incentive prizes included small toys, calculators, canvas bags, and healthy snacks.

On the final day of the club (Week 8), students once again completed post-tests to assess differences between baseline and post-intervention knowledge. Tests were sent home for parents to complete and return as previously mentioned in Part I.

D. Analysis

Descriptive analysis of the pre and post-tests for both students and their parents/guardians for Part I and II of the intervention was performed using SPSS (version 21). We did not conduct tests of significance for these results due to the low power of this pilot study.

CHAPTER IV

RESULTS

There were 11 student participants in Part I of the Healthy Hearts, Healthy Lifestyles after-school intervention. There were more females than males (n=6 and n=5, respectively). All students completed pre-tests and nine of the 11 (n=5 female, n=4 male) completed post-tests, as two students were absent from the club on the final day. Nine of the students' parents/guardians completed pre-tests (n=7 female, n=2 male) and four completed post-tests (n=3 female, n=1 male).

There were initially 12 students at the start of Part II of the Healthy Hearts, Healthy Lifestyles club, with two additional students joining on week two, and three additional students joining on week three for a total of 17 participants. Five fifth grade students from Part I also participated in Part II. Pre-tests were sent home with the students in this phase, and we had 12 students return these tests (5^{th} grade students: n=4 female, n=1 male; 4^{th} grade students: n=5 female, n=2 male). Student post-tests were once again completed on the final day of the club, and 13 students completed these (5^{th} grade students: n=4 female, n=2 male; 4^{th} grade students: n=5 female, n=2 male). Due to multiple discipline issues occurring during the school day and at the after-school club, two students were not allowed to complete Phase II, as the school's principal prohibited them from doing so. Ten of the students' parents/guardians completed pre-tests (n=6 female, n=2 male, n=2 missing) and four completed post-tests (n=3 female, n=1 male).

The pre-tests and post-tests were the same test given at both the beginning and end of each session of the club (Part I and Part II). The same test was given to both parents or guardians and children. The tests consisted of multiple choice, true or false, fill in the blank questions, and ranked questions, as well as a diet and exercise behavioral questionnaire. The questions are listed in the under the Pre-Test/Post-Test questions in Appendix B.

A. Pilot After-School Program, Part I

The percentages of correct and partially correct answers are listed below for Part I children in Table 2. The ranked questions had participants check their perceived status of health and their level of stress. The student responses for these questions can be found in Figure 1.

Student responses to the behavioral questions are shown in Figures 2 and 3. Students recorded how many days of the past week included eating high fat foods, high sugar foods, drinking sugar-sweetened beverages, eating 5 servings of fruits and vegetables, exercising 60 minutes each day, experiencing second-hand smoke, and eating breakfast. All behavioral questions are listed on the y-axis and display the number of days each behavior was performed the week prior and how many students performed each behavior.

Responses for Part I parents/guardians are listed in the same manner, shown below in Table 3 and Figures 4, 5, and 6. Due to the different numbers of students and parents/guardians taking the pre-test and post-tests, the percentages of those who took both are shown in Appendix C. Percentages trend similarly for those who completed both tests as the percentages listed below.

Table 2: 5th Grade Students Pre and Post-Tests, Part I

Question	Frequency (n)	Correct (%)	Partially Correct (%)
1	11	63.6	---
1P	9	88.9	---
2	11	81.8	---
2P	9	88.9	---
3	11	100	---
3P	9	100	---
4	11	36.4	---
4P	9	22.2	---
5	11	9.1	---
5P	9	11.1	---
5a	11	0	9.1
5aP	9	0	0
6	11	27.3	---
6P	9	44.4	---
6a	11	0	0
6aP	9	0	0
7	11	0	0
7P	9	11.1	0
7a	11	9.1	0
7aP	9	44.4	0
8	11	18.2	63.6
8P	9	22.2	44.5
8a	11	18.2	36.4
8aP	9	22.2	55.6
9	11	81.8	---
9P	9	66.7	---
10	11	81.8	---
10P	9	100	---
11	11	90.9	---
11P	9	100	---
12	11	27.2	27.3
12P	9	11.1	66.7
13	11	36.4	27.2
13P	9	11.1	44.5
14	11	81.8	---
14P	9	66.7	---

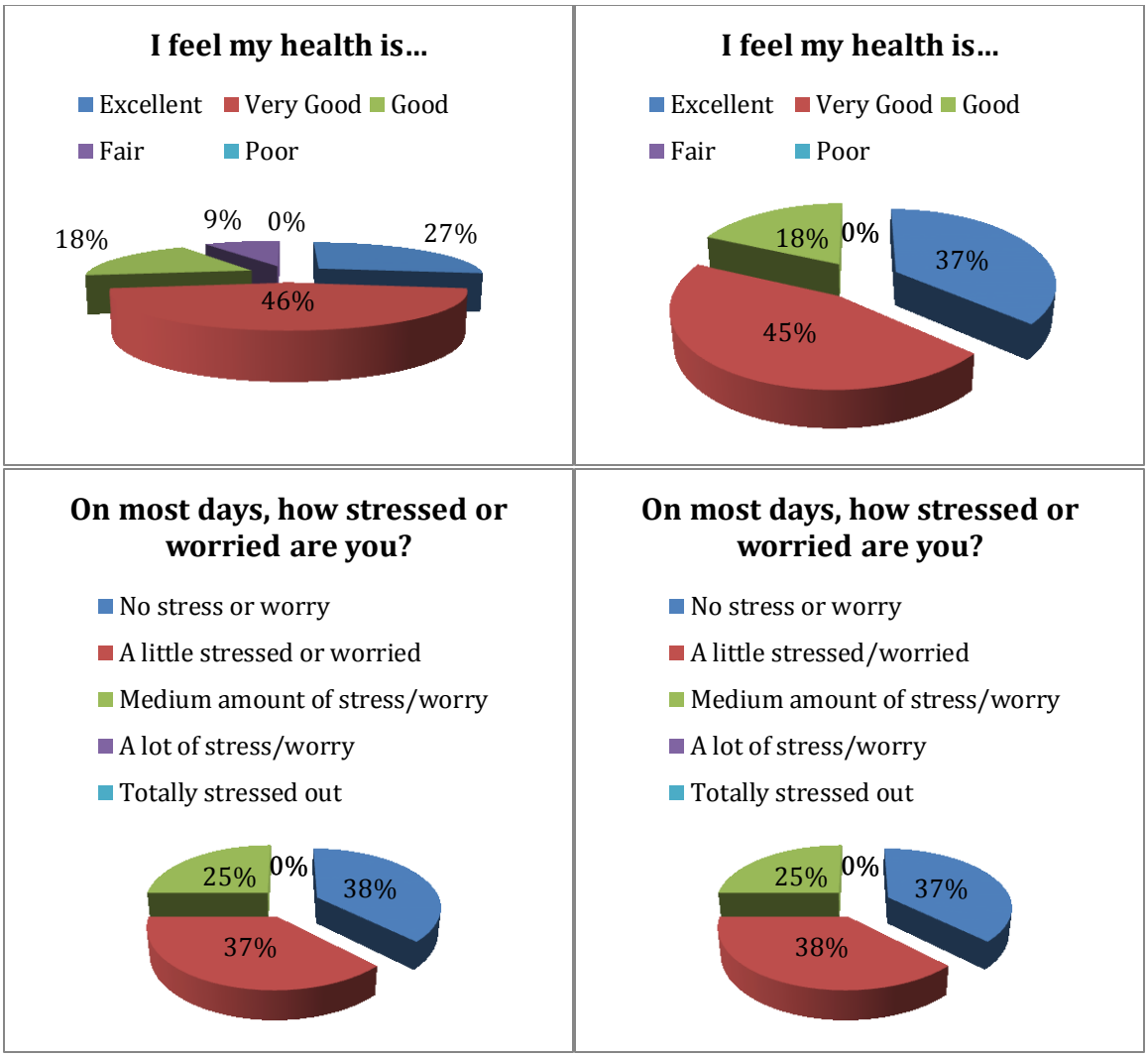

Figure 1: 5th Grade Students Pre and Post-Tests, Part I

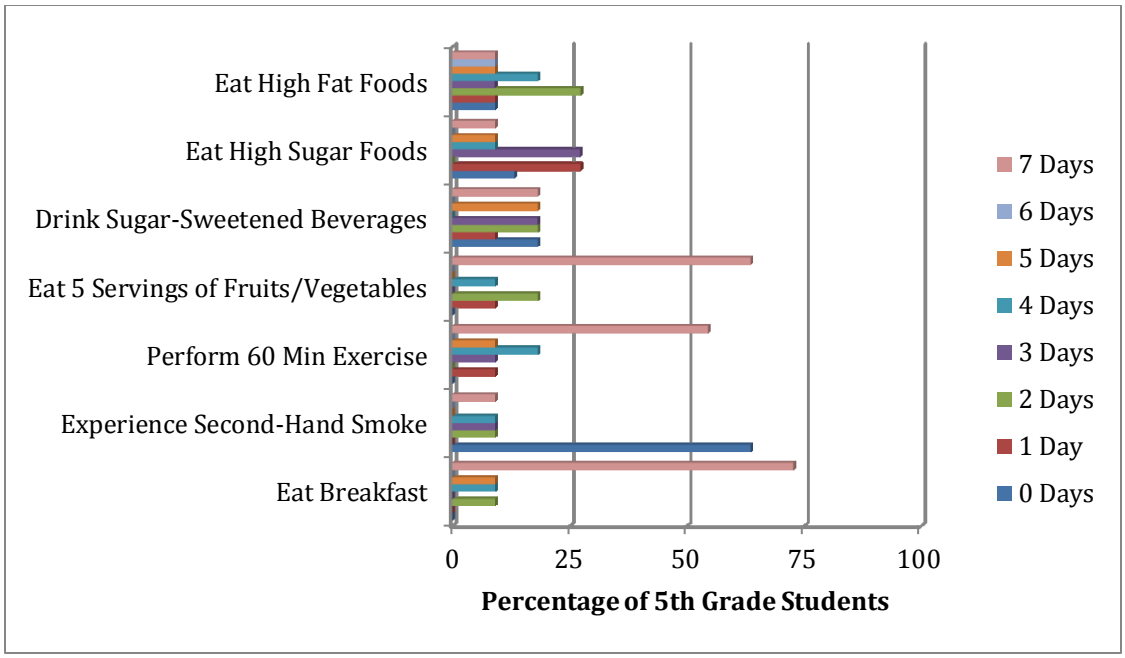

Figure 2: 5th Grade Students Pre-Test Behavioral Questions, Part I

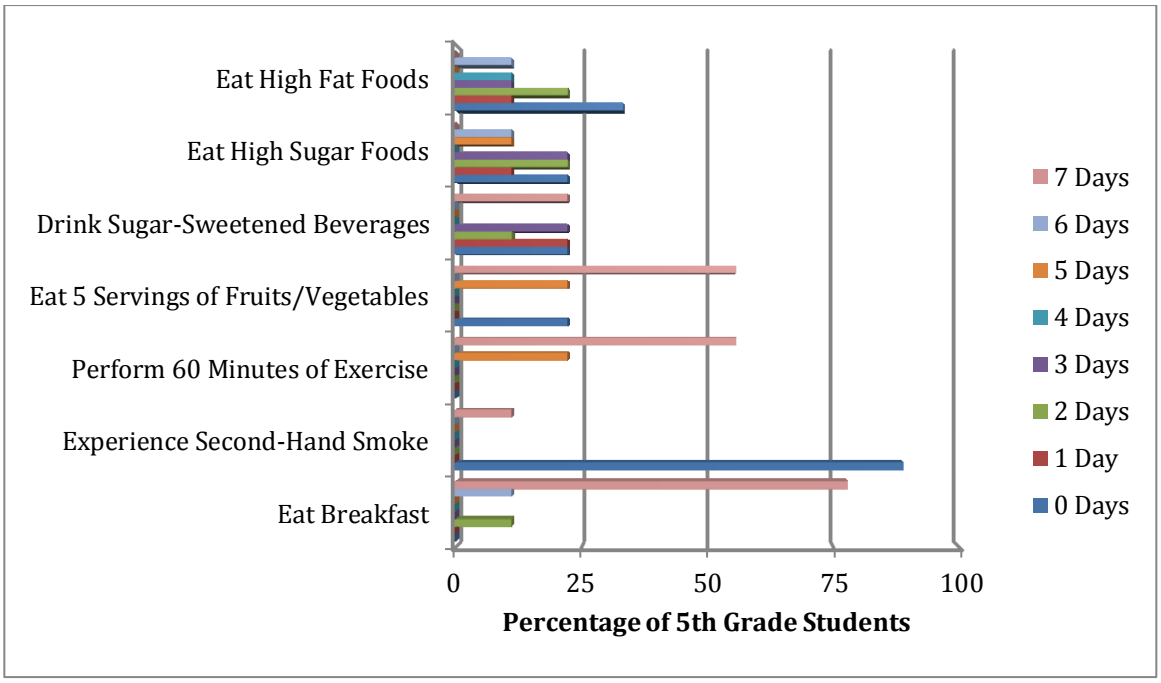

Figure 3: 5th Grade Students Post-Test Behavioral Questions, Part I

Table 3: Parents/Guardians Pre and Post-Tests, Part I

Question	Frequency (n)	Correct (%)	Partially Correct (%)
1	9	77.8	---
1P	4	50	---
2	9	55.6	---
2P	4	75	---
3	9	100	---
3P	4	100	---
4	9	22.2	---
4P	4	50	---
5	9	44.4	---
5P	4	75	---
5a	9	22.2	55.6
5aP	4	75	0
6	9	77.8	---
6P	4	100	---
6a	9	44.4	22.4
6aP	4	75	0
7	9	55.6	11.1
7P	4	50	0
7a	9	77.8	0
7aP	4	50	0
8	9	55.6	44.4
8P	4	50	50
8a	9	22.2	44.5
8aP	4	50	25
9	9	100	---
9P	4	100	---
10	9	100	---
10P	4	100	---
11	9	100	---
11P	4	100	---
12	9	77.8	11.1
12P	4	100	0
13	9	66.7	22.2
13P	4	100	0
14	9	88.9	---
14P	4	100	---

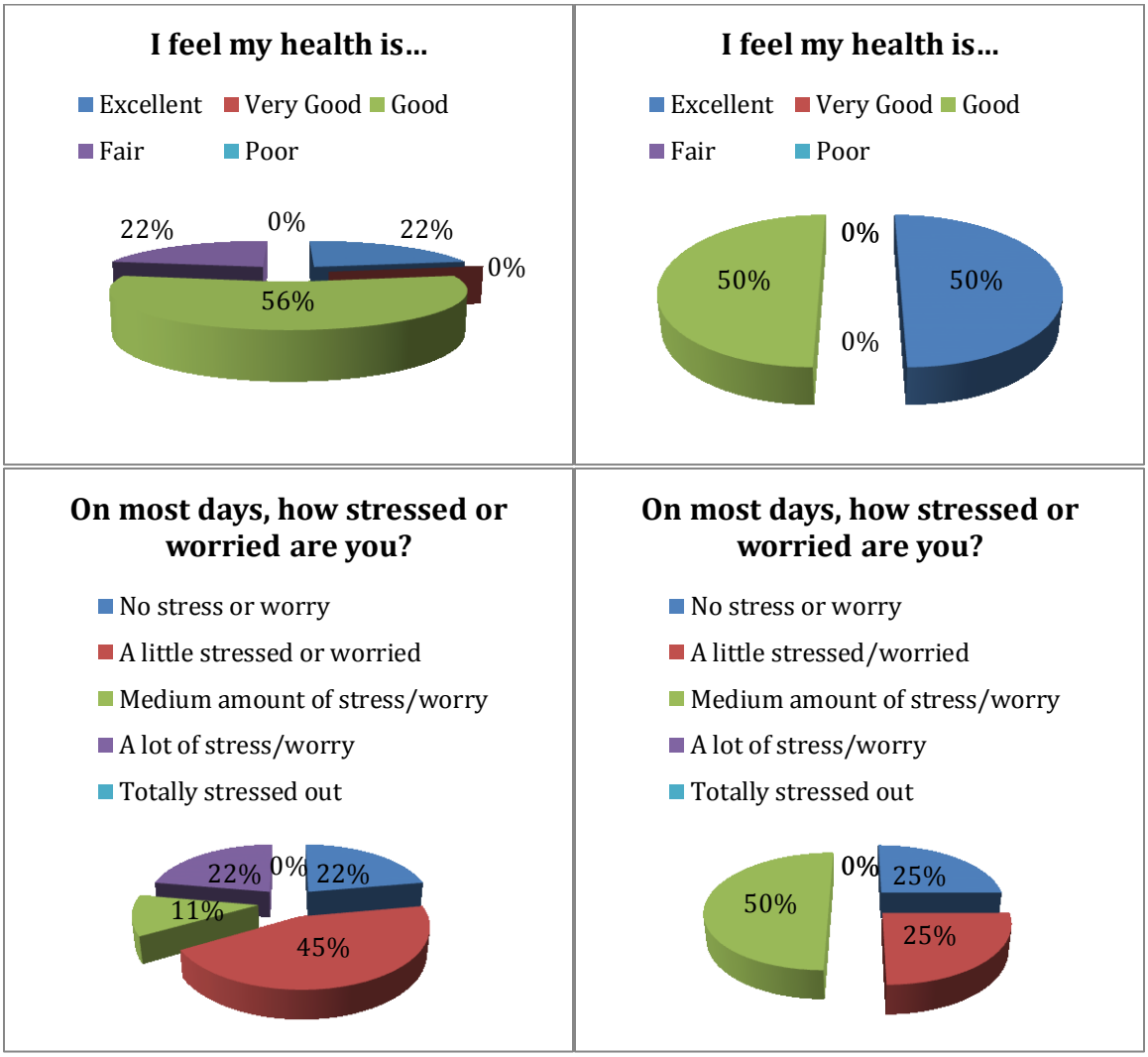

Figure 4: Parents/Guardians Pre and Post-Tests, Part I

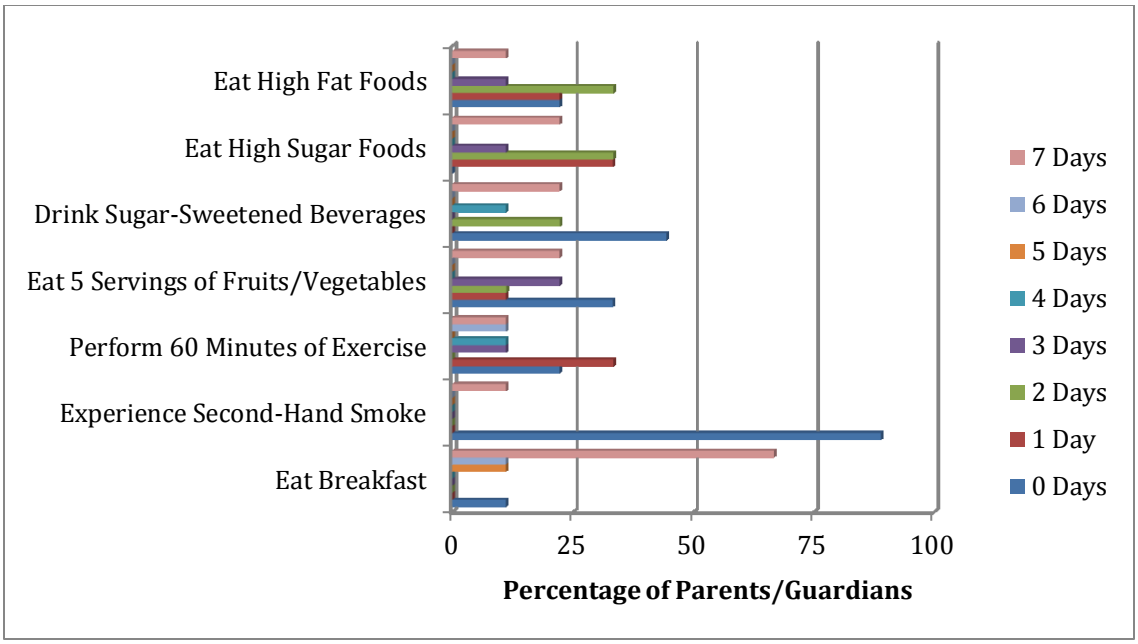

Figure 5: Parents/Guardians Pre-Test Behavioral Questions, Part I

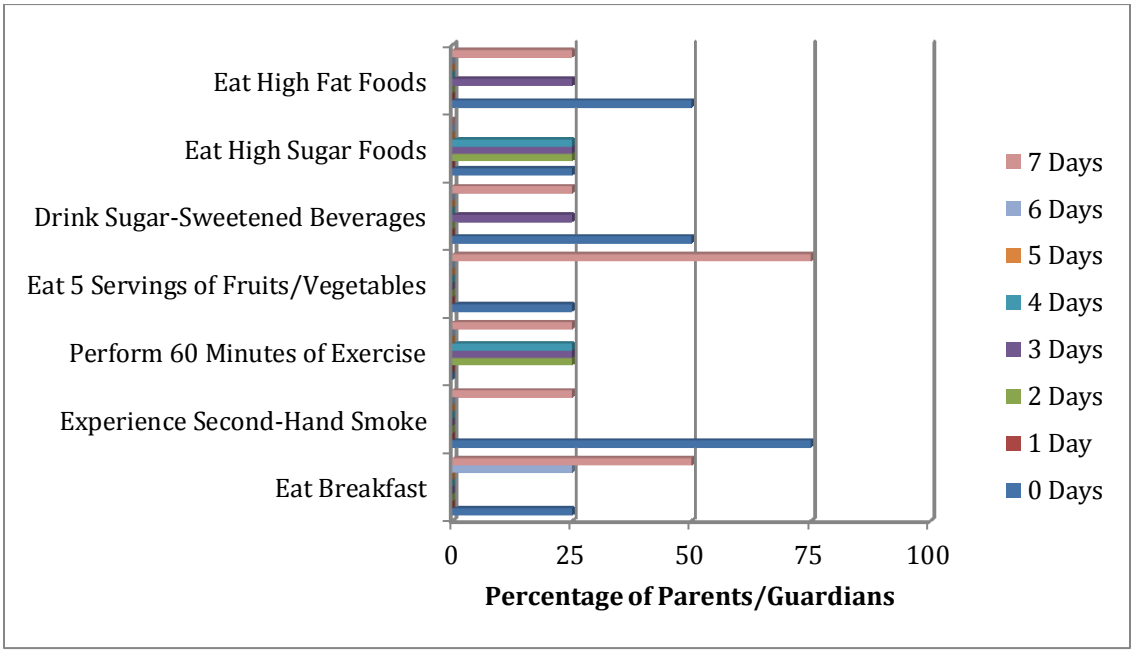

Figure 6: Parents/Guardians Post-Test Behavioral Questions, Part I

Percentages of questions answered correctly were greater for many of the post-test responses in the fifth grade cohort. Greater percentages of students recognized they were to get 60 minutes of exercise each day and that unsaturated fat is a healthier option than saturated fat (63.6% to 88.9% and 27.3% to 44.4%, respectively). Additionally, higher percentages of fifth grade students had 0 days in the past week of high fat food consumption (9.1% to 33.3%).

A much higher percentage of parents/guardians reported consuming 5 servings of fruits and vegetables every day of the week prior to the test (22.2% to 75%). Larger percentages of parents/guardians also reported achieving 60 minutes of physical activity every day (11.1% to 25%), with fewer reporting achieving this metric on 0 or 1 day in the week prior to the post-test (22.2% and 33.4% both decreased to 0%).

B. Pilot After-School Program, Part II

Similarly to Part I, the percentages of correct and partially correct answers, as well as ranked and behavioral responses, are listed below for Part II children, split between 4th grade students (Table 4; Figures 7, 8, and 9) and 5th grade students (Table 5; Figures 10, 11, and 12). Responses for Part II parents/guardians are also included for both pre-tests and post-tests (Table 6; Figures 13, 14, and 15).

Table 4: 4th Grade Students Pre and Post-Tests, Part II

Question	Frequency (n)	Correct (%)	Partially Correct (%)
1	7	100	---
1P	7	100	---
2	7	100	---
2P	7	71.4	---
3	7	85.7	---
3P	7	100	---
4	7	28.6	---
4P	7	28.6	---
5	7	14.3	---
5P	7	71.4	---
5a	7	14.3	0
5aP	7	14.3	14.3
6	7	28.6	---
6P	7	42.9	---
6a	7	14.3	0
6aP	7	0	0
7	7	14.3	0
7P	7	0	0
7a	7	71.4	0
7aP	7	14.3	0
8	7	28.6	42.8
8P	7	14.3	42.8
8a	7	14.3	42.8
8aP	7	42.9	0
9	7	57.1	---
9P	7	71.4	---
10	7	100	---
10P	7	85.7	---
11	7	100	---
11P	7	100	---
12	7	57.1	0
12P	7	28.6	0
13	7	57.1	14.3
13P	7	14.3	28.6
14	7	71.4	---
14P	7	57.1	---

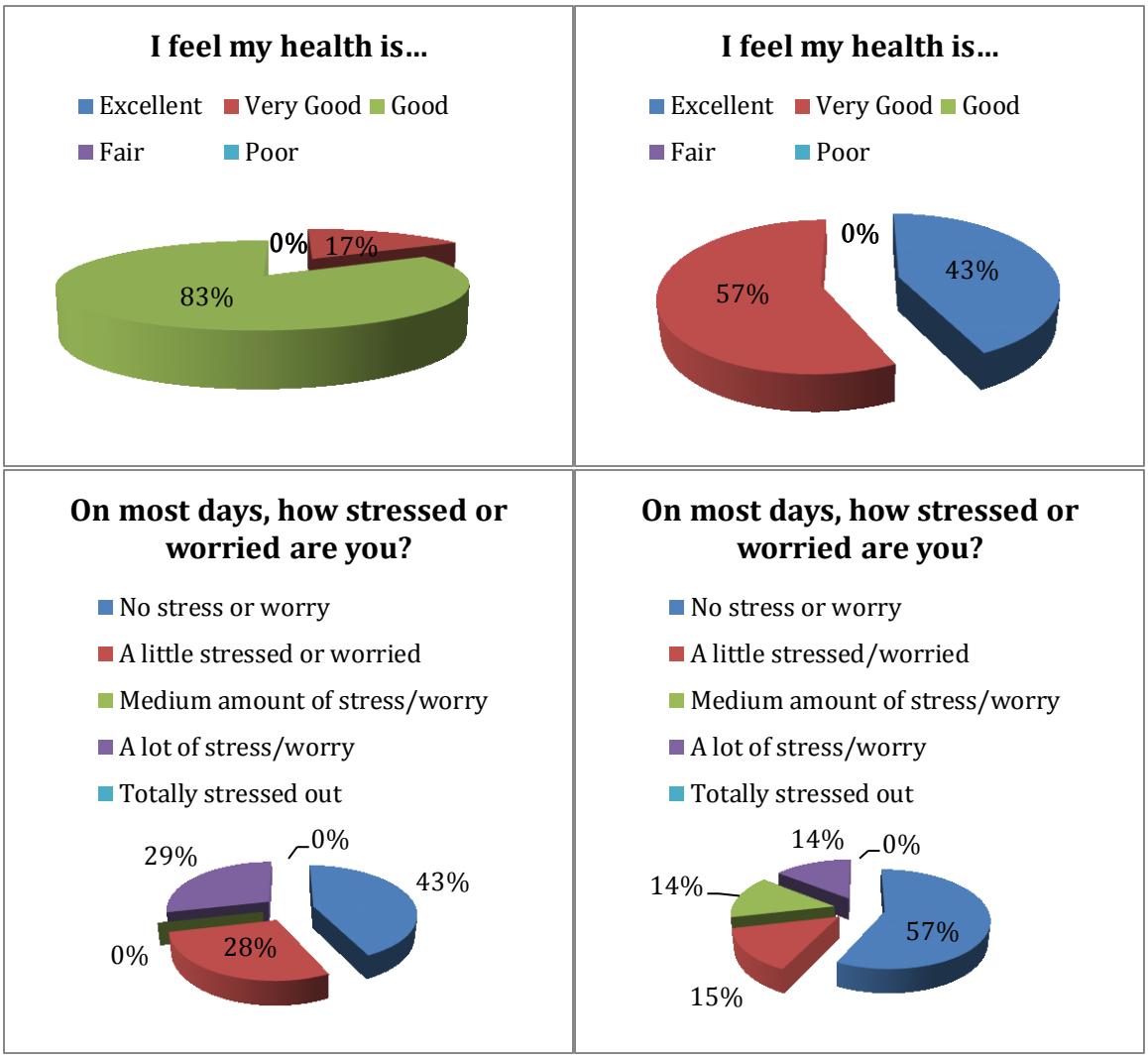

Figure 7: 4th Grade Students Pre and Post-Tests, Part II

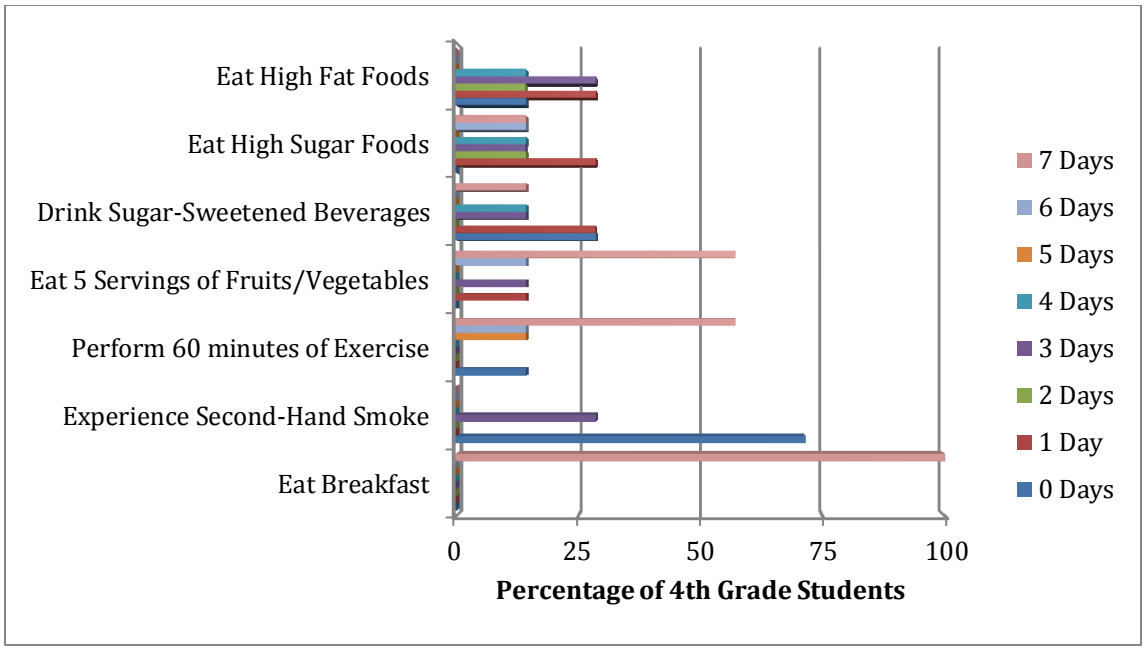

Figure 8: 4th Grade Students Pre-Test Behavioral Questions, Part II

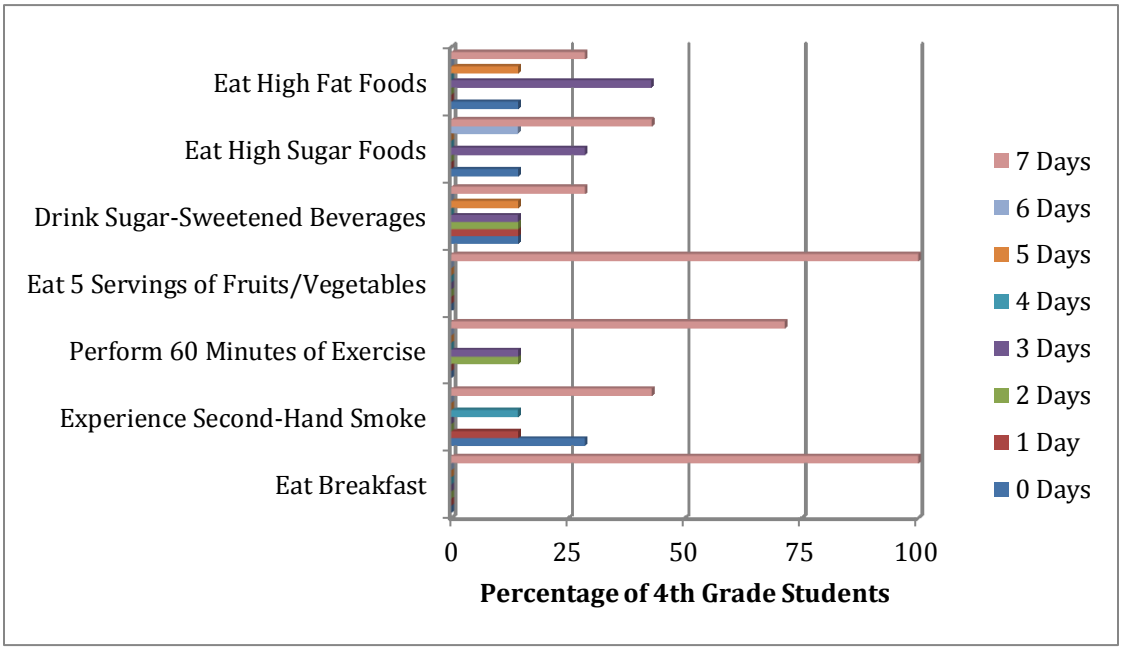

Figure 9: 4th Grade Students Post-Test Behavioral Questions, Part II

Table 5: 5th Grade Students Pre and Post-Tests, Part II

Question	Frequency (n)	Correct (%)	Partially Correct (%)
1	5	100	---
1P	6	100	---
2	5	100	---
2P	6	100	---
3	5	100	---
3P	6	100	---
4	5	40	---
4P	6	50	---
5	5	20	---
5P	6	33.3	---
5a	5	0	0
5aP	6	16.7	0
6	5	20	---
6P	6	66.7	---
6a	5	0	0
6aP	6	0	0
7	5	0	0
7P	6	0	0
7a	5	20	0
7aP	6	50	0
8	5	40	20
8P	6	33.3	66.7
8a	5	40	40
8aP	6	16.7	33.3
9	5	60	---
9P	6	100	---
10	5	100	---
10P	6	83.3	---
11	5	100	---
11P	6	100	---
12	5	20	60
12P	6	33.3	33.4
13	5	100	0
13P	6	50	33.3
14	5	80	---
14P	6	66.7	---

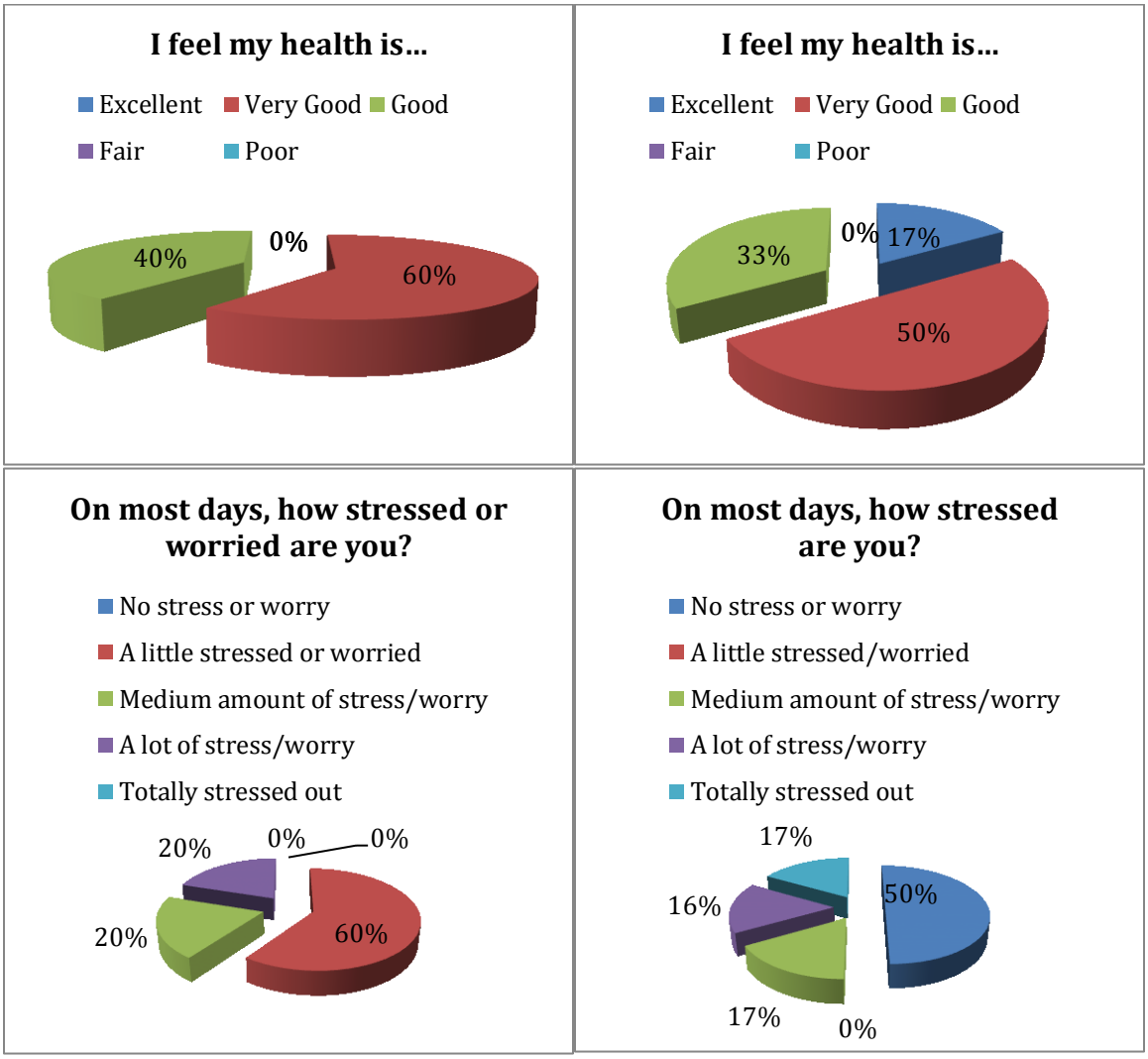

Figure 10: 5th Grade Students Pre and Post-Tests, Part II

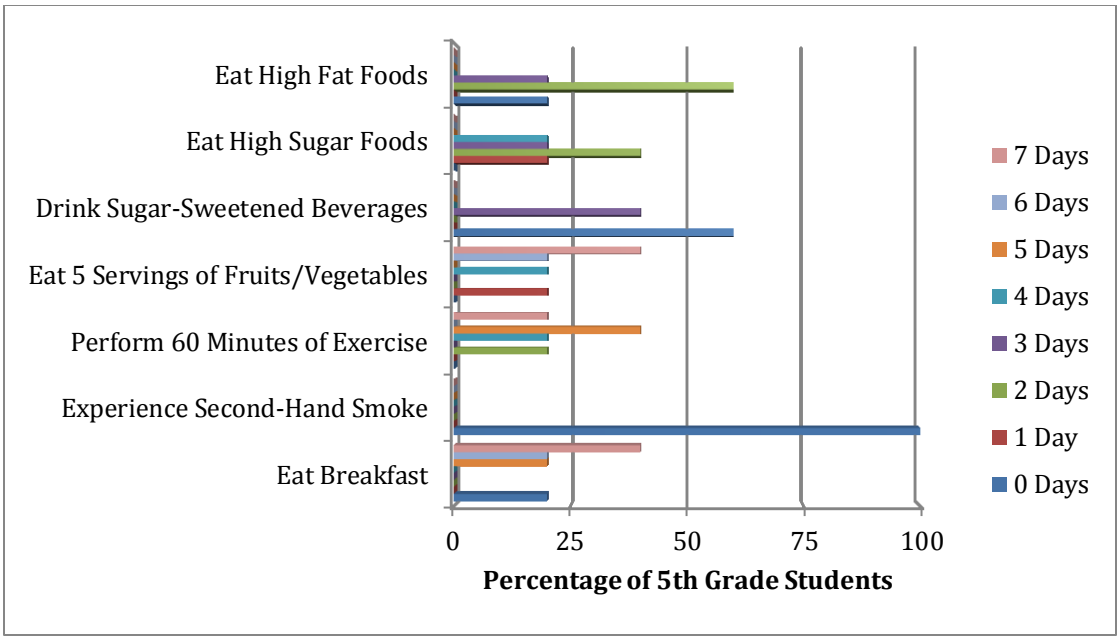

Figure 11: 5th Grade Students Pre-Test Behavioral Questions, Part II

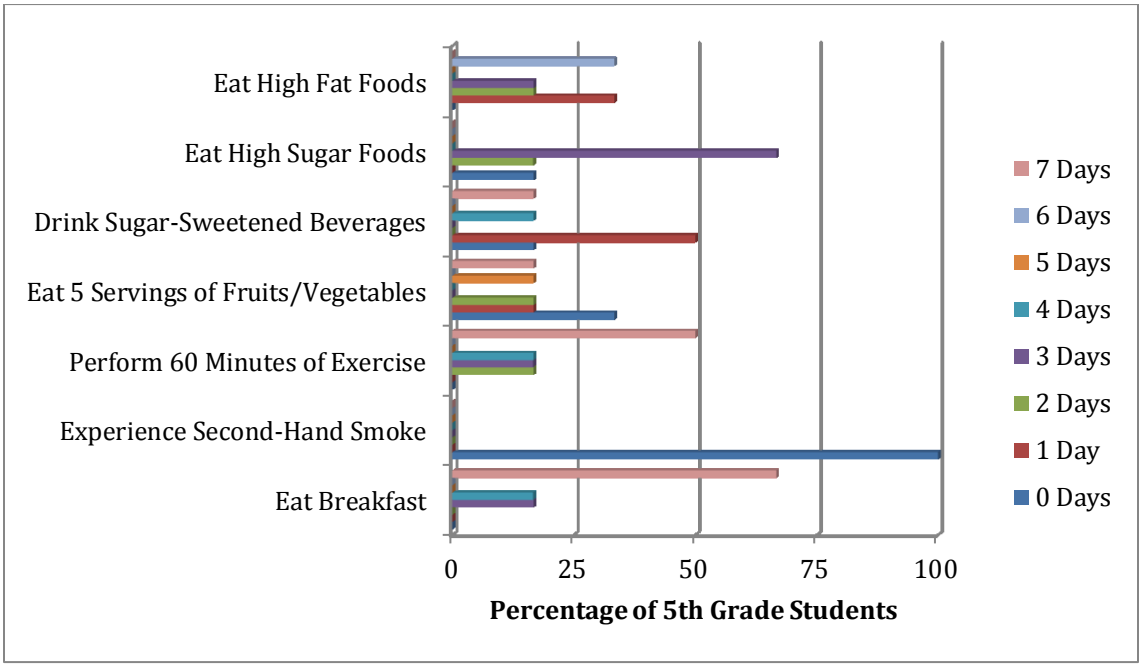

Figure 12: 5th Grade Students Post-Test Behavioral Questions, Part II

Table 6: Parents/Guardians Pre and Post-Tests, Part II

Question	Frequency (n)	Correct (%)	Partially Correct (%)
1	10	50	---
1P	4	75	---
2	10	90	---
2P	4	75	---
3	10	100	---
3P	4	100	---
4	10	50	---
4P	4	50	---
5	10	50	---
5P	4	75	---
5a	10	40	0
5aP	4	75	0
6	10	90	---
6P	4	100	---
6a	10	30	20
6aP	4	100	0
7	10	70	10
7P	4	100	0
7a	10	90	0
7aP	4	100	0
8	10	60	30
8P	4	100	0
8a	10	40	40
8aP	4	0	100
9	10	100	---
9P	4	100	---
10	10	100	---
10P	4	100	---
11	10	100	---
11P	4	100	---
12	10	80	0
12P	4	100	0
13	10	90	0
13P	4	100	0
14	10	70	---
14P	4	100	---

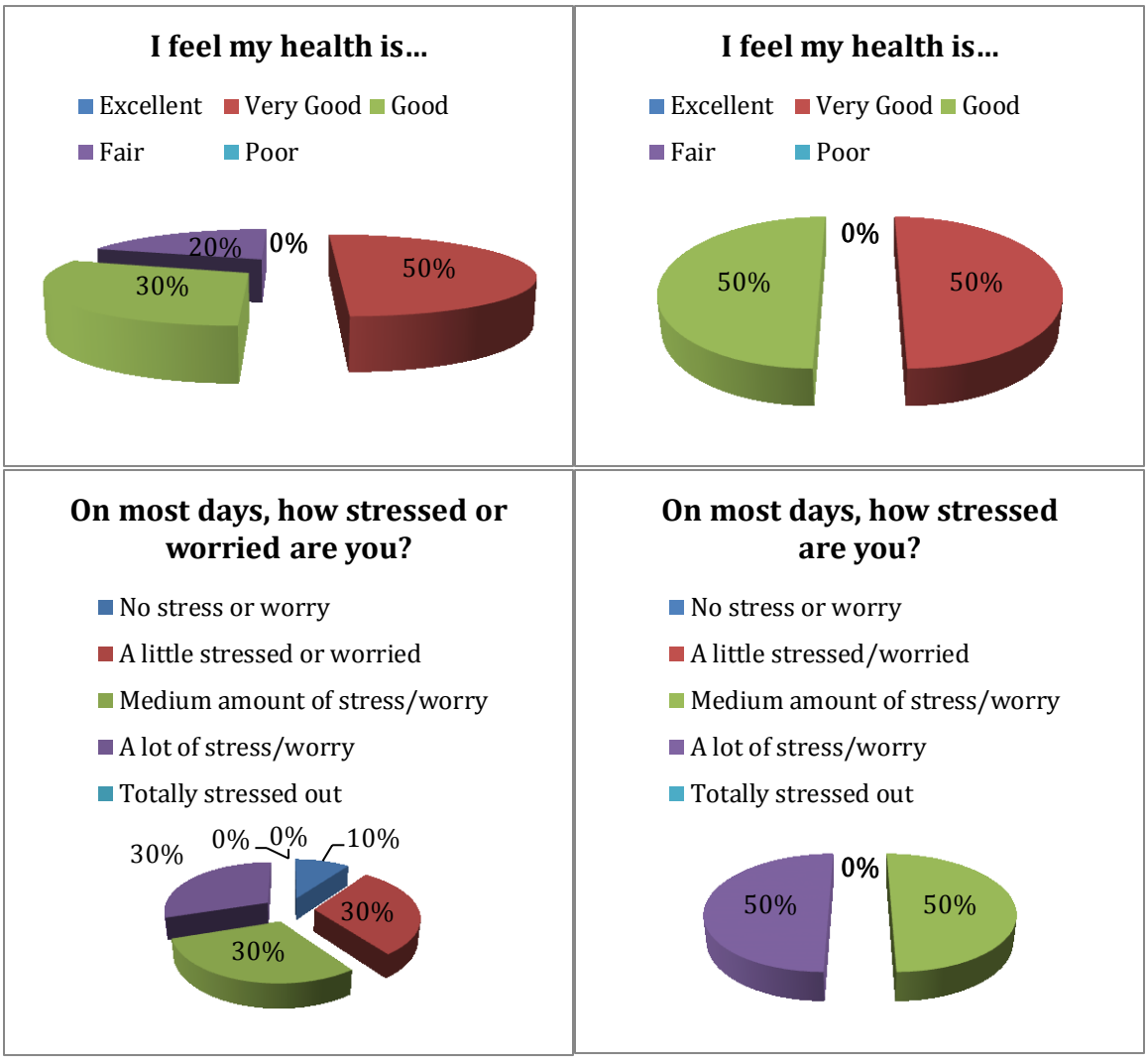

Figure 13: Parents/Guardians Pre and Post-Tests, Part II

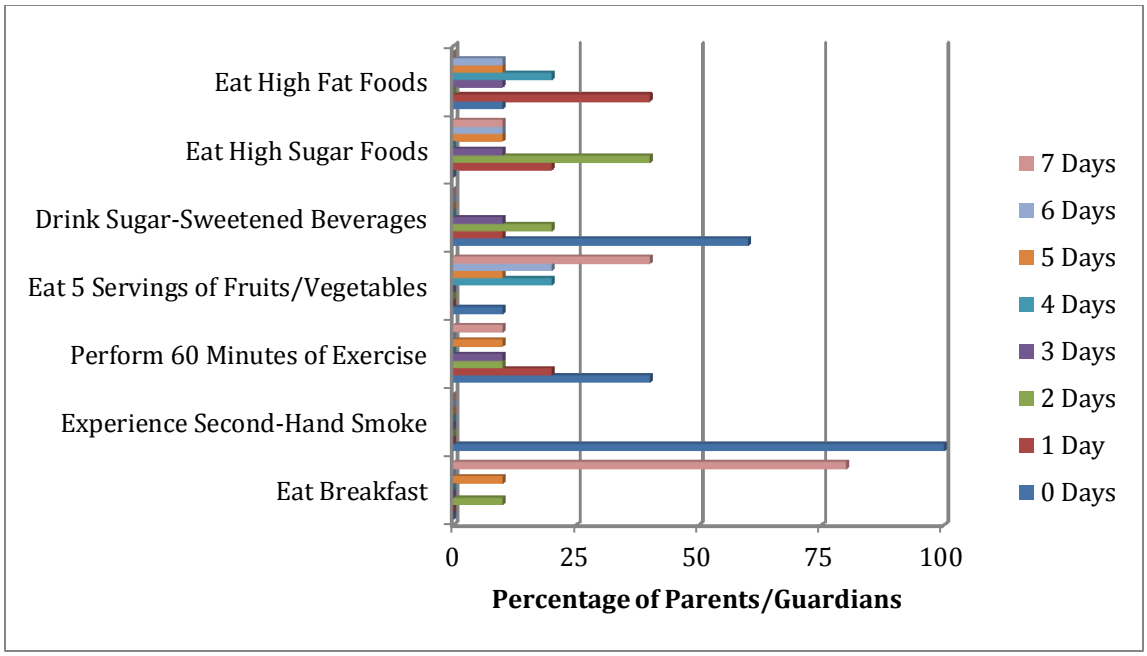

Figure 14: Parents/Guardians Pre-Test Behavioral Questions, Part II

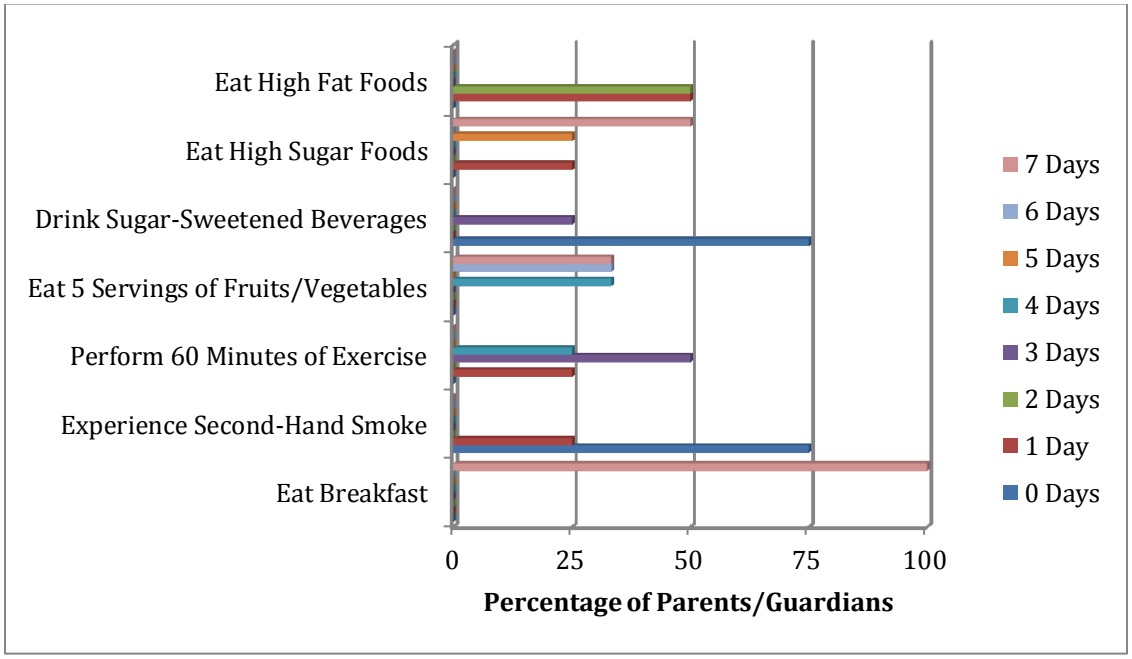

Figure 15: Parents/Guardians Post-Test Behavioral Questions, Part II

*Only 3 participants responded to how many servings of fruits/vegetables were eaten the week prior.

The tables above highlight the differences between fourth and fifth grade students in Part II of the study. All fourth grade students who completed the post-test reported eating 5 servings of fruits and vegetables every day in the week prior to the test, while 71.4% of these students achieved 60 minutes of physical activity every day.

Higher percentages of fifth grade students recognized complex carbohydrates and unsaturated fats as healthier options (20% to 33.3% and 20% to 66.7%, respectively). Additionally, they were able to provide examples of complex carbohydrates and whole grain foods (0% to 16.7% and 20% to 50%, respectively).

All parents/ guardians who participated in the post-test were able to recognize unsaturated fat as a healthier option and offer an example of both saturated and unsaturated fat (90% and 30%, respectively, increased to 100%).

CHAPTER V

DISCUSSION

As the current leading cause of death in the United States, cardiovascular disease posits itself as a major public health concern. Because atherosclerosis and lifestyle behaviors affecting the development of this disease begin in childhood, it is vital to address these risks and make changes as early in the lifespan as possible (Balagopal, 2011; Daniels et al., 2012). Comprehensive interventions targeting multiple risk factors as they relate to the development of cardiovascular disease may prove beneficial in delaying or eradicating this malady.

The Healthy Hearts, Healthy Lifestyles after-school program was a comprehensive intervention, aimed at increasing the knowledge of fourth and fifth grade students and their parents or guardians in regards to lifestyle behaviors that may lead to CVD. The hope is that through knowledge gains about new methods of physical activity and healthy eating, students and their families would eventually experience increased self-efficacy to participate in healthy behaviors. This can be seen through the Transtheoretical Model, in which knowledge plays an important role in moving someone from thinking about a behavior to actually having the self-efficacy to make a healthy change (CDC, 2007). Additionally, the Social Cognitive theory concept of self-efficacy as it relates to food preparation may be positively established in this type of environment (Bandura, 1989). Students in the first phase exhibited excitement over making healthy snacks, so the club facilitators ensured students personally prepared a healthy snack at each club meeting in the second phase. Self-efficacy could also be reinforced by this intervention through the creation of a healthier culture amongst these students, such as is suggested by the Social

Network Theory (Christakis & Fowler, 2007; Fowler & Christakis, 2008). This was not only facilitated by club attendance, but by the use of "buddy groups," wherein fifth grade students were grouped with fourth grade students in the hopes that the older children would be (and would continue to be) good role models of health, as exhibited by the "Healthy Buddies" Canadian study (Stock et al., 2007).

Although we did not have the power to do statistical analysis with these data, our results suggest that both Hypothesis 1 and Hypothesis 2 were supported, as parents and students showed improvements in health knowledge and self-reported behaviors based on their post-test responses. Students were not given feedback on their pre-tests, which may increase the chance of improvements coming from their own knowledge progression. The outcomes shown in the Results section above describe particular knowledge gains worth noting. Greater percentages of fifth grade students in Part I and fourth grade students in Part II of the intervention recognized complex carbohydrates (9.1% to 11.1% and 14.3% to 75%, respectively) and unsaturated fats (27.3% to 44.4% and 28.6% to 50%, respectively) were healthier options. Additionally, 5th grade students in Part II gave correct examples of complex carbohydrates and whole grain foods (0% to 16.7% and 20% to 50%, respectively), indicating increased health knowledge from this intervention. However, only 20% of 5th grade students in Part II answered questions correctly regarding types of carbohydrates and fats on the pre-test. This could be due to a lack of knowledge retention from Part I of the intervention, as only one of the former club members recalled unsaturated fat as the healthier fat. More fifth grade students in Part II were able to list at least some of the food groups (20% to 66.7%), again exhibiting a gain in nutritional knowledge. All fifth grade students in Part II of the intervention answered questions one

through three correctly on both the pre-test and post-test. These questions pertained to the amount of exercise and fruit and vegetable intake they should get in a day, and also that low fat and low sugar foods were healthier for their hearts. This indicated a possible carry-over from Part 1 of the Healthy Hearts club. Five of the eight total fifth grade students participating in the second part of the program had been club members the semester prior. Gains in health knowledge have also been seen in previous studies involving comprehensive intervention efforts like the San Diego Heart Project and the Healthy Buddies initiative. (Nader et al., 1989; Stock et al., 2007).

Students improved in self-evaluation of health and stress level across both age groups in Part II of the intervention. Fourth grade students increased from 0% to 37.5% and 5th grade students increased from 0% to 16.7% in the "Excellent" health category, while 42.9% increased to 62.5% and 0% increased to 50% in the category of "No Stress" for each age group, respectively. This could be due to an increased knowledge base of what constitutes "health". Additionally, one club day incorporated lessons on ways to relieve stress, through the use of exercise, progressive muscle relaxation, and Biodots to determine stress level. Students might have been incorporating different methods to relieve stress, might have had lighter school workloads at the time of the post-test, or might be experienced less stress due to extra time with peers and time spent exercising at the club sessions. However, improvements need should be viewed with prudence, as the students could know the "correct" answer to put down, which may not be a true indicator of their actual feelings or behaviors. Also, some answers did not improve, rather the percentages were worse in the post-test responses. A reasons for this may be the setting in which the students took the post-tests.

Within each phase, the tests were given to the students at the end of their final day at the club, and students may have been easily distracted by the presence of their peers, and especially by those who finished first and moved on to other activities.

Fifth grade students in Part I of the intervention showed improved nutrition behavior, with decreased days of consuming high fat, high sugar, and sugar-sweetened beverages; a finding seen in other comprehensive school-based interventions (Evans et al., 2012; James, Thomas, Cavan, & Kerr, 2004; Tucker, 2011). Fourth and fifth grade students in Part II of the intervention showed a decrease in days of high sugar consumption, however they did not see the same decrease in sugar-sweetened beverage intake. One possibility for this may be the curriculum in Part I consisted of a sugary beverage lesson, where students learned how much sugar was in popular drinks (sports drinks, energy drinks, etc.) and had hands on activities to demonstrate these amounts and learn facts about the importance of drinking water.

The best results in fruit and vegetable consumption, as well as physical activity levels were seen in the fourth grade students. Further analysis may show that students are more open to making these behavioral changes before reaching fifth grade.

Fourth grade students reported more days of experiencing second-hand smoke (0% to 37.5%). This may suggest that there are specific people in these students' lives whom they do not see every day, but do affect them if they smoke around these students. Smoking policies may need further enforcement, as this suggests it may not be immediate family members subjecting these students to second-hand smoke.

All student cohorts showed an increase in days consuming breakfast, except the fourth grade students who all reported eating breakfast every day in the past week and that percentage did not change on the post-test. This is an important finding, as consistent breakfast consumption may help fend off obesity and its comorbidities, as one is less likely to overeat or eat high caloric foods later in the day if he or she eats breakfast (AHA, 2011).

In both Part I and Part II of the study, parents/guardians showed increased knowledge of complex carbohydrates (44.4% to 75% and 50% to 75%, respectively) and unsaturated fats (77.8% and 90%, respectively increased to 100%) as healthier options and had a greater ability to provide examples of each type of carbohydrate and fat. This could be attributed to discussions on what their children learned at the Healthy Hearts, Healthy Lifestyles club, the take-home activities students were given to reinforce their lessons at the club, or participation in the Family Fun Night, where families were taught health lessons by their students at different stations. The incorporation of the take-home activities and Family Fun Night stemmed from the success seen in the Children First Study, where cardiovascular risk factors were greatly reduced in parents whose children participated in a heart health education initiative at school (Fornari et al., 2013).

Post-test responses from both groups showed all parents/guardians were able to define what it means to be healthy and what living a healthy lifestyle entails, and all reported having someone in their lives to encourage them to be healthy. This is extremely important because social networks have been shown to influence health behaviors, as previously mentioned (Christakis & Fowler, 2007, 2009).

There was greater improvement in behaviors based on the questionnaire among parents/guardians in Part I of the study than in Part II. We may have seen a greater change or more success if we had reworded the physical activity question for parents/guardians to ask how many days of the week they achieved 30 minutes of exercise, as opposed to 60 minutes. Since the guidelines for adults state 30 minutes at least five days per week are beneficial to adults, the wording of these tests may have failed to include those adults who do meet the recommended guidelines for their age group (ACSM, 2010, 2013; Schoenborn & Stommel, 2011).

Students were assigned to buddy groups based on preference of the fifth grade students and with the help of one of the club facilitators. Fifth grader input was allowed, as mentoring studies have found greatest success when mentoring relationships are allowed to develop naturally (Straus et al., 2013). Although perceptions of the buddy groups were not directly gathered from the students, observations from the club facilitators were mixed. Positive perceptions were shown as students worked together to answer trivia questions, discuss lessons for the day, or work on preparing stations for Family Fun Night. Although peer relationships are vital in creating social norms and students are more apt to share behavioral characteristics with their closest friends, a mentoring relationship may be better established between mentors and mentees that have a greater age gap, or have similar interests (Gesell et al., 2012; Stock et al., 2007; Straus et al., 2013).

Through observation by the club facilitators, these students were too close in age to effectively lead one another toward healthy behaviors, as the fifth grade students saw the fourth grade students as more of a nuisance, rather than a cohort they wanted to help. Thus, utilizing the 5th graders more as peer leaders, rather than mentors, such as was seen in the TEENS study, may prove more beneficial (Story et al., 2002).

C. Limitations

Although several knowledge and behavioral gains were seen in the descriptive results above, there are many limitations in this study that must be addressed. First, the sample sizes were very small; we only included one school as this was a pilot study and the response at this school was not as high as anticipated. If this program were to continue, more recruitment strategies should be employed. In addition to flyers sent home and the visits by the club facilitators to the fourth and fifth grade classrooms, informational meetings could be held for the parents before the club begins another session. Also, providers in the Healthy Hearts Club initiative could send flyers home with the fourth grade students they see. Starting recruitment campaigns earlier in the year (perhaps at the very beginning of the school year) could reach students before they commit to other after-school activities. Additionally, incentives for parental involvement may foster a greater response rate with pre and post-tests, as well as parents' willingness to involve their students in the club, as seen in the Chicago after-school program mentioned previously (Choudhry et al., 2011).

One drawback of the after-school program is that it could displace other physical activity the students may already be performing, as assumed by Metcalf and colleagues in a review of physical activity intervention outcomes (Metcalf et al., 2012). We attempted to

combat this phenomenon by holding focus groups, where parents and children expressed the desire for an after-school program that incorporated healthy activities. The presumption here, then, is that these focus groups would not mention the need for a program if students were already involved in a healthy activity after the school day.

Additionally, success or failure of this intervention was only seen through responses on pre and post-tests. Although three of the four times students were given tests they were in the presence of the club facilitators, every parent or guardian completing tests and the students completing pre-tests at the beginning of Part II worked on these at home. Although it was asked that responses just be to the best of one's ability, there is no way to tell if answers to certain questions were aided by parents, the Internet, or other sources. Also, there are limitations that accompany using tests that have not been screened for reliability or validity against a gold standard test. It may be that some questions were too difficult for students in this particular age group or the questions may not correspond well to the actual knowledge and behaviors we were attempting to ascertain.

Another limitation is the lack of a control group. We cannot know that the program was responsible for the changes seen without a control group to compare the results. Reassessment through written tests as well as objective measurements six months and one year after the after-school intervention would be a more rigorous evaluation process, and could divulge sustained knowledge and behavioral changes.

As previously stated, there were some discipline issues with the students, so the addition of a teacher at Lopez with whom the students already have a rapport may help the club facilitators focus on delivering the lessons, rather than attending to discipline matters.

Finally, as aforementioned, this intervention could incorporate the use of older mentors for the buddy groups, as well as the peer mentors from within the club. As shown in the previously discussed study by Stock and colleagues, fourth through seventh grade students teaching and mentoring kindergarten through third grade students proved to be successful in health knowledge gains for both groups (Stock et al., 2007).

CHAPTER VI

CONCLUSIONS AND FUTURE RECOMMENDATIONS

An intervention such as the Healthy Hearts, Healthy Lifestyles pilot after-school program may elicit short term, gains in health knowledge and behaviors. This intervention adds to the literature that through utilization of the school environment, elementary school children and their families can be successfully reached (Fornari et al., 2013). The use of multiple teaching points throughout the curriculum, designed to affect several cardiovascular disease risk factors, proved to be a method to possibly increase knowledge of, and participation in, healthy behaviors.

Future interventions should note the limitations in this study and make changes, accordingly. Hosting focus groups to understand what type of intervention is desired and plausible for the target audience can prove beneficial, as seen recently in another youth health behavior intervention program (Hingle, Nichter, Medeiros, & Grace, 2013). Use of the same program curriculum, but with the incorporation of a teacher from the school and older mentors may be more productive. Additionally, more in-depth training for the fifth grade students as peer mentors may produce greater success with this facet of the intervention (Stock et al., 2007). Due to higher percentages of fourth grade students meeting fruit and vegetable consumption guidelines, as well as physical activity guidelines than their fifth grade peers, future interventions may also want to target students in fourth grade or younger, as they could be more receptive to making these particular behavioral changes. In order to recruit more students and offer additional opportunities for family members to participate, programs could host special events, such as evenings with a motivational health leader, or, as seen in one study, have healthy breakfasts with student

athletes in the community (Foster et al., 2008). Also, other ideas for incentives should be explored, as this sticker method may reward students whose parents or guardians are more engaged and willing and able to participate in the take-home activities than other students' family members. Finally, the incorporation of objective measures and control schools to gauge outcomes could further substantiate the results seen from this study.

"Knowledge is power," said the great philosopher, Francis Bacon. That power, however, is only beneficial when it moves one to change behavior for the better (Carpenter & Colvard, 1986). By equipping students with the knowledge of cardiovascular disease, its risk factors and comorbidities, as well as the self-efficacy and peer support to make healthy choices, public health interventions can have an impact on this detrimental disease, securing greater health for future generations.

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APPENDIX A

RECRUITMENT FLYER

Healthy Hearts

Ready…Set…

Are you **READY** to play games, make snacks and hang out with your friends?

Are you **SET** to learn fun ways to take care of your heart?

Come join the fun every Tuesday after school

3:10-4:15 PM, Room _____

Games, snacks & prizes!

Don't miss out!

APPENDIX B

PRE-TEST/POST-TEST

Pre-Test/Post-Test Questions

1. At your age, how many minutes of exercise should you get every day?
    a. 15 minutes c. 60 minutes
    b. 30 minutes d. 120 minutes
2. How many combined servings of fruits and vegetables should you eat every day?
    a. 2 c. 3
    b. 4 d. 5
3. To eat for a healthy heart, you should choose foods that are_____ in fat and sugars.
    a. Low b. High
4. How many servings of sugar sweetened beverages should you limit yourself to in a week?
    a. 1 serving c. 5 servings
    b. less than 2 servings d. 3 servings
5. Is it better to eat a simple or a complex carbohydrate? _____
    5a. What is an example of each?

6. Is it better to eat a saturated or an unsaturated fat? _____
    6a. What is an example of each?

7. What does it mean if a food is a whole grain? _____
    7a. What is an example of a whole grain food?

8. What are the five food groups that should be part of any meal?

    8a. What food groups should take up the most space on our plate?

9. Progressive muscle relaxation is a way to help us deal with the everyday hassles in life.
    True or False

10. Our thoughts and feelings have an effect on our body.
    True or False

11. The choices and decisions I make today about my body will have an effect on my health as an adult as I age.
    True or False

12. What does it mean to be healthy?

13. What is a healthy lifestyle?

14. I have friends and/or family members who encourage me to be healthy.
    True or False

15. I feel my health is:
    ___Excellent
    ___Very Good
    ___Good
    ___Fair
    ___Poor

16. On most days, how stressed or worried are you?
    1_____no stress or worry, feeling very chill!
    2_____a little stressed/worried
    3_____medium amount of stress/worry
    4_____a lot of stress/worry
    5_____totally stressed out!

<u>Think about last week and place an "x" on the days you did the following…</u>

1. How many days did you eat foods or snacks with **high fat** (fried foods, French fries, meat with fat or skin left on, chips)?
*Mon.*_____ *Tues.*_____ *Wed.*_____ *Thurs.*_____ *Fri.*_____ *Sat.*_____ *Sun.*_____ ***Total #***_____

2. How many days did you eat desserts with **high sugar** (cookies, cake, ice cream, candy bar)?
*Mon.*_____ *Tues.*_____ *Wed.*_____ *Thurs.*_____ *Fri.*_____ *Sat.*_____ *Sun.*_____ ***Total #***_____

3. How many days did you drink **sugar-sweetened beverages** (soda, ice tea with sugar, energy drinks)?
*Mon.*_____ *Tues.*_____ *Wed.*_____ *Thurs.*_____ *Fri.*_____ *Sat.*_____ *Sun.*_____ ***Total #***_____

4. How many days did you eat **5** servings of **fruits AND vegetables**? (1 serving is a ½ cup, it could easily fit in your hand)
*Mon.*_____ *Tues.*_____ *Wed.*_____ *Thurs.*_____ *Fri.*_____ *Sat.*_____ *Sun.*_____ ***Total #***_____

5. How many days did you get at least **60 minutes** of exercise?
*Mon.*_____ *Tues.*_____ *Wed.*_____ *Thurs.*_____ *Fri.*_____ *Sat.*_____ *Sun.*_____ ***Total #***_____

6. How many days of the week were you around someone while they were smoking?
*Mon.*_____ *Tues.*_____ *Wed.*_____ *Thurs.*_____ *Fri.*_____ *Sat.*_____ *Sun.*_____ ***Total #***_____

7. How many days did you eat **breakfast**?
*Mon.*_____ *Tues.*_____ *Wed.*_____ *Thurs.*_____ *Fri.*_____ *Sat.*_____ *Sun.*_____ ***Total #***_____

APPENDIX C

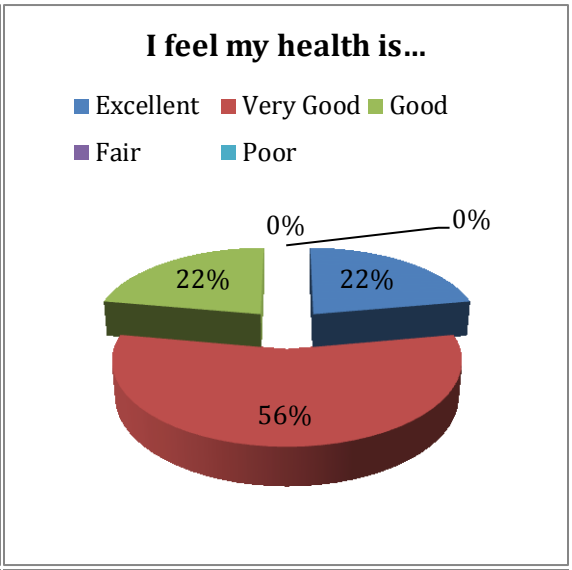
RESPONSES TO PRE-TESTS/POST-TESTS FOR

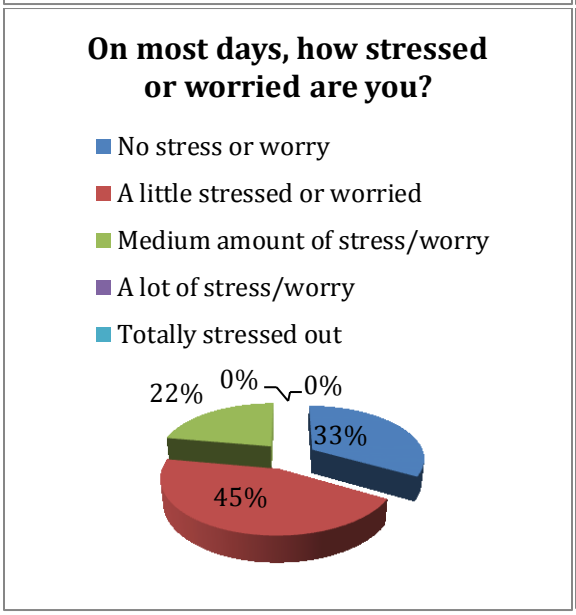
THOSE WHO COMPLETED BOTH TESTS

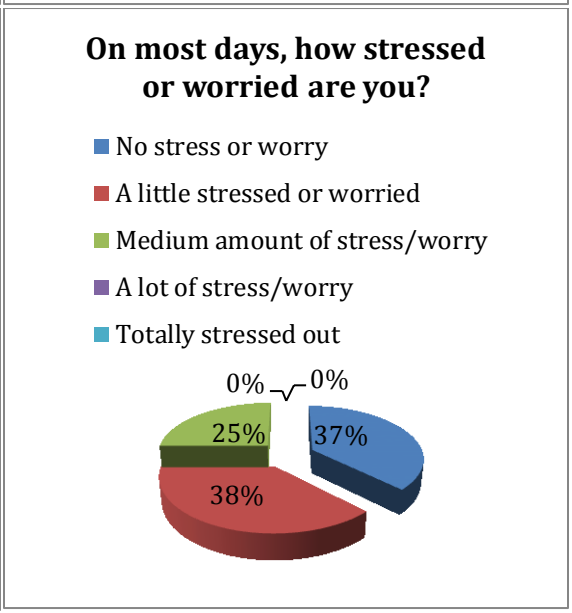
5th Grade Students: Completed Both Pre and Post-Tests, Part I

Question	Frequency (n)	Correct (%)	Partially Correct (%)
1	9	66.7	---
1P	9	88.9	---
2	9	77.8	---
2P	9	88.9	---
3	9	100	---
3P	9	100	---
4	9	33.3	---
4P	9	22.2	---
5	9	11.1	---
5P	9	11.1	---
5a	9	0	0
5aP	9	0	0
6	9	33.3	---
6P	9	44.4	---
6a	9	0	0
6aP	9	0	0
7	9	0	0
7P	9	11.1	0
7a	9	0	0
7aP	9	44.4	0
8	9	22.2	55.6
8P	9	22.2	44.4
8a	9	22.2	22.2
8aP	9	22.2	55.6
9	9	88.9	---
9P	9	66.7	---
10	9	77.8	---
10P	9	100	---
11	9	100	---
11P	9	100	---
12	9	22.2	33.3
12P	9	11.1	66.7
13	9	33.3	22.2
13P	9	11.1	44.4
14	9	88.9	---
14P	9	66.7	---

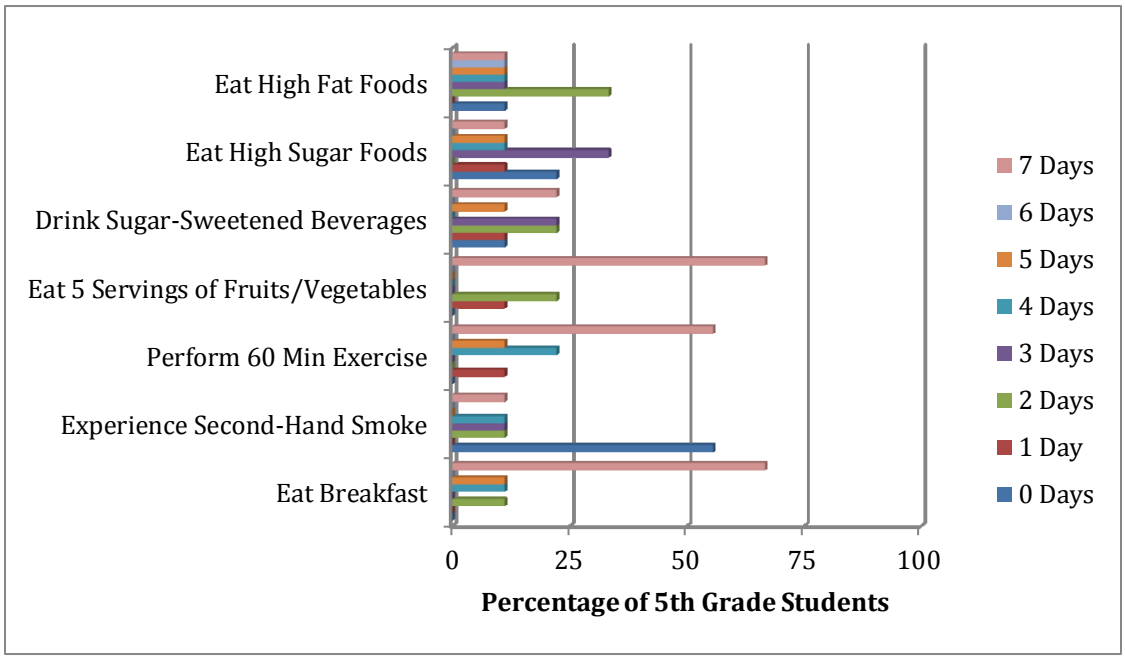
5th Grade Students: Completed Both Pre and Post-Tests, Part I

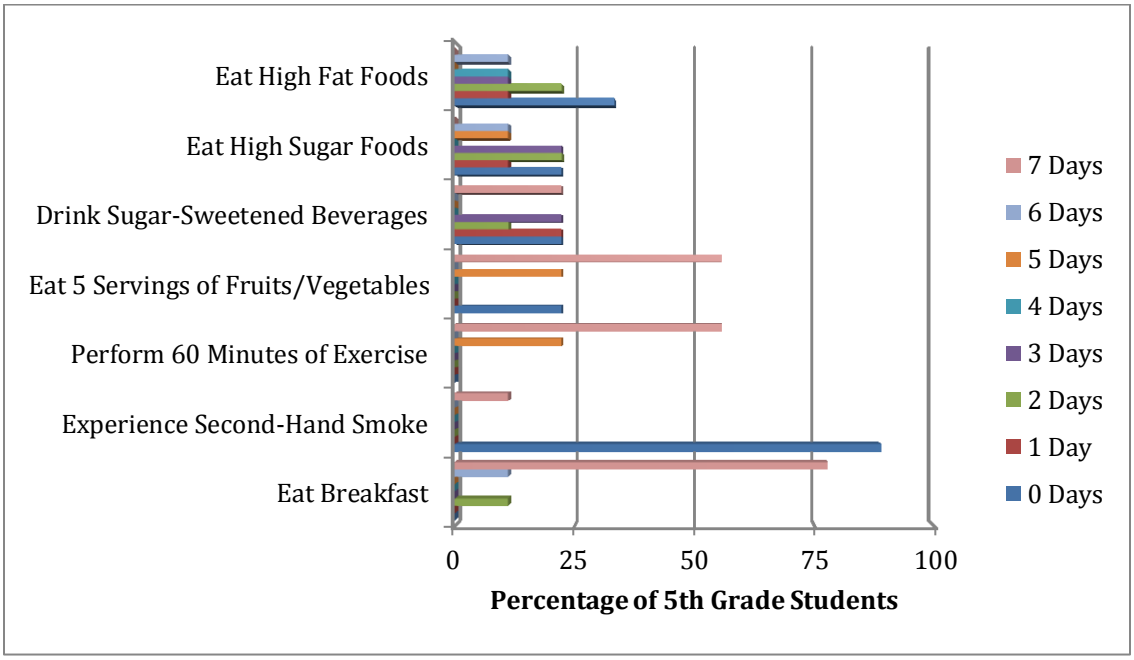






5th Grade Students: Completed Both Pre and Post-Tests, Part I

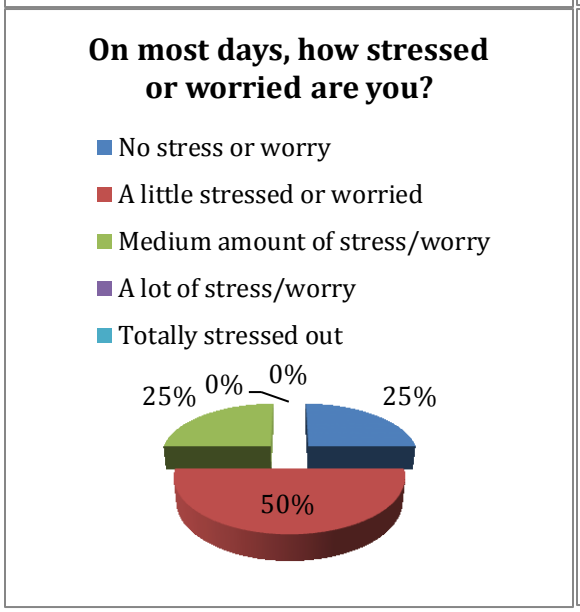


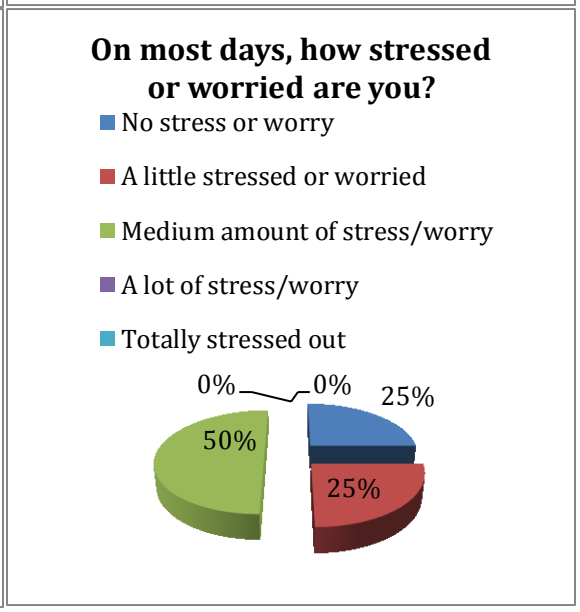


Parents/Guardians: Completed Both Pre and Post-Tests, Part I

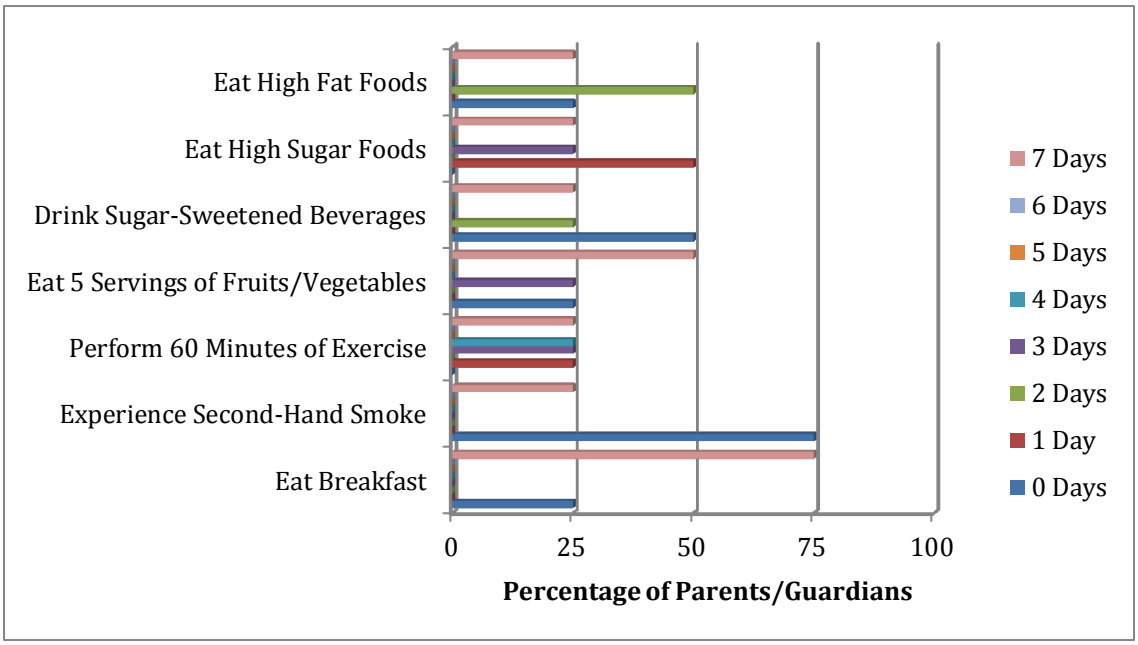
Question	Frequency (n)	Correct (%)	Partially Correct (%)
1	4	75	---
1P	4	50	---
2	4	75	---
2P	4	75	---
3	4	100	---
3P	4	100	---
4	4	0	---
4P	4	50	---
5	4	50	---
5P	4	75	---
5a	4	25	25
5aP	4	75	0
6	4	75	---
6P	4	100	---
6a	4	50	25
6aP	4	75	0
7	4	50	0
7P	4	50	0
7a	4	75	0
7aP	4	50	0
8	4	25	75
8P	4	50	50
8a	4	25	50
8aP	4	50	25
9	4	100	---
9P	4	100	---
10	4	100	---
10P	4	100	---
11	4	100	---
11P	4	100	---
12	4	75	25
12P	4	100	0
13	4	75	25
13P	4	100	0
14	4	75	---
14P	4	100	---

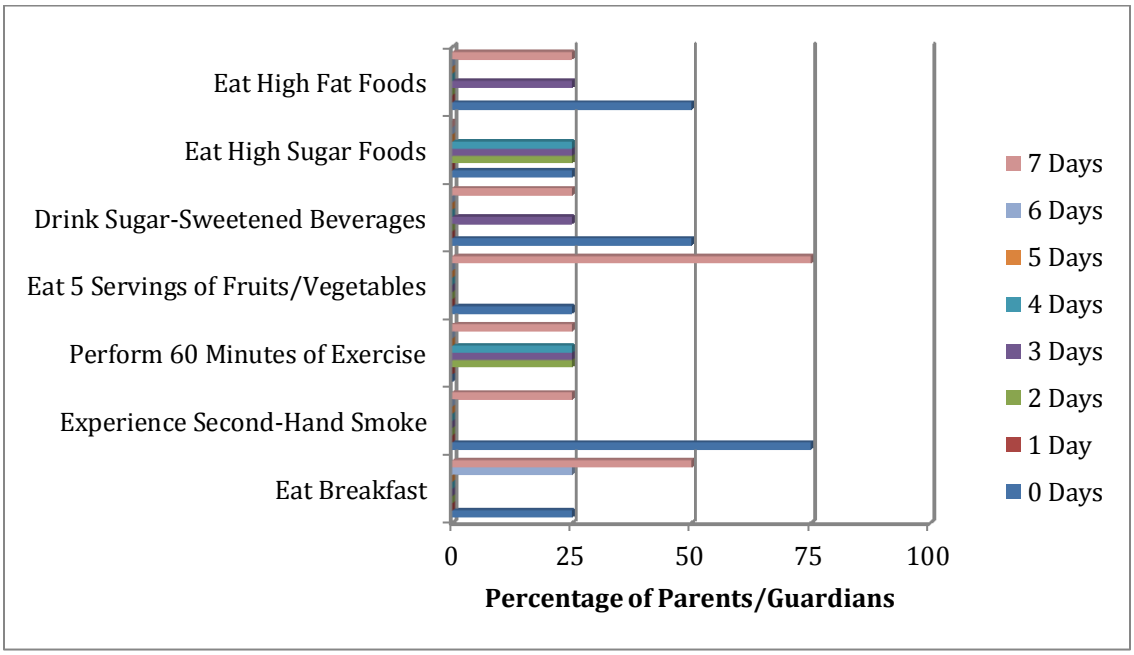
Parents/Guardians: Completed Both Pre and Post-Tests, Part I





Parents/Guardians: Completed Both Pre and Post-Tests, Part I

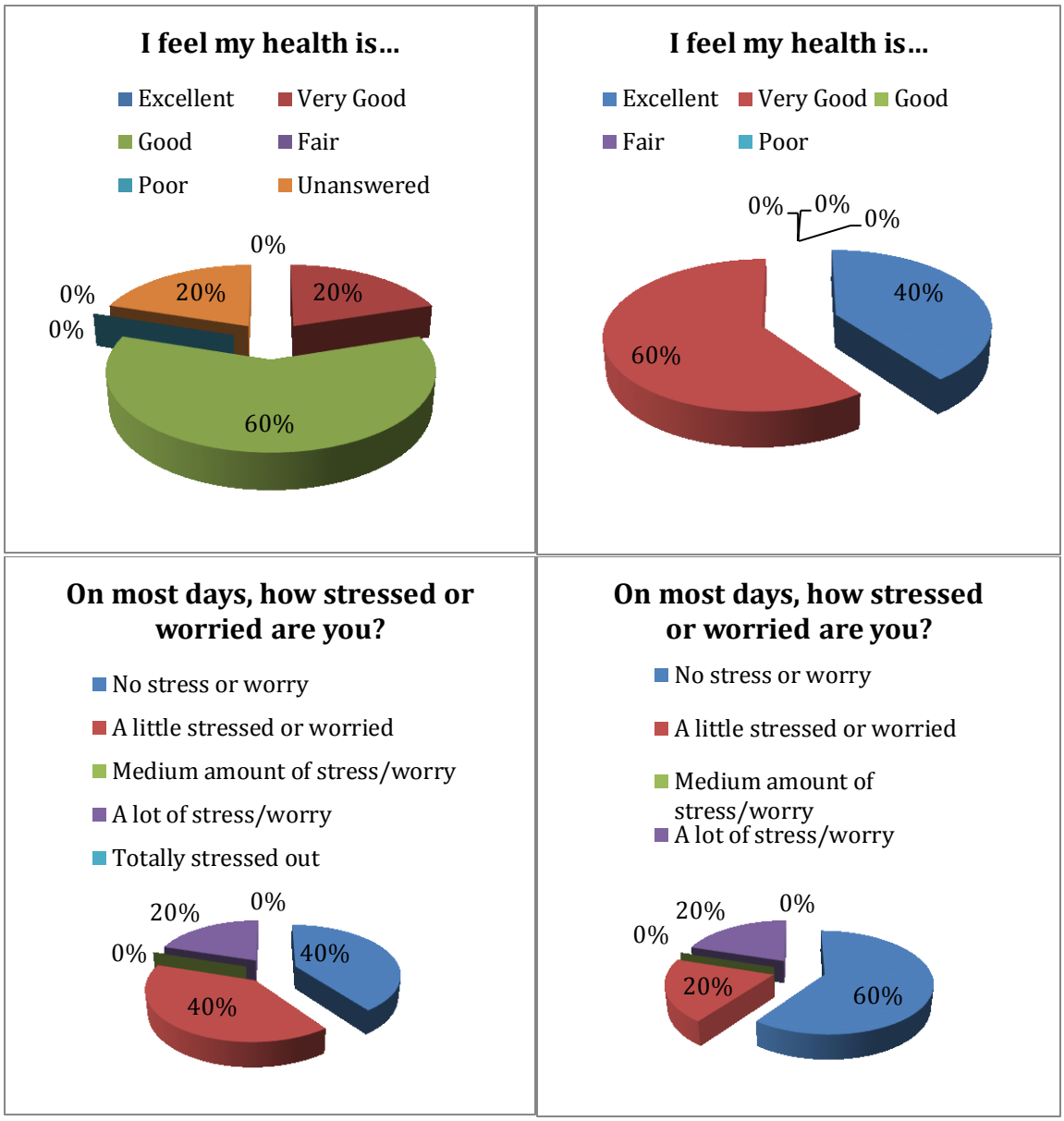




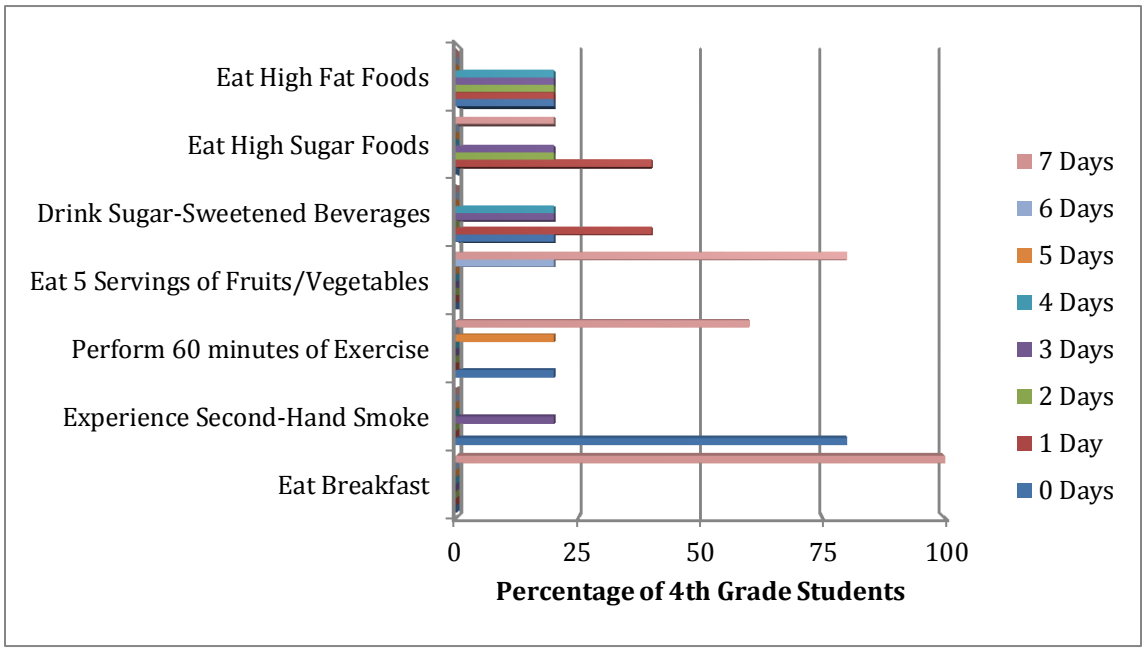
4th Grade Students: Completed Both Pre and Post-Tests, Part II

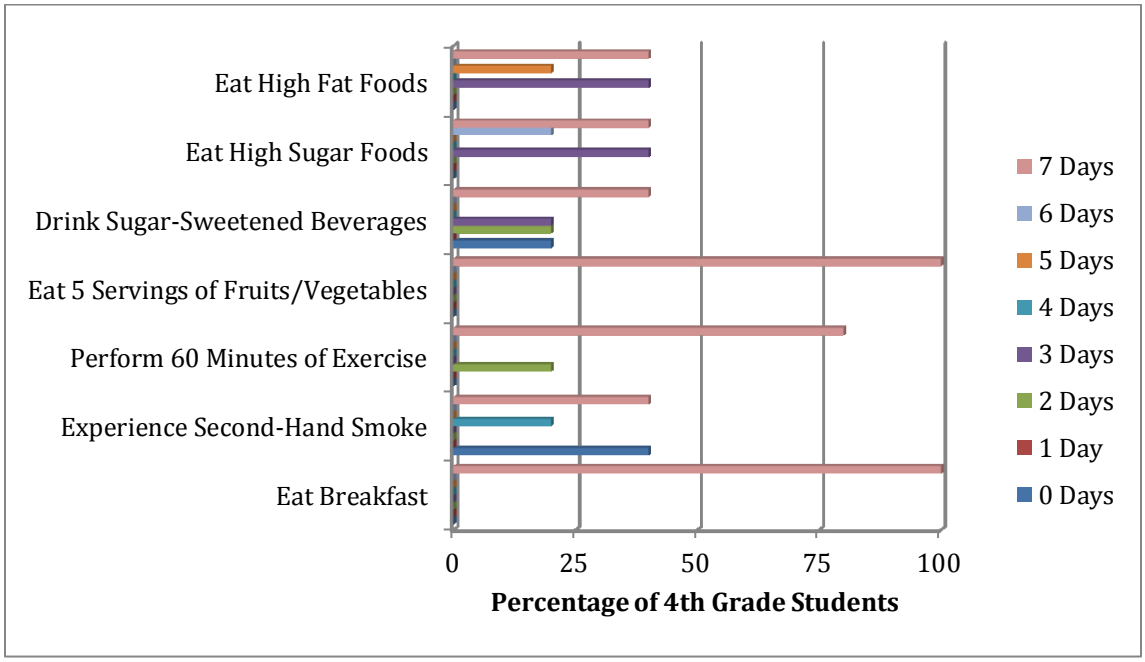
Question	Frequency (n)	Correct (%)	Partially Correct (%)
1	5	100	---
1P	5	100	---
2	5	100	---
2P	5	100	---
3	5	80	---
3P	5	100	---
4	5	40	---
4P	5	20	---
5	5	20	---
5P	5	80	---
5a	5	20	0
5aP	5	20	20
6	5	40	---
6P	5	60	---
6a	5	20	0
6aP	5	0	0
7	5	20	0
7P	5	0	0
7a	5	80	0
7aP	5	20	0
8	5	20	60
8P	5	20	40
8a	5	20	40
8aP	5	0	60
9	5	60	---
9P	5	80	---
10	5	100	---
10P	5	100	---
11	5	100	---
11P	5	100	---
12	5	40	0
12P	5	40	0
13	5	40	20
13P	5	20	40
14	5	80	---
14P	5	80	---

4th Grade Students: Completed Both Pre and Post-Tests, Part II



4th Grade Students: Completed Both Pre and Post-Tests, Part II

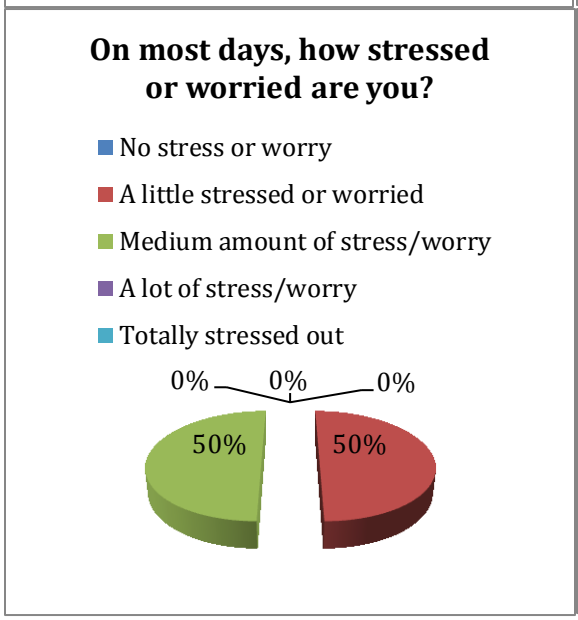


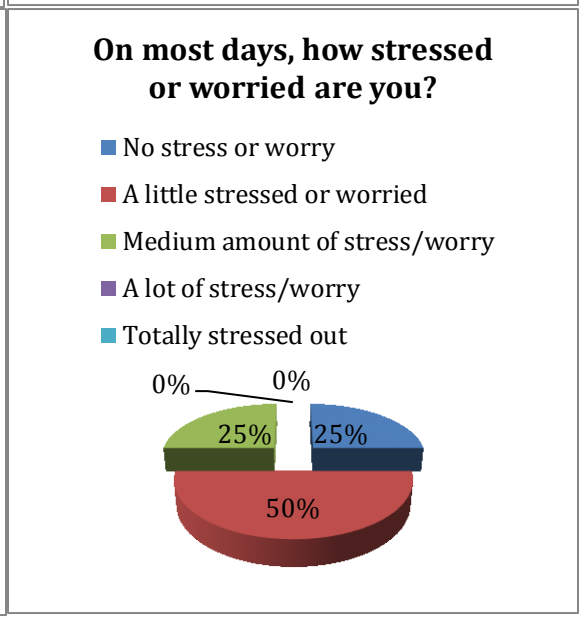


5th Grade Students: Completed Both Pre and Post-Tests, Part II

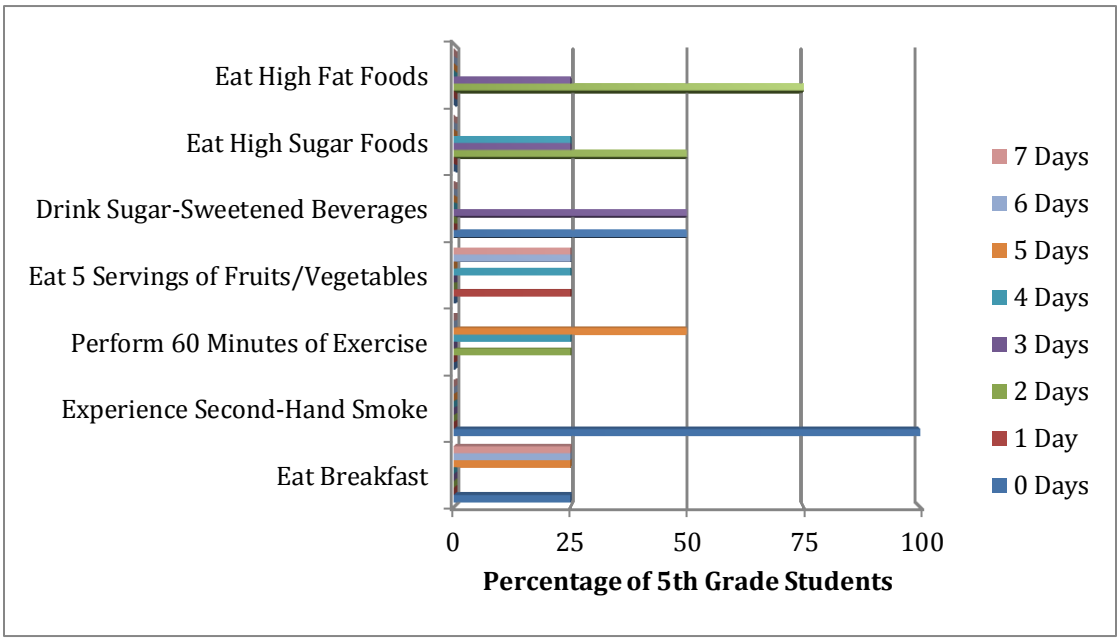
Question	Frequency (n)	Correct (%)	Partially Correct (%)
1	4	100	---
1P	4	100	---
2	4	100	---
2P	4	100	---
3	4	100	---
3P	4	100	---
4	4	50	---
4P	4	50	---
5	4	25	---
5P	4	50	---
5a	4	0	0
5aP	4	0	25
6	4	25	---
6P	4	25	---
6a	4	0	0
6aP	4	0	50
7	4	0	0
7P	4	0	0
7a	4	25	0
7aP	4	25	0
8	4	50	0
8P	4	50	50
8a	4	50	50
8aP	4	25	50
9	4	75	---
9P	4	100	---
10	4	100	---
10P	4	100	---
11	4	100	---
11P	4	100	---
12	4	25	50
12P	4	50	25
13	4	100	0
13P	4	75	25
14	4	75	---
14P	4	75	---

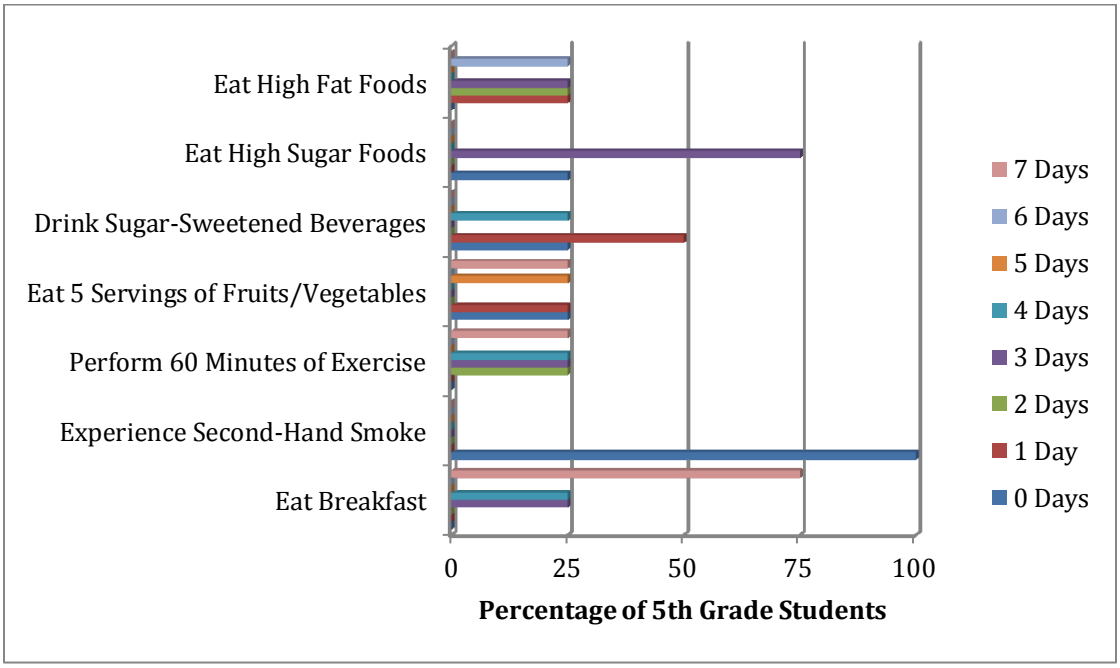
5th Grade Students: Completed Both Pre and Post-Tests, Part II





5th Grade Students: Completed Both Pre and Post-Tests, Part II

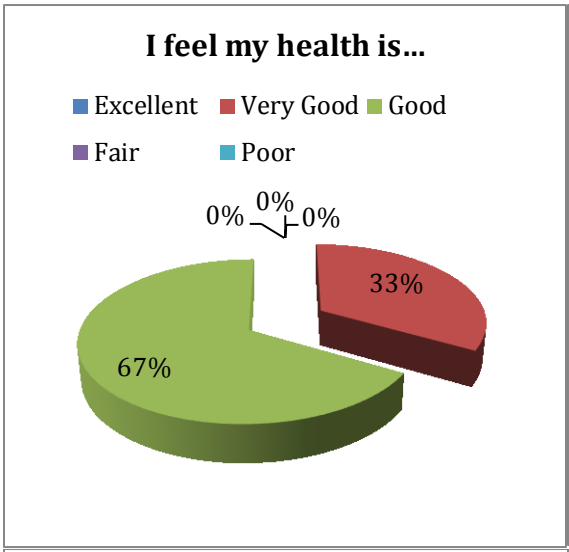


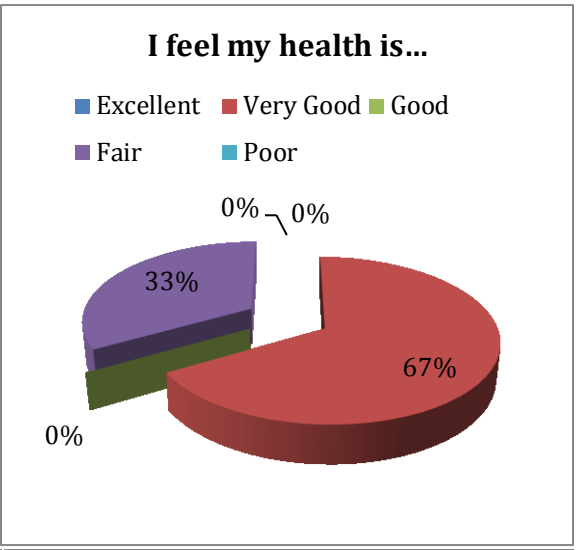


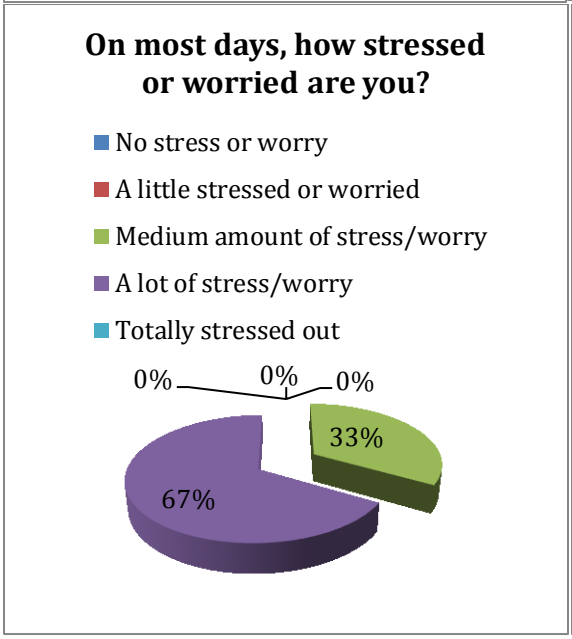
Parents/Guardians: Completed Both Pre and Post-Tests, Part II

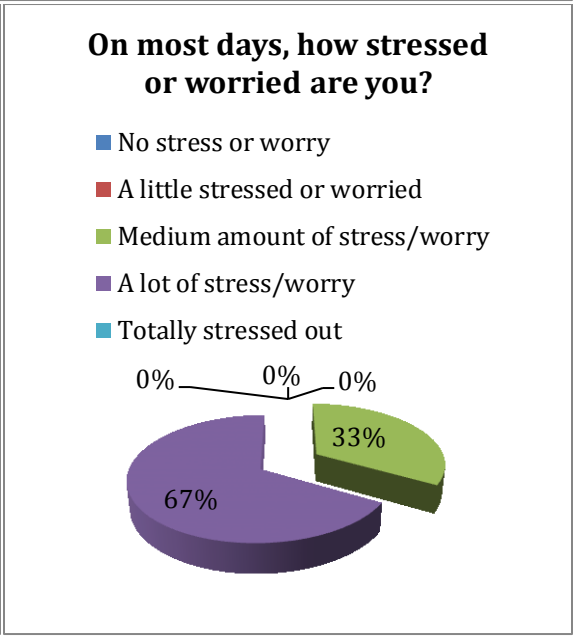
Question	Frequency (n)	Correct (%)	Partially Correct (%)
1	3	66.7	---
1P	3	66.7	---
2	3	100	---
2P	3	66.7	---
3	3	100	---
3P	3	100	---
4	3	66.7	---
4P	3	66.7	---
5	3	66.7	---
5P	3	66.7	---
5a	3	66.7	0
5aP	3	66.7	0
6	3	100	---
6P	3	100	---
6a	3	66.7	0
6aP	3	100	0
7	3	100	0
7P	3	100	0
7a	3	100	0
7aP	3	100	0
8	3	66.7	33.3
8P	3	100	0
8a	3	33.3	66.7
8aP	3	0	100
9	3	100	---
9P	3	100	---
10	3	100	---
10P	3	100	---
11	3	100	---
11P	3	100	---
12	3	100	0
12P	3	100	0
13	3	100	0
13P	3	100	0
14	3	100	---
14P	3	100	---

Parents/Guardians: Completed Both Pre and Post-Tests, Part II

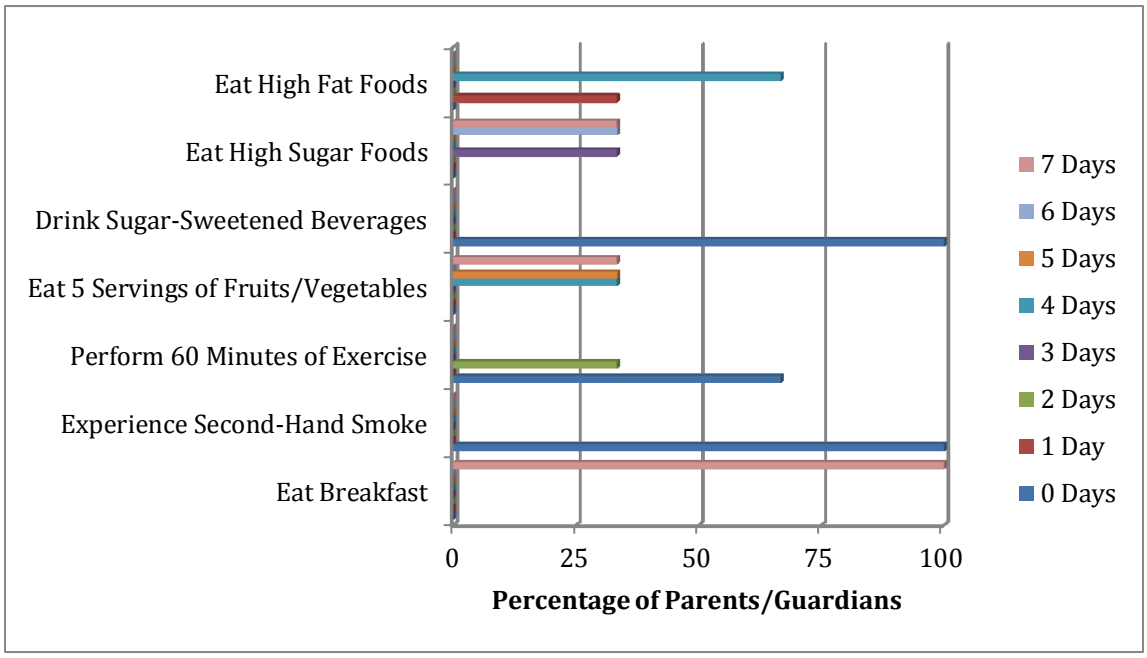


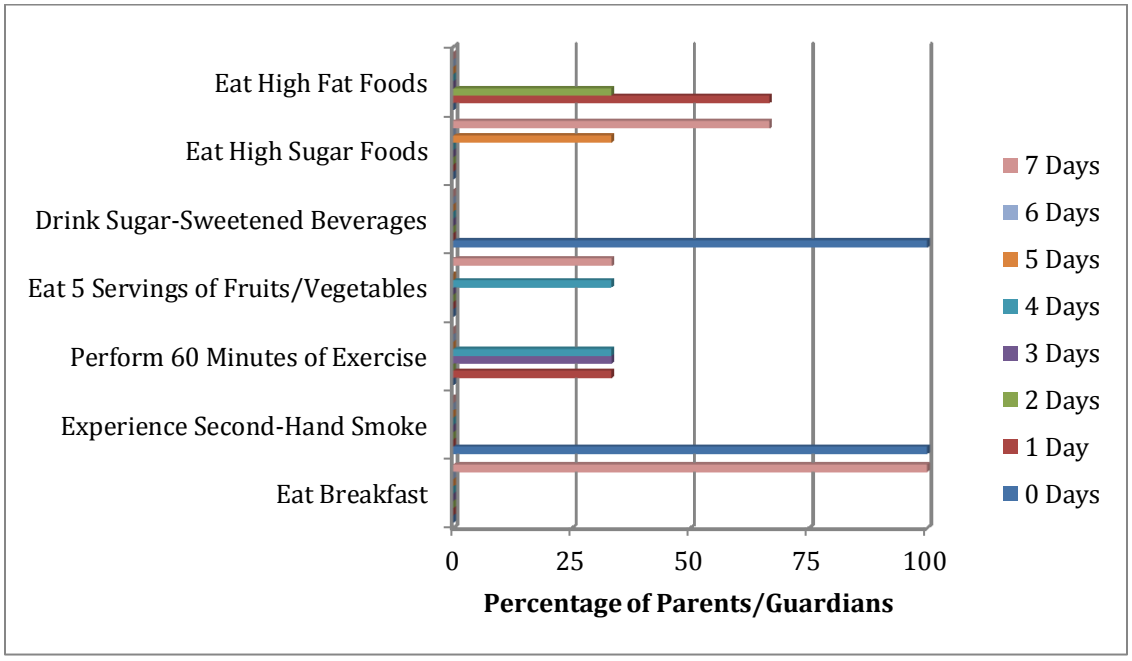






Parents/Guardians: Completed Both Pre and Post-Tests, Part II





*Only 2 participants responded to how many servings of fruits/vegetables were eaten the week prior.

APPENDIX D

EXAMPLE OF THE WEEKLY CURRICULUM

Day 7: Healthy Lifestyles

Healthy Hearts Healthy Lifestyles Club

4th and 5th Grade

Tuesday-March 5, 2013

Overview

Today is a general overview of what the kids have learned the past 7 weeks. They will review components of living healthy lifestyles.

Objectives

- Review physical activity guidelines
- Review nutrition lessons
- Learn about the major food groups/servings
- Learn how stress affects the body

Activities

- Welcome/collect take-home activities (3 mins)
- Physical Challenge physical activity/Dodge Ball (15 mins)
- Make Ants on a Log snack/water break (15 mins)
- Discuss leadership quality with buddy groups (5 mins)
- Discuss take-home activity with buddy groups (2 mins)
- Review questions about nutrition, exercise, stress/Learn about food groups (MyPlate)-still in buddy groups (20 mins)
- Stickers/take-home activities (5 mins)

Materials

- Prize
- Celery
- Cream cheese
- Raisins
- Carrots
- Guacamole
- Cups for water
- Plates/bowls
- Knives (cheese)
- Spoon (guac)
- Buddy list
- Talking points
- Markers
- Food group index cards
- Take-home activity sheets

APPENDIX E

FAMILY FUN NIGHT FLYER

Family Fun Night

Bring the family out for an evening with your student to see what they've been learning at their Healthy Hearts, Healthy Lifestyles club! The night will include games, snacks and prizes. All family members welcome!

Tuesday, March 12th 4:15-5:45 PM

In the Blue Commons at Lopez

Immediately following the final Healthy Hearts Club after-school meeting!

APPENDIX F

FAMILY FUN NIGHT STATION ACTIVITIES

Are you Heart Smart??

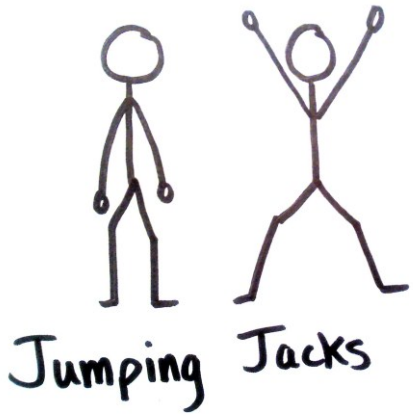
Have someone in your group read the activities. If they strengthen the heart, everyone must jump up and down for 15 seconds. If they weaken the heart, everyone must fall on the ground.

- Riding a bike
- Eating 4 pepperoni pizzas
- Walking your dog
- Smoking cigarettes
- Never going outside to play and watching TV all the time
- Dancing with your friends
- Skating
- Not eating 5 servings of fruits/vegetables daily
- Skateboarding
- Shooting baskets
- Playing PlayStation or X-Box
- Eating fast food
- Raking the leaves
- Washing the car
- Taking the stairs
- Taking the elevator
- Swimming
- Eating potato chips and Twinkies

Feel free to make up your own activities!

Photo courtesy of http://interestingmarketingtidbits.com/honor-american-heart-month-even-after-february/

Ready, Set, MOVE!



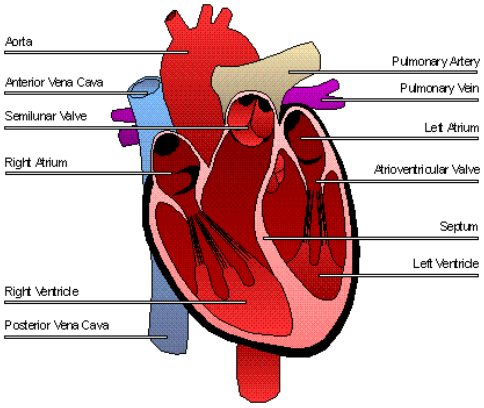
Roll the exercise and number cubes and have everyone in the group perform the movements the specific number of times listed on the cube.

MOVEMENTS:

- **Jumping Jacks**
- **Squats**
- **Toe Touches**
- **Running in Place**
- **Arm Circles**
- **Hopping**

Photo courtesy of http://momfitnow.com/2011/09/five-top-stretches-to-jump-start-your-workout/

Jump Start Your Heart



Arrange the signs on the floor in the order of the blood flow through the heart. Once arranged, have everyone work their way through the circuit, performing each movement listed.

Hints: Start with the right side!
Remember the blood needs oxygen first before it can go to the body!
Try to do this without looking at the answers!

Order: Right atrium, right ventricle, lungs, left atrium, left ventricle, body

Photo courtesy of http://www.worldinvisible.com/apologet/humbody/heart.htm

Stress and Hassle Buster!
Progressive Muscle Relaxation

Have everyone spread out and lay on the floor. Students, take turns reading off the instructions to your families. Use a calm voice to help them really relax!

Use the script provided!

Photo courtesy of http://stress.lovetoknow.com/Stress_Relief_Balls

My Plate Activity
Portions!

Check out the activities in the Train Your Brain booklet provided. Have your family perform one activity to learn about portion sizes that are the most heart-healthy! Use the items provided to represent portions of different foods.

Photo courtesy of http://www.hsph.harvard.edu/nutritionsource/healthy-eating-plate-vs-usda-myplate/

Healthy Snack Time!

Follow the recipe below to make a fruit dip for your apples! Cups are provided if you want water with your snack!

- **2 spoonfuls Greek yogurt**
- **1 spoonful agave nectar**
- **1 teaspoon vanilla**
- **½ teaspoon cinnamon**
- **Grab some apple slices and enjoy!**

Photo courtesy of http://theskinnyconfidential.com/2011/11/20/a-quick-easy-apple-snack/