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presented by

Richard Anthony Miles

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Masters of Science degree in Human Nutrition

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HEALTHY EATING ENVIRONMENTS, POLICIES AND PROGRAMS OF MICHIGAN PRIMARY AND SECONDARY SCHOOLS: THE HEALTHY SCHOOLS STUDY

By

Richard Anthony Miles

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ABSTRACT

HEALTHY EATING ENVIRONMENTS, POLICIES AND PROGRAMS OF MICHIGAN PRIMARY AND SECONDARY SCHOOLS: THE HEALTHY SCHOOLS STUDY

By

Richard Anthony Miles

Schools have been identified as key public health intervention sites to promote healthy eating. The Healthy School Action Tool (HSAT) was designed to assist schools in moving towards school health through a 3-step health improvement process including self-assessment, planning, and action. The Healthy Schools Study (HSS) was an exploratory assessment of school healthy eating characteristics based on the self-assessment of 332 Michigan schools that completed the HSAT from October 2004 to February 2007. A majority of the schools that completed the HSAT had Coordinated School Health Teams (CHST). The prevalences of healthy eating policies, practices and environments varied, and this variation was associated with school characteristics including demographics, CSHT characteristics and external resources. Several CSHT characteristics were associated with desirable healthy eating outcomes. However, the relationship between healthy offering policies and practices was inconsistent. Further investigation is needed to describe the relationship between CSHT's, policies and school healthy eating outcomes.

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2008

Dedicated to God, my family and the children of America

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This thesis was made possible by the collective effort of many individuals who care deeply about the health of school-age children. Many of these individuals have dedicated years of hard work to pursuing healthy solution for public health concerns and share their findings with others. Now, I would personally like to thank them for supporting me with their resources and expertise while collaborating on this project.

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Key partners in this coalition included members of the Michigan Action for Healthy Kids. The steering committee members, Nick Drzal, Shannon Carney, Diane Golzynski and others, obtained the primary data set from the Healthy School Action Tool (HSAT), facilitated coalition meetings and assisted in key areas of the research process. Without their participation, the HSS would not have been possible. So I would like to convey my sincere appreciation for each one of them.

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CHAPTER 1: INTRODUCTION

1.1 Overview

Poor diets can significantly increase the risk for young people of serious health problems.[1] The United States Department of Health and Human Services (HHS) acknowledges healthy eating as a key to the prevention, treatment and amelioration of several chronic diseases.[2, 3] Among youth, healthy eating has been recognized to reduce risk factors for chronic diseases such as cardiovascular disease (CVD). [4-6] In addition, proper nutrition supports childhood growth, development and performance.[7-9]

In order to promote healthy eating, schools have been identified as key public health intervention sites.[10] Fox et al, in a recent review of school intervention literature, found that schools could promote healthy eating through establishing strong policies and implementing creative interventions to control foods and beverages offered at school.[11] The authors further suggested that there is enough evidence to support wide-spread implementation of school interventions to promote healthy eating among children.

In the state of Michigan, adoption of school health polices and implementation of school health interventions are controlled at the school district or building level. [12] However, the state supports these actions by providing guidance and recommendations for the creation, adoption and implementation of school health policies and interventions. In order to assist schools and districts with these tasks, a special interactive toolkit, the Healthy School Action Tool (HSAT) was created. The HSAT is a unique school health measurement and motivational toolkit designed to support schools in moving toward healthy environments, policies, and programs. Developed by members of Michigan Action for Healthy Kids in 2004, the HSAT assists schools through a 3-step (1.

assessment, 2. planning, and 3. implementation) school health improvement process. Prior to 2007, the HSAT consisted of eight separate modules: 1. School Health Policies and Environment, 2. Health Education, 3. Physical Education and Other Physical Activity Programs, 4. Nutrition Services, 5. Professional Development/Continuing Education, 6. School Health Services, School Counseling, Psychological, and Social Services, 7. Health Promotion for Staff, and 8. Family and Community Involvement; each module corresponded to one of the components of the Centers for Disease Control and Prevention Coordinated School Health Model.[13]

The producers of the HSAT recommend that schools form a multi-disciplinary Coordinated School Health Team (CSHT) including school administrators, faculty, staff, students and community members to work through the HSAT process. [14, 15] Collectively, this team is encouraged to promote a healthy lifestyle through the creation and implementation of policies, programs and environmental elements. However, the effectiveness of this prescribed CSHT model has not been extensively studied.[16]

The Healthy Schools Study (HSS) was an exploratory assessment of school nutrition programs, policies and environments among schools that completed the HSAT in the state of Michigan. This study aimed to describe the eating environments of sample schools and the characteristics of their CSHT's, and explore potential associations between CSHT's and school policies, programs and environments in order to provide a foundation for school health recommendations and future studies.

1.2 Benefits of Healthy Eating for Children

Inadequate nutrition has become a national concern. The three leading causes of death in the United States are chronic diseases (heart disease, cancer and stroke) related

to lifestyle, including diet and physical activity.[17] The United States Department of Health and Human Services (HHS) acknowledges healthy eating as a key to the prevention of cardiovascular disease, cancer, type 2 diabetes, and other chronic diseases.[2, 3] Healthy eating plays a critical role in the health outcomes of Americans. Poor diet and physical inactivity are leading causes of death in the United States; each year they account for more than 300,000 deaths.[10]

Similar to that of the general population, the youth of America are challenged with a growing number of health disorders. A recent study of data from the National Health and Nutrition Examination Survey (NHANES) 2003-2004 found that 19% of children aged 6 to 11 were overweight and an additional 17% of adolescents were considered at risk for overweight.[18] Additionally, the percentage of children with high blood pressure (from 1994-2002) has increased along with the prevalence of overweight.[4] Childhood overweight and hypertension as well as other risk factors for chronic diseases, such as cardiovascular disease, diabetes and cancer, can be the consequences of an unhealthy lifestyle. Healthy eating has been recognized to reduce risk factors (hypertension and dyslipidemia) for developing cardiovascular disease (CVD) among youth.[5, 6] In addition to CVD, healthy eating plays a key role in the prevention of osteoporosis and type 2 diabetes.[19, 20] The prevention of type 2 diabetes is particularly critical at this time because of the rapid increase in incidence observed among young children. [21, 22] Proper nutrition can assist in the regulation of blood glucose and other metabolic processes, which may assist in the prevention and management of diabetes. [23]

The benefits of proper nutrition extend beyond disease control and prevention. Healthy eating supports childhood growth and development.[7] When abnormal eating

patterns are developed, such as those seen in adolescents with anorexia, physical and emotional development are often harmed.[24] Failure to consume an adequate diet can lead to nutrient deficiencies, such as vitamin D deficiency, which prevents optimal development by reducing peak bone mass.[25] In contrast, a healthy diet that provides adequate nourishment has been shown to have positive effects on oral health and academic performance.[8, 9] Specifically, adequate nutrition is associated with the prevention and treatment of dental caries, periodontal disease and oral cancer; along with better concentration, test scores, learning capacity and attendance in school. [8, 9, 26] Overall children's ability to function and perform, including in an academic environment, is enhanced when they are well nourished.

1.3 Healthy Eating Recommendations and Trends

1.3.1 Healthy Eating Recommendations

In response to the growing body of literature supporting the benefits of healthy eating, the United States government has established recommendations to promote good health. According to the 2005 Dietary Guidelines for Americans, it is recommended that children and adolescents consume a variety of fruits and vegetables, most grains as whole grains and low-fat dairy daily along with the recommended dietary allowances (RDA) or adequate intake (AI) of specific vitamins and minerals.[27] With respect to specific macronutrients, both the Institute of Medicine's (IOM) and the American Dietetic Association (ADA) promote acceptable macronutrient distribution ranges (AMDR) for children. [28] According to the AMDR's, children should receive 45 to 65 percent of total daily calories from carbohydrates. This recommendation mimics that of the adult recommendation. However, the recommendations for fat and protein are more age-

specific to address special developmental needs. It is recommended that young children (1 to 3 years old) consume 30-40% and 5-20% of total daily calories from fat and protein respectively, and older children consume 25-35% and 10-30% of these nutrients, respectively. Saturated fat, trans fat and cholesterol should be minimized. In addition, both ADA and IOM encourage a diet low in added-sugars. Although there is not a specific dietary reference intake (DRI) for added sugar, some evidence suggests ≤10% of calories could be beneficial. [29] Conversely, high fiber diets are recommended for the prevention of chronic diseases. [28] Specifically, the National Academy of Sciences and IOM recommend that children and adolescents consume 14 grams of fiber for every 1,000 kcal of food consumed. [30]

1.3.2 Eating Trends

Over the last 25 years several notable dietary trends have been observed in the American culture. Americans are consuming more fast food meals and meals away from home, larger portion sizes, and less nutritious food and beverage choices at school.[28, 31] Each of these trends may promote dietary habits which oppose the recommended guidelines and could result in undesirable health consequences.

The routine consumption of fast food has been associated with poor dietary habits. A recent study by Paeratakul et al of U.S. children and adults found that consumers of fast food were more likely to have higher intakes of fried foods and carbonated soft drinks, and lower intakes of fruits, vegetables and milk than non-fast food consumers. [32] In addition, when this consumption pattern was assessed in terms of specific nutrients, fast food consumers' intake of total calories, fat, saturated fat and sodium were found to be higher, and vitamins A and C were found to be lower than that

of non-fast food consumers.[32] This consumption pattern could lead to several health consequences. For example, excessive consumption of total calories and calories from fat can cause energy imbalance and lead to being overweight and increase one's risk for chronic diseases including cardiovascular disease.[31 33] Additionally, low vitamin A and C intake can lead to vitamin deficiency conditions, such as scurvy and xenophthalmia, along with other disorders (e.g. night blindness). Therefore, routine fast food consumption could be harmful.

Likewise, the trend towards larger portion sizes can affect consumer health negatively. According to Young's retrospective review of weight trends and portion sizes, the average body weight of Americans has increased along with typical food and beverage portion sizes. [34] This strong association between portion size and weight has lead Young and others to consider the trend towards larger portions sizes as one potential contributor to the obesity epidemic. [34-36]

The increasing availability of unhealthy foods at school venues is another trend which can have a harmful impact on the nation's children. Although the National School Lunch Program and the National Breakfast Program regulate most meals served at school, there is little national regulation for the competitive foods sold or distributed outside of the school meals programs. [37] Competitive foods are often high in added sugars, fat and calories, which may replace key nutrients required for growth and learning. [31, 37]

Collectively these trends may significantly contribute to poor dietary patterns for a wide-range of consumers including children. On average, the country's youth are not consuming enough fruits and vegetables, and are consuming excessive amounts of (total)

calories and calories from fat and sugar.[27, 38] Continuing these trends could be detrimental to the health of our population. Therefore, interventions may be necessary to prevent serious health consequences.

1.4 Healthy Eating Intervention: Schools

1.4.1 Intervention Site

Schools have been identified as key public health intervention sites to improve nutrition among American youth for several reasons: 1) a large number of children attend schools, 2) children spend a large amount of time in schools, 3) schools are platforms for learning, and 4) schools can provide many opportunities to engage in eating.[10] During the 2005-2006 school year, over 55 million children attended primary or secondary schools in the United States. [39] Michigan alone had 1.6 million public primary or secondary school attendees in the 2005-2006 school year.[39] Hence, school-based interventions implemented in every school could potentially have an impact on the school-age population of the nation.

The extensive amount of time children spend in school also provides unique intervention opportunities. Although the amount of time children spend in school may vary based on school and student circumstances, minimum standards have been established by the U.S. Department of Education and the Michigan Department of Education to ensure the every child receives academic instruction. [40 41] Annually Michigan public schools are required to provide a minimum of 1,098 instructional hours to students. [42] Schools generally make instruction available to students five days per week and the typical school day contains instructional lessons in the morning and afternoon.

The time children spend in school can provide opportunities for short-term as well as long-term interventions.

Schools are learning institutions and have many useful resources for educational interventions. [43] Primary and secondary schools have skilled teachers and materials to educate students on a series of subject matters including math, science, English, social studies, and others. The Michigan Department of Education requires that schools within the state teach curriculum which meets specific standards in each subject area. [44, 45] Nutrition education and healthy lifestyle lessons and interventions may be incorporated into this curriculum for students of various academic levels. [46]

Finally, eating opportunities at school may allow for dietary interventions. Within the traditional American school day, students have the opportunity to eat meals or snacks. Congress acknowledged the importance of school meals with the creation of the National School Lunch Program in 1946, which provides federally assisted meals to over 100,000 schools across the country. [47] Since its inception, school feeding programs have been expanded to include breakfast, after school, and summer meals and snacks. In addition to federally assisted feeding programs, students can often purchase or receive other foods from vending machines, snack stations, school stores and others venues at a school. [37] Through each of these venues, schools have the opportunity to influence the diets of the students.

Schools can have an impact on the eating behavior of students in several ways. Schools may encourage or discourage eating behaviors through traditional classroom education as well as school policies, programs and environments. Classroom courses such as home economics and health education may provide children with healthy

knowledge on meal preparation and food selection. However, it is also important to note that without careful consideration for nutrition and healthy eating behaviors, students may learn unhealthy habits from these courses as well. For example, if the majority of the cooking or food preparation lessons in a home economics course focused on baking pies, cakes and cookies, which are typically high in fat and added-sugar, students may not learn how to make a nutritionally-balanced meal. The state of Michigan has acknowledged the importance of a well-constructed health and nutrition education curriculum and designed the Michigan Model for Health, which includes comprehensive nutrition education lessons for the classroom. [46]

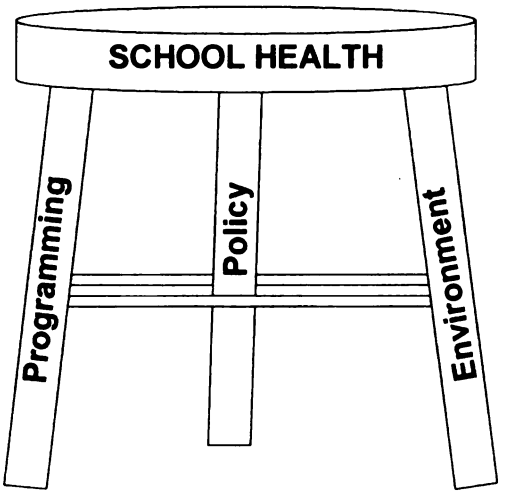
In addition to traditional classroom lessons, nutrition education can be effectively incorporated into other activities including gardening and cafeteria food service. School gardening classes have been shown to increase student knowledge and consumption of fruits and vegetables, while cafeteria food point-of-purchase labeling along with special events designed to educate and promote healthy foods were reported to influence food purchases and consumption.[48-52] These non-traditional forms of nutrition education may play significant roles in developing optimal dietary habits among students.

Beyond nutrition education, schools may influence eating behavior through policies, programs and environments. These policies, program and environments can discourage or promote healthy eating. For example, at many schools, students may purchase foods high in fat, sodium and added sugars with low nutritional value, even though it is well known that frequent consumption of these foods can have adverse health consequences. [53] On the other hand, to promote adequate nutrition, many schools give

students a reserved period of time to consume lunch each day. During this time students may eat a nourishing meal before completing the remainder of their school day.

The U.S. Surgeon General's Office encourages schools to incorporate supportive school-wide policies, programs and environments to consistently promote a healthy life-style throughout the school. [10] These elements can form a supportive triad for school health that includes healthy eating. (Figure 1.1) The Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity recommends schools take actions regarding each of these elements and collaborate these efforts to support a healthy lifestyle within the school. [10]

Figure 1.1: School Health – Three Legs of Support



1.4.2 School Policy

School policy is one means to support school health. A school policy is a plan or course of action intended to influence and determine decisions, actions, and other matters in a school. Policy can be created by almost any governing body and the scope of the policy could apply to a nation, state, district, school, department, classroom or other

divisions. Policies can be an instrument for supporting healthy lifestyles among youth. School policies can be developed to promote certain behaviors by requiring or mandating associated actions. [54]

Research supporting the value of school policies relative to health led the federal government to require every school in the country to have a School Wellness Policy by 2006 through the Child Nutrition and WIC Reauthorization Act (CNRA) of 2004.[55] The act requires school wellness policies contain 5 key components: 1) goals for nutrition education, physical activity, and other school wellness elements, 2) nutrition guidelines for foods offered in the school, 3) methods to assure that USDA guidelines for school meals are being met, 4) a monitoring plan for school food policy, and 5) a process for involving parents, students, the community, school food service and administration in the development of the school wellness policy.[56, 57] Within these requirements, a variety of policies can be developed. The act was designed to encourage schools to customize their wellness policy for their particular school or district.

Model policies have been created to assist schools with adopting comprehensive school healthy policies. For example, the Michigan State Board of Education (MSBE) drafted a policy on offering healthy food and beverages in venues outside of the federally regulated child nutrition programs. The policy states a school will offer: [58]

> 1. Whole and enriched grain products that are high in fiber, low in added fats and sugars, and served in appropriate portion sizes consistent with the current United States Department of Agriculture standards.

2. Fresh, frozen, canned or dried fruits and vegetables using healthy food preparation techniques. Offer 100 percent fruit juice in 12-ounce servings or less.

3. Nonfat, low-fat, plain and/or flavored milk and yogurt. Offer nonfat and/or low-fat real cheese, rather than imitation cheese. Offer the following serving sizes: yogurt in eight-ounce servings or less, milk in 16-ounce servings or less, cheese in 1.5-ounce (two-ounce, if processed cheese) servings or less.

4. Nuts, nut butters, seeds, trail mix, and/or soybean snacks in one-ounce portions or less. Offer portions of three ounces or less of cooked lean meat, poultry, or fish using healthy food preparation techniques.

5. Sauces, dressings, and dips in one-ounce servings or less.

This policy along with other model policies may be adopted as is by schools or utilized as a template to develop their own school policies to promote healthy eating.

However, the development of a policy does not ensure the implementation or practice of its contents, especially when the policy is not created at the local-level or by the unit responsible for implementation. [59] Implementation of policy can be a complex and challenging process. Therefore, the CNRA requires each school to produce a plan for

monitoring their wellness policy and assuring that guidelines established in the policy are being met. [55]

Implemented policies can have a positive affect on programs and the environment including food offerings and promotional programming practices. For example, in the Trying Alternative Cafeteria Options in Schools (TACOS) study, the sales of low-fat foods among students was increased after the implementation of a policy to decrease the availability of high-fat foods in the school along with low-fat food promotions. [60] In other instances, policy has been associated with healthy practices and programming including limiting the hours of operation for vending machine with foods of low nutritional value and eliminating programs that include the distribution of food coupons as rewards. [61] These studies demonstrate the ability of healthy eating policies to support healthy environments and programming.

1.4.3 School Programs

Programming is another tool available for addressing healthy eating in schools. A program is a series of events or other pertinent activities designed around a specific topic or issue. Programs may be developed in response to a policy, support an existing practice, or fulfill other related needs. One of the largest school-based healthy eating programs in the country is the National School Lunch Program (NSLP). [62] The NSLP provides lunches for students throughout the nation equivalent to at least one third of the nutrients a school-age child needs each day. Students of low-income households are eligible to receive free or reduced price lunches from the program.[63] In 2006, the NSLP served 5 billion lunches to 30.1 million participants across the nation.[64] Michigan schools alone served 137 million lunches to 885,000 students.[65] The nutritional requirements of the

NSLP are generally considered the standard for school lunch programs in the country. The guidelines for the program were developed by the United States Department of Agriculture (USDA) to correspond with the Dietary Guidelines for Americans. [66]

In addition to national programs, other state and local programs, such as food service personnel training programs and farm-to-school programs, are utilized to promote nutrition in schools. For example, the Coordinated Approach to Child Health (CATCH) Eat Smart Nutrition Program was utilized in Texas to provide specialized training for the preparation of meals that met healthful guidelines. [67] The program contributed resources including recipes and training in low-fat cooking techniques to school food service departments so that they might be better equipped to deliver healthy school meals. Farm-to-school programs have also been utilized to deliver healthful school meals. [68] In the state of Michigan several schools have developed relationships with local producers to supply fresh fruits and vegetables which are served in school meals. Programs such as these can play a key role in supporting school health.

1.4.4 School Environments

The environment is the third support element that may be utilized to promote a healthy lifestyle in schools. In general terms, the environment is the surrounding circumstances and conditions in which people operate and interact. The environment is commonly subdivided into two areas: 1) physical environment and 2) social environment. The physical environment includes physical structures and features of the surroundings such as the seating capacity of the cafeteria and the presence of water fountains, while the social environment refers to the behavior or interaction of people including staff supervision and peer conversations.[69]

School environments can include the school campus and the community in which the school is located. Elements of the school's environments, such as availability of health food options, advertisements of unhealthy foods and peer support, can encourage or discourage a healthy lifestyle.[70 71] In order to consistently promote a healthy-lifestyle, schools should consider environmental elements. [10]

1.5 School Interventions

Several research studies have shown that the creation and implementation of nutrition policies, programs and environmental interventions can have positive effects on student behavior.[72, 73] For example, students in the National School Lunch Program (NSLP) consume more recommended healthful foods (milk, fruits and vegetables), and fewer foods with little nutritional value (sweetened beverages and candy) than students that purchase non-NSLP foods.[74] However, not all interventions designed to promote a healthy lifestyle are equally as effective. Thirty-two percent of the interventions and programs reviewed by Doak and colleagues were classified as ineffective in childhood obesity prevention because they failed to decrease the percentage of overweight participants or had adverse consequences (e.g. increased the percentage underweight participants). [75] Therefore, school administrators and staff may benefit from assistance in designing and implementing programs, policies and environments to promote healthy eating in their schools. Knowledge obtained from studies, reviews and evaluations of school-based interventions could serve as a guide for designing, implementing or improving health interventions at schools.

One desirable outcome of school health interventions is the adoption of healthy practices by students and staff. Accomplishing this goal may require the consideration of

multiple factors in the design and implementation process. [76] Experts have developed several health behavior and health education models and theories to serve as guides in addressing the complexity of this task. For example, the Social-Cognitive Theory (SCT) has been utilized effectively to design interventions focused on improving eating and physical activity behavior.[77] This theory, like other behavior-change theories, acknowledges the complexity of health behavior change by recognizing the roles of at least seven different constructs and concepts in health behavior (environment, situation, behaviorally capacity, expectations, self-control, observational learning, reinforcements, self-efficacy, emotional coping responses, and reciprocal determinism) that could be considered.[69] The framework provided by this theory and others could assist schools and others in developing effective interventions.

In addition to the general guidelines put forth by theoretical models, intervention designers should bear in mind the target audience and other unique circumstances of the intervention situation. A study of school children's eating patterns in Maryland showed notable differences in the number of meals skipped by children attending school in rural communities versus those in urban communities. [78] Hence, unique intervention may be needed to meet the specific needs of each student population. Another research team from Minnesota found that among youth populations, specifically adolescent students, health behaviors tend to coexist.[79] When various health behaviors of Minnesota high school students were examined, consumption of unhealthy foods was found to be inversely associated with seat-belt use and teeth brushing.[79] This finding supports the notion that it may be more beneficial to design interventions that address a series of health behaviors rather than only one. Neumark-Sztainer and colleagues' review of the literature led them

to recommend focusing on adolescent lifestyle and not individual health behaviors.[79] These sample specific findings, suggest that an in-depth understanding of the target population could assist intervention designers in producing effective interventions.

Another consideration when designing school healthy eating interventions is the availability of food choices in various locations throughout the school. Currently many schools across the state of Michigan offer more than just the traditional school meals. [80] They have a la carte stations, vending machines, school stores and other food sale venues. Foods offered at these venues may differ greatly, especially between schools. Hence, each school and venue may require special attention to ensure consistent health promotion.

In terms of nutrition education, interventions may be required to ensure that all students receive formal nutrition education in school. Although is it highly encouraged, nutrition education curriculum is not required for Michigan high school students. [81] According to the recently instated Michigan Merit Curriculum, the high school standards in Michigan require one combined credit of physical and health education in which nutrition education may or may not be included. [45] Still, the Michigan Department of Education recommends the use of the Michigan Model for Health, a standardized health education curriculum for health and physical education classes, which includes nutrition education. However, since schools may choose not to use this curriculum or any other standardized curriculum with nutrition education components, some Michigan students may receive little or no nutrition education in high school. [46]

Effectively addressing this complex mixture of school health challenges (e.g. developing and implementing policies, designing effective programs, producing health

promoting environments and instating nutrition education curriculum) may call for the cooperation of a diverse group of individuals representing different areas of the school system and community, such as school administration, school food service, teaching staff, parents, students and others (e.g. healthcare professionals). Researchers have found that in certain cases more than staff and administrative involvement were needed to effectively deliver desirable outcomes, and that schools could benefit from the support of families, the community and other organizations. [60, 82] Therefore, Michigan Action for Healthy Kids and others (e.g. Centers for Disease Control and Prevention) encourage schools to form a multi-disciplinary team (administrators, teachers, parents, students, healthcare professionals, and community members) to address school health. [83, 84] The team is referred to as a Coordinated School Health Team (CSHT) or school health council.

A CSHT could be an asset in school health promotion for several reasons. [85, 86]One value of a multi-disciplinary collaboration is that persons of various disciplines could promote a healthy lifestyle within the school in different ways based on their expertise. For example, administrators likely have the ability to change policy, food service staff could modify the foods available to the students, and physical education instructors could teach children ways to stay or become physically active. When coordinated together, these efforts by the team could offer a school-wide consistent message to promote a healthy lifestyle including healthy eating.

1.6 Measuring School Health Environments

The self-assessment, planning and action model recommended by the Centers for Disease Control and Prevention (CDC) and Michigan Action for Healthy Kids (MAFHK)

for a CSHT to undertake school health issues is a three-tier process. [87, 88] Although the approach has various names around the world (e.g. comprehensive school health model and health promoting schools model), the process follows the same general guidelines.[89, 90] The process begins with the gathering of information about the current environment (determining strengths and weaknesses), planning changes and implementing the plan.

Knowledge of current school health programs, policies and environments can provide a firm foundation on which to begin building future interventions. Evaluation of this knowledge is valuable to the process of making environmental improvements or sustaining successes. [91] However, there has not been an extensive evaluation of school health policies, programs and environment in the state of Michigan. [16] Therefore, studies designed to assess these school health elements may provide beneficial information about the health of Michigan schools.

1.6.1 School Health Assessment Tools

Tools have been developed to assist schools and researchers in gathering information about school health policies, programs and environments. The School Health Index (SHI) is one of the most widely recognized self-assessment and planning guide in the United States. The SHI was created by the Centers for Disease Control and Prevention (CDC) in 2000 (and revised in 2004).[92] This tool utilizes eight modules to cover the wide spectrum of school health elements.[1] The eight modules are grouped together and presented in two forms, one designed specifically for primary (elementary) schools and the other for secondary (middle and high) schools. The School Health

[1] Modules: 1) School health and safety policies and environment; 2) Health education; 3) Physical education and other physical activity programs; 4) Nutrition services; 5) Health services; 6) School counseling, psychological, and social services; 7) Health promotion for staff; 8) Family and community involvement

Policies and Programs Study (SHPPS) is a national surveillance program which uses SHI and interviews to measure the health environment and monitor the progress of schools around the country.[93] Data collected from this program is analyzed on the state, district, school and classroom level. Results of the analyses are used to determine if schools are meeting the national recommendations. Beyond measuring and monitoring school environments, the SHI is also designed to assist schools in: (1) identifying the strengths and weaknesses of their health-promotion policies and programs, (2) developing an action plan for improving student health, and (3) involving teachers, parents, students, and the community in improving school policies, programs, and services.[92] The utilization of the SHI has effectively led to school improvements by assisting schools in healthful policy creation and implementation.[94]

In order to build upon the success of the SHI, the United States Department of Agriculture (USDA), the Food and Nutrition Service (FNS) and Team Nutrition (TN) created "Changing the Scene: Improving the School Nutrition Environment" (Changing the Scene).[2] This toolkit follows the same basic principals as the SHI, but focuses specifically on nutrition and healthy eating. Changing the Scene is primarily a motivation tool for encouraging change in the school nutrition environment and it provides a less comprehensive assessment of the school health environment than the SHI.

Another tool developed that gathers information about school health environments is the Elementary School Environment and Policy Survey (SEPS). The SEPS was created by a team of colleagues at the Rocky Mountain Prevention Research Center from the University of Colorado to measure the environment of local elementary

[2] Changing the Scene: Improving the School Nutrition Environment website http://www.fns.usda.gov/tn/Healthy/changing.html

schools in response to the growth of obesity and other chronic diseases in the youth population of the state.[95] The SEPS has recently been adapted for middle schools in collaboration with researchers from Michigan State University and representatives from Michigan Action for Health Kids. The SEPS was developed to provide in-depth assessment of nutrition and physical activity elements in schools and has been utilized as a surveillance tool, similar to the SHPPS.

1.6.2 Healthy School Action Tool

The Healthy School Action Tool (HSAT), like the SHI, Changing the Scene and SEPS, may be utilized to assess elements of the school health environment. The HSAT is a unique school health measurement and motivational tool that was designed specifically for Michigan schools. The HSAT is the product of the Michigan Health Advisory Group (MHAG) and Michigan Action for Healthy Kids (MAFHK). The MHAG was established to provide guidance to schools and assist in the development of statewide recommendations. Experts on youth health issues from around the state of Michigan were invited to join the advisory group. The MHAG was comprised of the Michigan Department of Education, Michigan Department of Community Health, and the Michigan Governor's Council on Physical Fitness, Health and Sports. This committee produced "The Role of Michigan Schools in Promoting Healthy Weight", an evidence-based document designed specifically to address the health of Michigan schools, especially obesity.[13] The paper describes the built environment, social environment, status of nutrition and physical activity among Michigan students, and ways to improve school health environments.

The advisory council determined that the implementation of state school health recommendations would require a collective effort from districts, schools and communities. Several key players were identified in the school intervention process including school administrators, food service directors/managers, physical education teachers, health and life management teachers, school nurses, parents, students, and community members. The desire to connect the recommendations with key players in districts, schools and communities led to the production of the HSAT.

The HSAT was adapted from the School Health Index for Physical Activity, Healthy Eating, and a Tobacco-Free Lifestyle: A Self-Assessment and Planning Guide from Centers for Disease Control and Prevention (SHI) and the Changing the Scene Healthy School Nutrition Environment Improvement Checklist create by USDA, Food and Nutrition Service, and Team Nutrition (Changing the Scene). Experts from key state departments and related organizations customized the elements of the tool to fit the profile of Michigan's schools. The development of the HSAT was a collaborative effort (Michigan Department of Community Health, the Michigan Department of Education, Michigan State University Extension, Michigan Team Nutrition, and United Dairy Industry of Michigan).

According to its developers, the functions of the HSAT online assessment were to assist Coordinated School Health Teams (CSHT's) in determining if their "school's environment gives opportunities for students to make healthy choices and offers consistent messages about the importance of healthy eating, physical activity, sun safety and a tobacco-free lifestyle, and to provide a forum for action planning." [83] The HSAT, prior to being revised in November of 2007, consisted of eight separate modules (1.

School Health Policies and Environment, 2. Health Education, 3. Physical Education and Other Physical Activity Programs, 4. Nutrition Services, 5. Professional Development/Continuing Education, 6. School Health Services, School Counseling, Psychological, and Social Services, 7. Health Promotion for Staff, and 8. Family and Community Involvement); each corresponded to one of the components of the CDC Coordinated School Health Program, and all followed a similar format. [13] Every module contained multiple-choice questions for a school's CSHT to answer about the module topic along with links to an electronic resource guide which schools could utilize to gather more information about the topic of interest. Responses to the items in each module corresponded to points. The quantity of points given for each response was based on evidence found in the Role of Michigan Schools and Promoting Health Weight and other scientific literature. When all questions in the assessment were completed, a scorecard was provided to the school, which enabled the school to compare itself to the ideal score. The assessment revealed the school's strengths and weaknesses, and provided a resource guide with recommended actions to improve the school's health environment. Upon completion of the assessment, the school's CSHT was prompted to develop an action plan to improve the schools health environment. The action plan template provided to the team took into consideration the feasibility of actions by considering factors such as cost, time, support and importance. Upon completion of an action plan, CSHT's were encouraged to implement the action plan, monitor the school's progress, and reassess periodically and update their action plan accordingly.

1.6.3 Michigan School Health Environments

In the state of Michigan, schools are managed primarily by local entities or school districts. Typically, these school districts determine the policies, programs and environments in place within schools. The state of Michigan contains over 835 school districts which vary in structure, management style and emphasis on school wellness. [96] These differences and others may significantly contribute to variations observed in school health environments. The School Health Policies and Programs Study's found wide variation in the nutrition and physical activity policies, programs and environments among Michigan school districts.[93] Some of these variations, such as differences in school nutrition policies, are related to measurable factors recorded by the Healthy School Action Tool (HSAT). An analysis of this information collected by the HSAT may assist in determining elements associated with variations in the school health environments.

1.7 Rationale and Study Aims

The Healthy Schools Study (HSS) was a cross-sectional exploratory assessment of school nutrition programs, policies and environments among schools that completed the HSAT in the state of Michigan. This study utilized the HSAT data collected from Coordinated School Health Teams (CSHT's) and other school staff members, educators, related professionals and community members from across the state between October 2004 and February 2007. This study was the first in Michigan to extensively evaluate the school nutrition policy, program and environmental self-assessment data from the Healthy School Action Tool (HSAT).

The HSS aims were specifically:

a. **To provide a description of the school healthy eating environments among those schools that completed the HSAT between October of 2004 and February of 2007.** A descriptive analysis of the school health environments was conducted to determine strengths, weaknesses and areas where Michigan's schools could improve. Dissemination of the study's findings could be used to build awareness of the successes and gaps regarding healthy eating policies, programs and environments in Michigan schools, and lend support in the development of plans for healthy eating policy, program and environmental improvements for Michigan's schools.

b. **To explore differences in school characteristics between schools with a CSHT that oversees healthy eating, schools with a CSHT that does not oversee healthy eating and schools without a CSHT.** The presence and oversight of CSHT's are important parts of the state-recommended HSAT process for school health. This study explored differences in school characteristics among schools with and without a CSHT along with schools that have a CSHT to oversee healthy eating. Differences between these schools may add to the current understanding of the CSHT model in Michigan schools.

c. **To explore the relationships between the CHST model and school nutrition policy and environmental elements.** The CSHT model is currently recommended for the HSAT process and improving school health by the State of Michigan. However, there is little evidence available to support the effectiveness of using the CSHT model. [97, 98] This study investigated the differences in the healthy eating policies and environments between schools using the CSHT model

without a focus on healthy eating, schools using the CSHT model with a focus on healthy eating, and schools who did not use this model. In addition, the associations between other CSHT characteristics (CSHT meeting frequency and member composition) and healthy eating policies and environments were also investigated.

d. **To investigate the relationships between healthy eating policies and corresponding practices.** One of the primary goals of the CSHT model and the HSAT process is to create healthy school policies. In theory, these policies should support healthful programs, practices and environments.[99] However, the relationship between policy and environment is not well understood. This study investigated associations between food offering policies and food offering practices.

e. **To offer information about schools that completed the HSAT to Michigan Action for Healthy Kids Coalition (MAFHK).** Findings from this study will be provided to MAFHK and partners. This was the first in-depth analysis of the HSAT healthy eating items, and the study's findings may be useful to MAFHK and its efforts to promote school health.

1.8 Research Questions and Hypotheses

The specific research questions of the study were:

Research Question 1: What are the characteristics of the schools that completed the HSAT between October 2004 and February 2007?

To answer this research question, a description of the study sample was created based on school characteristics. Schools were characterized by their type (e.g. public), grade level (e.g. elementary), student enrollment, location and income. The sample schools were then compared to the Michigan school population. In addition, the percentages of schools in the sample that were members of Michigan Team Nutrition (TN) and HSAT-related grant recipients were determined.

Research Question 2: Who was involved in the HSAT process?

The Healthy School Action Tool (HSAT) was designed to be a team-orientated process. Schools are encouraged to build a Coordinated School Health Team (CSHT) and collectively complete the HSAT process. However, schools may complete the HSAT without forming a CSHT. In addition, the composition of CSHT could vary greatly from school to school. Therefore, the frequency and percentage of schools within the sample that have a CSHT along with the types of members (e.g. administration, food service department, student, etc.) represented on each team were determined. Additionally, an exploratory assessment of the relationship between CSHT characteristics (presence and oversight) and school characteristics was conducted to determine if any associations exist.

Research Question 3: What are the prevalences of policies, environments and programs related to healthy eating among schools that have completed the HSAT?

School policies, environments and programs can have an impact on student eating behavior. [100, 101] Thus, an assessment of the policies, programs and environments in place at the sample schools based on HSAT self-assessment items was conducted. The prevalence of each HSAT item pertaining to a nutrition policy, program or environment was calculated. In addition, scales were created by combining categorically similar HSAT items to represent four separate areas of school healthy eating. Scales included a healthy offerings policy scale, an eating environment scale, a healthy offerings at school venues scale, and a healthy meal preparation and serving practice scale.

Research Question 4: What are the relationships between school characteristics, healthy eating polices and healthy eating environments existing in a school at the time the HSAT self-assessment was completed?

Four hypotheses were developed which described the likely relationships between CSHT characteristics recorded by the HSAT assessment and the types of policies and environments existing in a school. In addition, other factors were tested for associations with school policies and environments, including: school demographics, Team Nutrition membership, and grant funding. The existence of associations between these factors, and the magnitude and the direction of the relationships are described.

Hypothesis 1: *Schools that have a CSHT that oversees healthy eating are associated with an increased number of: 1) healthy eating policies (written and enforced), and 2)*

positive environmental factors (I. adequate, safe and encouraging cafeterias and serving areas, and II. healthy food preparation and offering practices) when compared to schools that do not have a CSHT or have a CSHT that does not oversee healthy eating.

The creation and implementation of healthy eating policies and environments are ways to promote healthy eating. Teams overseeing healthy eating would likely produce a greater number of policies and environmental changes to address healthy eating than schools without a team in place or with a team that oversees other areas of school health.

Hypothesis 2: *The number of CSHT meetings held in the last year is positively associated with the number of: 1) healthy eating policies (written and enforced), and 2) positive environmental factors (I. adequate, safe and encouraging cafeterias and serving areas, and II. healthy food preparation and offering practices)*

Since the goal of a CSHT is to enhance school health, CSHT meetings are generally held to facilitate the sharing of expertise and resources to address that goal. One reason the number of CSHT meetings may be associated with the number of polices and positive environmental elements in a school is that each CSHT meeting may be an opportunity to collectively establish policies or positive environmental changes. Plus, the number of CSHT meeting could reflect how active the team is in pursing its goals. Each meeting demonstrates effort on the part of the CSHT to work towards healthful outcomes. Therefore, a greater number of CSHT meetings could represent a greater effort towards achieving outcomes.

Hypothesis 3: *The number of representatives on a CSHT is positively associated with the number of: 1) healthy eating policies (written and enforced), and 2) positive environmental factors (I. adequate, safe and encouraging cafeterias and serving areas, and II. healthy food preparation and offering practices)*

One potential advantage of the CSHT model in creating and implementing healthy policies, programs and environments is the collective effort of a team with diverse expertise and resources. Increasing the number of representatives on the CSHT could increase amount of expertise and resources available to the team. Healthy eating policies and positive environmental factors may be created more effectively with these additional resources.

Hypothesis 4: *Schools' healthy offering policies are associated with healthy offering practices in school food distribution venues.*

The state and federally supported CSHT model encourages the creation of school health policies. School health policies are intended to influence environments and behaviors. Therefore, nutrition and healthy eating polices should be associated with corresponding healthful eating environments and practices. A comparison of healthy offering policy and healthy offering practice scales was conducted along with direct comparisons of individual policies with corresponding individual practices to determine if associations were present.

1.9 Organization of Thesis

This thesis is organized by the following sections: introduction (Chapter 1), methods (Chapter 2), results (Chapter 3) and discussion (Chapter 4). References cited in

the text are displayed following Chapter 4. Tables and figures which are not found within the text are included as appendices.

CHAPTER 2: METHODS

The Healthy Schools Study (HSS) was conducted using a retrospective collaborative research approach. This method entailed university researchers working in collaboration with community organizations and state institutions to evaluate existing data from the Healthy School Action Tool (HSAT). This research project was a partnership between Michigan State University and members of the Michigan Action for Healthy Kids Coalition (MAFHK) (Michigan Department of Community Health, Michigan Department of Education, Michigan State University Extension, United Dairy Industry of Michigan, National Kidney Foundation, American Cancer Society, Michigan Team Nutrition, and Michigan Public Health Institute). The research questions and analyses were developed with the assistance of several coalition members, and findings from this study will be shared with MAFHK and other partners.

2.1 Description of Data Sets

The primary dataset used for the Healthy Schools Study (HSS) was responses to the Healthy School Action Tool (HSAT) by Michigan primary and secondary schools who completed the self-assessment portion of the tool online between October of 2004 to the February of 2007. All Michigan schools with at least one grade level from kindergarten through twelfth grade were eligible to complete the HSAT. Schools were notified of the HSAT's availability by email, letters and posting promotions conducted by MAFHK and its partners. In addition, the HSAT was publicized by the Michigan State University Extension (MSUE) and Team Nutrition (TN) through website postings and printed materials such as newsletters.

Completion of the HSAT was voluntary and there was no cost to the schools. However, some state-based grant programs required completion of the HSAT to receive grant funding. For example, school nutrition-related grants provided by Michigan Team Nutrition, Michigan Department of Education and Michigan Department of Community Health since the fall of 2004 required the completion of the HSAT for funding. However, not all grants which required the completion of the HSAT for funding were nutrition-related. A description of the grants distributed requiring completion of the HSAT during the data collection period is shown in Table 2.1.

Some schools that were selected to receive these grants (12.8%) were not included in the sample because they did not complete the HSAT online during the monitoring period. Completion of the HSAT online may not have occurred during the monitoring period for several reasons: 1) schools completed the HSAT after the end of the monitoring period, 2) schools completed a paper-version of the HSAT and never recorded their responses online, and 3) schools were granted permission to complete the SHI as an alternative to the HSAT. From the time the HSAT was first introduced online until February of 2007, 332 schools completed the online self-assessment portion of the tool. These self-selected schools were the sample for the HSS study.

Data collected by the HSAT online assessment tool were downloaded from the website and organized by modules into a series of Microsoft Excel databases. The databases were then transferred into STATA 10.0 statistical software data files and merged for statistical analysis. Information from Module 1 (School Health Policies and Environment) and Module 4 (Nutrition Services) provided the primary basis for the HSS analysis.

Table 2.1: Grant Funding Sources in Michigan Requiring HSAT Completion from 2004-2007

Grant	Funder	Focus	Number of Grants Awarded
Team Nutrition Mini-Grant	Team Nutrition	Healthy Eating	46
School Wellness Grant	Michigan Action for Healthy Kids	Healthy Eating and Physical Activity	79
Healthy School Start-up Mini-Grant	Michigan Action for Healthy Kids	School Wellness (non-specific)	18
Sue D Isabel Grant	Private Funder	School Wellness (non-specific)	2
Healthy School Grant	Blue Cross Blue Shield	Physical Activity (and healthy eating)	9
Sun Safety Mini-Grant	Michigan Action for Healthy Kids	Sun Safety	10

In addition, complementary data was obtained from the records of the Center for Educational Performance and Information (CEPI). The CEPI collects information about Michigan K-12 schools to determine compliance with state and federal laws. [102] This information includes building-level data, individual personnel data and individual student data. Building-level data from the CEPI database was used in the HSS to determine school type, grade level, student enrollment, location, and the percentage of free/reduce lunch eligible students for the HSAT sample and the Michigan school population. This data was downloaded in the form of two subdatabases, the 2005-2006 Free and Reduced Lunch Building Dataset and the School Code Master State Dataset. [103] [104] The information from these databases were merged with the HSAT data in STATA 10.0 statistical software prior to analysis.

2.2 Definitions of Outcomes and Covariates

2.2.1 Outcomes

Outcome variables for this study included: school healthy eating policies, eating environmental elements, food offerings in eating venues, meal preparation practices, and meal period structure. Each outcome variable was determined by schools' responses to HSAT items. The HSAT items for each outcome are described in this section. In addition to the descriptions provide in this section, corresponding examples and definitions pertaining to HSAT items were available to school when completing the HSAT through weblinks. Some of these examples and definitions are presented in corresponding tables (see Table 2.2 – 2.10) throughout this section.

2.2.1.1 Healthy Eating Policies

In order to assess healthy eating policies, responses from a series of related items found in the first module (School Health Policies and Environment) of the HSAT were analyzed. Each item pertained to a different type of policy a school could have adopted. Three types of multiple choice questions were included in the item series.

The first group of policy question items allowed for three categorical responses ("No written policy", "Written policy exists" or "Written policy exists and is enforced") (see Table 2.2). Schools selected one of the options for each policy in the section (HSAT Question 1.2a). The policies in the section included: "Prohibits use of food as a reward", "Prohibits withholding food as a punishment" and "Offers predominately healthy food/beverages for classroom celebrations/parties". Foods and beverages were considered healthy if they met the nutrition-based guidance established by the Michigan Department of Education's Policy on Offering Healthy Food and Beverages Outside of the Federally Regulated Child Nutrition Programs (MSBE Healthy Eating Policy) (see Appendix A).

The policies in the second group of items included: "Prohibits the use of the sale of foods with low nutrient value in school fundraising", "Stipulates that predominantly healthy foods and beverages are offered at school events", "Stipulates that predominantly healthy foods and beverages are offered in school stores", "Stipulates that predominantly healthy food and beverages are offered as a la carte options" and "Regulates hours that vending machines containing food or beverages with low nutrient value are accessible to students". In this section schools selected from four categorical responses: "No written policy", "Written policy exists", "Written policy exists and is enforced", or "Not

Applicable" (see Table 2.3). Schools selected one of the options for each policy in the section (HSAT Question 1.2b). The "Not Applicable" response category was intended for schools which did not sell or distribute food or beverages in the venue. Foods of low nutritional value were considered foods, beverages or candies which provided their calories primarily from sugar and/or fat and contained few vitamins or minerals, such as chips, soda pop and candy.

The third type of policy item allowed for only two responses: "Yes" or "No". There was only one policy item in this format. Schools selected whether or not they had adopted the state recommended comprehensive policy (MSBE Healthy Eating Policy) created by the Michigan State Board of Education as a guide for foods offered outside of the federally funded meal programs (see Table 2.4). The policy contains nutrient requirements and portion sizes for foods sold or distributed in vending machines, a la carte stations, school stores, concession stands, classroom parties and other venues throughout the school.

Table 2.2: HSAT Question 1.2a

1.2a Our school has a written policy that:	No written policy (0 pts)	Written policy exists (1 pt)	Written policy exists & is enforced (2 pts)	
Prohibits use of food as a reward	☐	☐	☐	An example of using food as a reward is providing candy or fast-food coupons to students. For access to a fact sheet on this topic, see the Resource Guide.
Prohibits withholding food as a punishment	☐	☐	☐	An example of withholding food as punishment is not giving one student food offered to others.
Offers predominantly healthy food/beverages for classroom celebrations/parties	☐	☐	☐	For ideas on how to establish and implement policies related to this topic, see the Resource Guide.

Table 2.3: HSAT Question 1.2b

1.2b Our school has a written policy that:	No written policy (0 pts)	Written policy exists (1 pt)	Written policy & is enforced (2pts)	Not applicable (Checking this option will result in your total possible points being adjusted)	For information on implementing healthy food and beverage policies, see the Resource Guide.
Prohibits the use the sale of foods with low nutrient value in school fundraising	☐	☐	☐	☐ Choose "Not Applicable" if your school does NOT do any fund raising	Foods of low nutrient value provide calories primarily from fat and/or sugars and contain few vitamins or minerals. Examples include chips, candy, juice drinks, soda pop, and donuts.
Stipulates that predominantly healthy foods and beverages are offered at school events	☐	☐	☐	☐ Choose "Not Applicable" if you school have No food or beverages as school events	Examples of school events are assemblies, open houses, parent/teacher conferences or meetings
Stipulates that predominantly healthy foods and beverages are offered in school stores	☐	☐	☐	☐ Choose "Not Applicable" if your school does NOT have a school store	
Stipulates that predominantly healthy food and beverages are offered as a la carte options	☐	☐	☐	☐ Choose "Not Applicable" if your school does NOT offer a la carte options.	A la carte options are items students can choose that aren't usually counted as part of a reimbursable meal.

Table 2.3: HSAT Question 1.2b (continued)

1.2b Our school has a written policy that:	No written policy (0 pts)	Written policy exists (1 pt)	Written policy & is enforced (2pts)	Not applicable (Checking this option will result in your total possible points being adjusted)	For information on implementing healthy food and beverage policies, see the Resource Guide.
Regulates hours that vending machines containing food or beverages with low nutrient value are accessible to students.	☐	☐	☐	☐ Choose "Not Applicable" if your school does NOT have vending machines	Recommended restrictions: no access in elementary school; no access until the end of school for middle school; no access after the end of the last lunch period for high schools

Table 2.4: HSAT Question 1.2d

1.2d Our school has adopted the "Michigan State Board of Education Policy on Healthy Foods and Beverages."
□ Yes (1 pt) □ No (0 pts) See the Resource

2.2.1.2 Eating Environment

The physical eating environment was included in this study because of its importance to the "Healthy School Nutrition Environment." [105] A clean, well-maintained cafeteria with appropriate amenities can have several benefits such as the promotion of food safety, limitation of allergens, and encourage children to eat school prepared foods. [106,107] The responses to the eating environment items from HSAT Question 1.3b were assessed (see Table 2.5). Schools selected all of the environmental elements present in their school from a list of ten potential items, including: "Tables/eating surfaces are cleaned between lunch periods", "The physical structure of the cafeteria/eating environment does not need repair", "The tables/eating surfaces and chairs are undamaged AND the appropriate size for students", "There are enough tables/eating surfaces and chairs for all students to sit while eating", "Adults properly supervise the cafeteria/eating environment and role model healthy eating practices ", "Drinking fountains are available for students to get water at meals and throughout the day", "Positive and consistent messages about healthy eating are provided throughout the school ", "Noise level in eating areas is appropriate; students aren't required to be silent", "There is an opportunity for students to wash hands before eating" and "The cafeteria/eating environment is attractive, appealing and inviting".

Table 2.5: HSAT Question 1.3b

Check all that apply to your school **nutrition/healthy eating environment:**	1 pt ea	
Tables/eating surfaces are cleaned between lunch periods	☐	
The physical structure of the cafeteria/eating environment does not need repair	☐	
The tables/eating surfaces and chairs are undamaged AND the appropriate size for students	☐	
There are enough tables/eating surfaces and chairs for all students to sit while eating	☐	
Adults properly supervise the cafeteria/eating environment and role model healthy eating practices	☐	
Drinking fountains are available for students to get water at meals and throughout the day	☐	
Positive and consistent messages about healthy eating are provided throughout the school	☐	Examples: posters, bulletin boards, school announcements and positive role modeling.
Noise level in eating areas is appropriate; students aren't required to be silent	☐	
There is an opportunity for students to wash hands before eating	☐	
The cafeteria/eating environment is attractive, appealing and inviting	☐	

2.2.1.3 Eating Venues: Healthy Food Availability

Assessment of healthy food offering outside of the school meals was based on responses to seven related items in the first module of the HSAT (see Table 2.6). Schools indicated in which venues healthy foods were available to students. The venues in question included: vending machines, a la carte, school stores, concession, school events, classroom parties/celebrations, and fundraisers. Healthy foods were defined by the nutrition-based guidance established in the Michigan State Board of Education Policy on Offering Healthy Food and Beverages Outside of the Federally Regulated Child Nutrition Programs (MSBE Healthy Eating Policy) (see Appendix A). Based on the design of the HSAT item, schools that offered no foods or beverages in a venue were placed in the same category as schools that offered healthy options rather than unhealthy options.

Table 2.6: HSAT Question 1.3c

Our school offers healthy* food and beverage choices:	1 pt ea	For information on implementing healthy food and beverage policies, see the Resource Guide.
In **vending machines** (check this box if you do not have vending machines available for student use)	☐	
As part of **a la carte** options (check if you do not have a la carte options for sale to students)	☐	A la carte options are items students can choose that aren't usually counted as part of a reimbursable meal.
As options sold in the **school store** (check if you do not sell food or beverages in your school store or don't have a school store)	☐	For information on making positive changes in school stores, see the Resource Guide.
As part of **concessions** sold on the school campus (check if you do not sell food concessions at your school)	☐	
At **school events** (check if no food is offered at such events)	☐	Examples of school events are assemblies, open houses, parent/teacher conferences and meetings.
As part of **classroom parties or celebrations** (check if no food is offered at such events)	☐	
For **fundraising** events (check if no fundraising events or if no food or beverages are sold)	☐	

2.2.1.4 Meal Offerings and Meal Period Structure

The structure of the meal period and the food offered during the meal can affect the eating behavior of consumers. [108] Two groups of items from the fourth HSAT module (Nutrition Services) described elements of the schools' meal offerings and meal period structures including participation in feeding programs and recess (free time in which physical activities can be done) coordinated with the meal period. Responses to these items were assessed.

For the first group of "School Food Service Program" items, schools selected whether or not their school offered each of the 5 items listed in HSAT Question 4.1a (see Table 2.7). These items included: "The USDA School Breakfast Program", "The USDA National School Lunch Program", "Low-fat (1/2 or 1%) or fat-free every day", "At least 20 minutes to eat lunch after students obtain food", "Meals are scheduled at appropriate times and do not conflict with other activities".

The second group of "School Food Service Program" items from HSAT Question 4.1b allowed for three categorical responses ("Not Offered", "Offered" and "Not Applicable"). The "Not Applicable" response was intended for schools which did not offer school meals. The food service items in HSAT Question 4.1b included: "Meals that are fully accessible to all students", "Meals that include a variety of foods", "Meals that include appealing foods", "Meals that include low-fat foods daily", "Lower fat meats every day", "At least 10 minutes to eat breakfast after students obtain food" and "Recess before lunch rather than after" (see Table 2.8).

Table 2.7: HSAT Question 4.1a

Our school offers: (Check all that apply)	1 pt ea	
The USDA School Breakfast Program	☐	See the Resource Guide for information about USDA criteria for school meals and expanding breakfast.
The USDA National School Lunch Program	☐	
Low-fat (1/2 or 1%) or fat-free milk every day	☐	For milk, low-fat means 1/2% or 1% fat. Skim or fat-free milk is 0% fat.
At least 20 minutes to eat lunch after students obtain food	☐	See the Resource Guide for more information on the importance of time allocated for school meals.
Meals are scheduled at appropriate times and do not conflict with other activities	☐	Lunch must be offered between 10am and 2pm. Breakfast must be offered at the beginning of the school day. Meals are coordinated with class and bus schedules so all students can eat breakfast and lunch at school.

Table 2.8: HSAT Question 4.1b

4.1b Our school offers:	Not Offered (0 pts)	Offered (1 pt)	Not applicable (Checking this option will result in your total possible points being adjusted)	
Meals that are fully accessible to all students	☐	☐	☐ Choose "Not Applicable" only if your school does NOT offer school meals	Fully accessible means the school offers free and reduced-price meals for students who meet income requirements in a way that they are not identified by other students as recipients of these programs.
Meals that include a variety of foods	☐	☐	☐ Choose "Not Applicable" only if your school does NOT offer school meals	Variety means at least: two entrees offered for lunch daily; two choices of fruit or 100% fruit juice offered for lunch daily; two choices of vegetables offered for lunch daily; five foods containing whole grain offered weekly.
Meals that include low-fat foods daily	☐	☐	☐ Choose "Not Applicable" only if your school does NOT offer school meals	Low-fat means items containing no more than 3 grams fat per serving. This usually does not include items such as fries or other fried foods, foods cooked with or covered with butter or margarine, fruit pies or cobblers, cookies, cakes and pastries.

Table 2.8 HSAT Question 4.1b (Continued)

4.1b Our school offers:	Not Offered (0 pts)	Offered (1 pt)	Not applicable (Checking this option will result in your total possible points being adjusted)	
Meals that include appealing foods	☐	☐	☐ Choose "Not Applicable" only if your school does NOT offer school meals	Appealing means foods are acceptable to a majority of students, as indicated by some kind of evaluation.
Lower fat meats every day	☐	☐	☐ Choose "Not Applicable" only if your school does NOT offer school meals	
At least 10 minutes to eat breakfast after students obtain food	☐	☐	☐ Choose "Not Applicable" only if your school does NOT offer school breakfast	
Recess before lunch rather than after	☐	☐	☐ Choose "Not Applicable" if your school is a middle school or high school (no elementary grades)	See the Resource Guide for a fact sheet about recess before lunch.

2.2.1.5 Healthy Meal Preparation and Serving Practices

The ingredients used by and preparation techniques of school food services play a critical role in the nutritional value of foods served. For example, choosing lower fat ingredients and preparation methods could reduce the amount of total fat and calories in the meal. Responses gathered from a group of items in the fourth module of the HSAT described eight fat–reducing practices schools may have employed. This data was analyzed in the HSS.

Schools selected the practices their school food service had done consistently in the past 12 months. Three response options were available for this group of items: "No", "Yes" and "Not Applicable". The "Not Applicable" response was intended for schools that did not serve school meals. Practice items available in this section included: "Baking, roasting or broiling meat more often than frying", "Sauces, dressings or dips offered included low-fat or non-fat options and portion size was limited to one-ounce servings", "Serving skinless poultry", "Using low-fat or non-fat real cheese", "Serving cooked meats in portion sizes of three ounces or less ", "Preparing vegetables with minimal fat", "Thoroughly draining fat from ground meats" and "Cooking with non-stick spray or pan liners" (see Table 2.9).

Table 2.9: HSAT Question 4.1d

4.1d During the past 12 months, has school food service staff consistently followed practices to reduce fat and calories in meals offered to students such as:	No (0 pts)	Yes (1 pt)	Not applicable (Checking this option will result in your total possible points being adjusted)
Baking, roasting or broiling meat more often than frying	☐	☐	☐ Choose "Not Applicable" only if your school does NOT serve school meals
Sauces, dressings or dips offered included low-fat or non-fat options and portion size was limited to one-ounce servings	☐	☐	☐ Choose "Not Applicable" only if your school does NOT serve school meals
Serving skinless poultry	☐	☐	☐ Choose "Not Applicable" only if your school does NOT serve school meals
Using low-fat or non-fat real cheese	☐	☐	☐ Choose "Not Applicable" only if your school does NOT serve school meals
Serving cooked meats in portion sizes of three ounces or less	☐	☐	☐ Choose "Not Applicable" only if your school does NOT serve school meals
Preparing vegetables with minimal fat	☐	☐	☐ Choose "Not Applicable" only if your school does NOT serve school meals
Thoroughly draining fat from ground meats	☐	☐	☐ Choose "Not Applicable" only if your school does NOT serve school meals
Cooking with non-stick spray or pan liners	☐	☐	☐ Choose "Not Applicable" only if your school does NOT serve school meals

2.2.2 Covariates

2.2.2.1 School Type

The type of schools within the sample and the Michigan school population were determined by a classification system produced by Michigan Department of Education and the Center for Educational Performance and Information. These data were gathered from the 2005-2006 School Code Master Database. [104] Schools were classified into one of the following categories: Public School (Local Education Agency), Charter School (Public School Academy), Private School (Nonpublic School), and Other (Ancillary Facility). Each school type classification represents a different institutional governing structure.

2.2.2.2 Grade Level

Schools within the state of Michigan can contain many combinations of grade levels, and the Michigan Department of Education has different educational standards for these grade levels. In order to account for these variations, each school within the sample and the Michigan school population was categorized into one of six categories based on grade levels taught within the building. This categorization scheme was developed by the Center for Educational Performance and Information. The grade-level data were taken from the 2005-2006 School Code Master Database. [104] Schools were considered elementary schools if all the grades taught in the school were between kindergarten and sixth grade. Schools were classified as middle schools if all the grades taught in the school were between sixth grade and eighth grade. If a school had sixth grade students only it was considered an elementary school. Schools were considered high schools if all

the grades taught in the school were between ninth and twelfth grade. Schools that contained grades from a combination of elementary, middle and high school were classified in the following manner --1) schools with grades between kindergarten and eighth grade that were not previously classified as elementary or middle were considered elementary-middle schools, 2) schools with grades between sixth grade and twelfth grade that were not previously classified as middle or high schools were considered middle-high schools, 3)schools with grades between kindergarten and twelfth grade that were not previously classified were considered elementary-high schools, and 4) schools that taught only pre-kindergarten, alternative education, special education, adult education or career/technical education were excluded from the analysis.

During statistical analysis a modified categorical variable was created to represent school grade-level variation. This variable had three categories: primary school (elementary school), secondary school (middle school, high school, and middle-high school) and combination school (elementary-middle school and elementary-high school). This was done to reduce the number of grade level categories, thus increasing the simplicity of the analyses and results.

2.2.2.3 Student Enrollment

The number of students in a school may not only have an impact on the size of the school, but the resources a school receives from the state and federal government. State and federal educational funding distributed to each school varies based on student enrollment. [109] The number of students enrolled at a school building during the 2005-2006 school year represented school enrollment in the HSS. This information for the study sample and the Michigan school population was gathered from the 2005-2006

School Code Master Database. [104] In order to correct for the skewed distribution, student enrollment was logarithmically transformed for all regression analyses.

2.2.2.4 Location

The location of each school was classified by county. The state of Michigan has 83 counties spread across two peninsulas. Each county has a unique governing body which may influence local schools. The county of each school in our sample and each school in the state of Michigan was gathered from the 2005-2006 School Code Master Database. [104]

2.2.2.5 Income

The income of a school or school district may determine the resources the school has available to promote school health. Although most Michigan schools receive revenue from federal, state and local sources, local income contributes over 20% of the average income per pupil. [109] These local revenues are typically generated primarily from property taxes which are paid by families and businesses residing in the area.

Since the income of the students' household determines their eligibility for National School Lunch Program free or reduced price lunch and this information is readily accessible. Students' eligibility for free or reduced price lunch in the National School Lunch Program was utilized as the income marker in the study. Percentage of free and reduced lunch eligible students in a school was the variable used in the analyses. This information was obtained from the Michigan Department of Education 2005-2006 Building Level Free Reduced Lunch Public Data. [103]

2.2.3 Independent Variables

2.2.3.1 Team Nutrition

Team nutrition membership was also included in this study as an independent predictor of school characteristics. Team Nutrition provides nutrition education materials, problem solving support, examples of successful interventions and other helpful resources for member schools. [110] Participation in Team Nutrition was determined according to the Michigan Team Nutrition roster.

2.2.3.2 Coordinated School Health Team

The elements of the CSHT model recorded by the HSAT were the presence of a CSHT, the topics the CSHT may be responsible for addressing (i.e. physical activity, healthy eating and tobacco free-lifestyle), the number of CSHT meetings held, and member disciplines (e.g. school administration, food service and physical education) present on the CSHT. This information was determined based on schools' responses to a series of HSAT items in Module 1 (see Table 2.10).

The first CSHT item required schools to select "Yes" or "No" to the phrase, "Our school has a CSHT that oversees school health policies and programs." This question was utilized to determine if a school had a CSHT at the time the HSAT was completed. Next, schools selected the topic areas their CSHT was responsible for overseeing. Schools were available to select each of the following topic areas: "Physical Activity", "Healthy Eating" and "A Tobacco Free-Lifestyle". Once school selected the topical responsibilities of their CHST, they recorded the number of meetings their CSHT had in the last 12 months, excluding their meeting to complete the HSAT, by selecting one of four

categorical responses: "None", "1 time", "2-3 times" or "4 or more times". The final element in the CSHT section determined the composition of the CSHT. Schools selected the type of active representatives present on their CSHT from a list of 11 recommended representative categories. These representative categories included: "School Administration", "Nutrition Services", "Physical Education", "Health Education", "Family Involvement", "Health Services Provider or School Nurse", "School Counselor, Psychologist or Social Worker", "Students", "Classroom Teacher", "Community Involvement" and "Others".

Table 2.10 HSAT Question 1.1 (Coordinated School Health Team)

1.1a Our school has a CSHT* that oversees school health policies and programs.

Note: If this is your first team meeting, you may check "yes".

□ Yes (1 pt; proceed to 1.1b) □ No (0 pts for 1.1; skip to 1.2)

1.1b Our CSHT oversees policies and programs regarding: (Check all that apply.) 1 pt ea

□ Physical activity

□ Healthy eating

□ A tobacco-free lifestyle

1.1c Not including today, how many times did the CSHT meet **during the past 12 months:**

□ None (0 pts) □ 1 time (1 pt) □ 2-3 times (2 pts) □ 4 or more times (3 pts)

*For information about what a Coordinated School Health Team is and does, paragraph at the top of this page the Resource Guide.

1.1e The CSHT includes and active representative from each of these groups: (Check all that apply)		
School Administration (Principal, Assistant Principal or Superintendent)	□	(3 pts)
Nutrition Services (Food Service Director or Manager)	□	(2 pts)
Physical Education (PE Teacher)	□	(2 pts)
Health Education (Health Teacher/Health Educator)	□	(1 pt)
Family Involvement (Parent/Guardian)	□	(1 pt)
Health Services Provider or School Nurse	□	(1 pt)
School Counselor, Psychologist or Social Worker	□	(1 pt)
Students (on the team for middle/high school; input from for elementary schools)	□	(1 pt)
Classroom Teacher (other than PE or Health)	□	(1 pt)
Community Involvement (Examples: Health Dept. and MSU Extension)	□	(1 pt)

2.2.3 Scales

2.2.3.1 Development of Scales

Scales are meaningful ways to express the measure of a concept or topic composed of multiple items. In the HSS, categorically similar items were combined to form scales. Each scale corresponding to one of the hypothesized elements in Research Question 4 (see 1.8 Research Questions and Hypotheses). There were four scales developed: 1) Healthy Eating Policy, 2) Eating Environment, 3) Healthy Venue Offerings, and 4) Healthy Meal Preparation and Serving Practices. Each represented a different aspect of school health related to healthy eating promotion in the Healthy School Action Tool (HSAT).

Content validity of scales was determined by expert review. University researchers in collaboration with Michigan Action for Healthy Kids steering committee members assessed the content of each scale for theoretical application and statistical relevance. The statistical relevance was determined by an exploratory factor analysis and statistical measures for goodness-of-fit and reliability. Specifically, the statistical analysis included assessment of Eigenvalues, factor loadings, and Cronbach's Alpha reliability coefficients. Based on findings from the factor analysis, it was determined that the items analyzed measured four different factors (see Table 2.11). Each of the factors was considered a scale. All scales yielded a Cronbach's Alpha reliability coefficient greater than or equal to 0.6. Collectively, the statistical assessment and expert review justified the utilization of the scales for the study's analysis.

Table 2.11: Factor Loadings for Scale Items from an Exploratory Factor Analysis

Healthy Eating Policy Scale ("Our school has a written policy that:")	**Fact 1**	**Fact 2**	**Fact 3**	**Fact 4**
Prohibits use of food as a reward	**0.67**	0.00	-0.03	0.06
Prohibits withholding food as a punishment	**0.53**	0.01	-0.01	0.04
Requires healthy foods for classroom parties	**0.71**	0.04	0.06	0.01
Prohibits innutritious foods in fundraising	**0.80**	0.08	0.07	-0.01
Requires healthy foods at school events	**0.78**	0.06	0.07	0.05
Requires healthy foods in school stores	**0.64**	0.08	0.04	0.02
Requires healthy foods as a la carte options	**0.61**	0.09	0.13	0.01
Regulates vending machines hours	**0.59**	0.11	-0.03	-0.01
Eating Environment Scale (Our school's:)				
Tables are cleaned between lunch periods	0.05	-0.08	0.02	**0.22**
The cafeteria does not need repair	0.02	0.03	0.01	**0.27**
The tables/chairs are undamaged & appropriate	0.03	-0.04	0.00	**0.21**
There are enough tables/chairs for all students	0.04	-0.12	0.00	**0.35**
Adults supervise cafeteria/model healthy eating	0.09	0.03	0.12	**0.44**
Drinking fountains are available	0.07	-0.03	0.12	**0.32**
The noise level in eating areas is appropriate	0.09	-0.03	0.04	**0.37**
Students have chance to wash hands	0.16	0.05	0.00	**0.37**
The cafeteria is attractive and inviting	0.06	-0.04	0.09	**0.43**
Healthy Venue Offerings Scale (Our school offers healthy food choices:)				
In vending machines	-0.11	0.17	**0.47**	0.25
As part of a la carte options	-0.06	-0.03	**0.41**	0.21
As options sold in the school store	-0.01	0.04	**0.29**	0.25
As part of concessions sold on campus	-0.05	0.03	**0.56**	0.18
At school events	0.27	-0.01	**0.49**	0.01
As part of classroom parties or celebrations	0.29	-0.16	**0.54**	-0.08
For fundraising events	0.29	0.00	**0.56**	-0.11
Healthy Meal Preparation Scale (Our school's food service:)				
Bakes, roasts or broils meat more than fries	0.07	**0.65**	0.00	-0.05
Offers sauces low-fat & limited to ≤1oz	0.20	**0.29**	-0.04	0.07
Serves skinless poultry	0.18	**0.45**	-0.03	0.00
Uses low-fat or non-fat real cheese	0.11	**0.34**	-0.04	-0.07
Serves cooked meats in ≤3oz portions	0.12	**0.46**	0.04	0.27
Prepares vegetables with minimal fat	0.09	**0.53**	-0.03	0.06
Thoroughly drains fat from ground meats	0.11	**0.66**	0.00	-0.02
Cooks with non-stick spray or pan liners	0.04	**0.63**	0.01	-0.03

2.2.3.1.1 Healthy Eating Policy Scale

The Healthy Eating Policy Scale was composed of 8 items from the first module of the HSAT that referred to healthy eating policies (see Table 2.12). Categorical responses to policy items resulted in corresponding points. Schools received 0 points on the scale if they responded "No written policy", 1 point if a "Written policy exists", and 2 points if a "Written policy exists and is enforced". If a school selected "Not applicable," it received 0 points for the policy item. Percentage scores for the scale were created by dividing the total number of points earned from the scale by the total number of points each school could receive (excluding "Not applicable" items). This was done to properly account for schools that selected "Not applicable" for certain policy items. The factor loading values for items in the scale were greater than 0.5 for in all cases. This indicated a large percentage of variance in the items was explained by the scale. The Cronbach's Alpha reliability coefficient was 0.86, which was evidence of strong reliability. The items of this scale collectively represented healthy eating policy in the HSS analysis. In order to correct for the skewed distribution, the healthy eating policy scale was logarithmically transformed for all regression analyses.

Table 2.12: Healthy Eating Policy Scale

Scale Items (N = 8) ***Our school has a written policy that:***	**Factor Loading**	**Point System**
Prohibits use of food as a reward	0.67	• No written policy (0 points) • Written policy exist (1 point) • Written policy exists and is enforced (2 points) <u>Potential</u> Min: 0% (0 points) Max: 100% (6 - 16 points) Cronbach $\alpha = 0.86$
Prohibits withholding food as a punishment	0.53	
Offers predominantly healthy food/beverages for classroom celebrations/parties	0.71	
Prohibits the use the sale of foods with low nutrient value in school fundraising	0.80	
Stipulates that predominantly healthy foods and beverages are offered at school events	0.78	
Stipulates that predominantly healthy foods and beverages are offered in school stores	0.64	
Stipulates that predominantly healthy food and beverages are offered as a la carte options	0.61	
Regulates hours that vending machines containing food or beverages with low nutrient value are accessible to students.	0.59	

2.2.3.1.2 Eating Environment Scale

The Eating Environment Scale was composed of nine items from the first module of the HSAT which referred to the "nutrition/healthy eating environment" (see Table 2.13). Categorical responses to environmental items resulted in corresponding points. Schools received 1 point on the scale if they selected that the item applied to their school, and 0 points if they did not select that an item applied to their school. Percentage scores for the scale were created by dividing the total number of points earned from the scale by the maximum number of possible points (9 points). Percentage scale scores were created to maintain consistency in the reporting of scales throughout the HSS. The Cronbach's Alpha reliability coefficient was 0.56 which was evidence of moderate reliability. The average factor loading value for items in the scale was 0.33, which indicates that variation in these items was not well explained by one factor. However, the scale produced was the best combination of available items that described the cafeteria eating period and environment. The items of this scale collectively represent the eating environment in the HSS analysis.

Table 2.13 Eating Environment Scale

Scale Items (N=9) ***Our school's:***	**Factor Loading**	**Point System**
Tables/eating surfaces are cleaned between lunch periods	0.22	➢ Characteristic does <u>not</u> describe school or current school practices (0 points) ➢ Characteristic describes school or current school practices (1 point) <u>Possible Points</u> Max: 9 points Min: 0 points Cronbach α = 0.56
The physical structure of the cafeteria/eating environment does not need repair	0.27	
The tables/eating surfaces and chairs are undamaged AND the appropriate size for students	0.21	
There are enough tables/eating surfaces and chairs for all students to sit while eating	0.35	
Adults properly supervise the cafeteria/eating environment and role model healthy eating practices	0.44	
Drinking fountains are available for students to get water at meals and throughout the day	0.32	
Noise level in eating areas is appropriate; students aren't required to be silent	0.37	
There is an opportunity for students to wash hands before eating	0.37	
The cafeteria/eating environment is attractive, appealing and inviting	0.43	

2.2.3.1.3 Healthy Venue Offerings Scale

The Healthy Venue Offerings Scale was composed of 7 items from the first module of the HSAT which referred to healthy food and beverage offerings outside of traditional school meal programs (see Table 2.14). Categorical responses to offering items resulted in corresponding points. Schools received 1 point on the scale if they selected "Our school offers healthy food and beverage choices" in the venue or if they do not have such a venue in the school, and 0 points if they did not that select healthy offerings were available. Percentage scores for the scale were created by dividing the total number of points earned from the scale by the maximum number of possible points (6 points).

A percentage scale score was developed to maintain consistency in the reporting of scales throughout the study. The Cronbach's Alpha reliability coefficient was 0.66, which was evidence of moderately-strong reliability. The factor loading values for items in the scale were all greater than 0.4, except for the item regarding concessions. However, this item was allowed to remain in the scale because it clearly related to the offering of healthy foods in a venue outside of school meals like all of the other items in the scale. The items of this scale collectively represented the venue offerings in the HSS analysis.

Table 2.14: Healthy Venue Offerings Scale

Scale Item (N=7) ***Our school offers healthy food choices:***	**Factor Loading**	**Point System**
In vending machines (check this box if you do not have vending machines available for student use)	0.47	➢ Venue does <u>not</u> offer healthy food and beverage choices (0 points) ➢ Venue offers healthy food and beverage choices (1 point) <u>Possible Points</u> Max: 6 points Min: 0 points Cronbach $\alpha = 0.66$
As part of a la carte options (check if you do not have a la carte options for sale to students)	0.41	
As options sold in the school store (check if you do not sell food or beverages in your school store or don't have a school store)	0.29	
As a part of concessions sold on the school campus (check if you did not sell concessions at your school)	0.56	
At school events (check if no food is offered at such events)	0.49	
As part of classroom parties or celebrations (check if no food is offered at such events)	0.54	
For fundraising events (check if no fundraising events or if no food or beverages are sold)	0.56	

2.2.3.1.7 Healthy Meal Preparation and Serving Practices Scale

The Healthy Meal Preparation and Serving Practices Scale was composed of 8 items from the fourth module of the HSAT which referred to school food service preparation and serving practices (see Table 2.15). Categorical responses to practice items resulted in corresponding points. Schools received 1 point on the scale if they selected that "Our school offers [or conducts]" the mentioned practice, and 0 points if they selected "Not Offered". If a school selected "Not applicable" it received 0 points for the practice item. Percentage scores for the scale were created by dividing the total number of points earned from the scale by the total number of points each school could earn. This was done to properly account for schools that selected "Not applicable" for certain practice items. The Cronbach's Alpha reliability coefficient was 0.73, which was evidence of moderately-strong reliability. The factor loading values in the scale were greater than 0.4 for all items except two (items pertaining to sauces and cheese). However, expert review determined that these items were valuable fat-lowering meal preparation practices, and therefore allowed to remain in the scale. The items of this scale collectively represent the healthy meal preparation practices in the HSS analysis.

Table 2.15: Healthy Preparation and Serving Practices Scale

Scale Items (N=8) ***School food service practices:***	**Factor Loading**	**Point System** ➢ Characteristic does <u>not</u> describe school meals or current school practices (0 points) ➢ Characteristic describes school meals or current school practices (1 point) <u>Possible Points</u> Max: 11 points Min: 0 points Cronbach α = 0.73
Baking, roasting or broiling meat more often than frying	0.65	
Sauces, dressings or dips offered included low-fat or non-fat options and portion size was limited to one-ounce servings	0.29	
Serving skinless poultry	0.45	
Using low-fat or non-fat real cheese	0.34	
Serving cooked meats in portion sizes of three ounces or less	0.46	
Preparing vegetables with minimal fat	0.53	
Thoroughly draining fat from ground meats	0.66	
Cooking with non-stick spray or pan liners	0.63	

2.3 Software Used in Analysis

Statistical analysis for the Healthy Schools Study was conducted using STATA SE v.10.

2.4 Description of Analyses by Research Question

Research Question 1: What are the characteristics of the schools that completed the HSAT?

The following factors were used to describe schools that completed the HSAT: type of school, grade level, student enrollment, location, income and grant funding. The type of school was categorized as public, private or charter.[111] Specialized institutions were dropped from the study sample due to inherent differences (e.g. students live at the facility) between these institutions and the rest of the sample. These included two juvenile detention centers and an ancillary facility. The prevalence and proportion of each type of school within the HSAT sample were determined and compared to the proportion of each type of school in the state of Michigan according to the Center for Educational Performance and Information (CEPI) School Master Code. [104] The prevalence and proportion of HSAT schools in each grade level classification were determined and compared to the proportion of schools in each grade level classification in the state of Michigan according to the CEPI database. [104] The mean, minimum and maximum number of students enrolled in schools that completed the HSAT were determined by descriptive statistics. The income of the schools was represented by the percentage of students in the school that were eligible for free or reduced price National School Lunch Program meals. This percentage was obtained for schools that completed the HSAT using the CEPI database and compared to the state average.[103] The percentage of sample

schools in each Michigan county was determined by comparing the number of schools in the county who have completed the HSAT to the total number of schools in the county. The prevalence and percentage of schools that were members of Michigan Team Nutrition and schools that have received state grant funding that required completion of the HSAT in the sample were calculated as well.

Research Question 2: Who is involved in the HSAT process?

Involvement in the HSAT process was assessed by describing Coordination School Health Team characteristics (presence of a team, responsibilities of the team, team membership and meeting frequency). The frequency and percentage of schools that had CSHT and the percentage of CSHT that oversaw healthy eating in the school were determined for the sample along with the number of meetings held by CSHT in the past year prior to completing the HSAT and percentage of each type of member (school administrator, food service director, physical education teacher, health education teacher, parent/guardian, school health service provider, school counselor/psychologist/ social worker, student, classroom teacher, community organization and other) represented on a CSHT. In addition, the average number of member types represented on a CSHT was also calculated.

Association between the presence of a CSHT (and its oversight of healthy eating) and the grade level, student enrollment, income, Team Nutrition membership, and grant funding of sample schools were determined by logistic regression models. School type was excluded from this analysis and all other regression models due to the grossly disproportionate distribution of this characteristic among sample schools.

Research Question 3: What are the prevalences of policies, environments and programs related to healthy eating among HSAT schools?

The prevalences and percentages of schools with various healthy eating policies, programs and environments were calculated and compared.

Research Question 4: What are the relationships between school characteristics, healthy eating polices and healthy eating environments existing in a school at the time the HSAT self-assessment was completed?

Multiple regression and logistic regression models were designed to determine if several hypothesized factors were associated with the types of policies, programs and environments that exist in HSAT schools. These factors included school demographics, CSHT characteristics, Team Nutrition membership and grant funding.

Hypothesis 1: *Schools that have a CSHT that oversees healthy eating are associated with an increased number of: 1) healthy eating policies (written and enforced), and 2) positive environmental factors (I. adequate, safe and encouraging cafeterias and serving areas, and II. healthy food preparation and offering practices) when compared to schools that either do not have a CSHT or have a CSHT that does not oversee healthy eating.*

The scale score percentages of healthy eating policies, which are written and enforced, were compared between three groups: 1) schools without a CSHT, 2) schools with a CSHT that does not oversee healthy eating, and 3) schools with a CSHT that oversees healthy eating. This comparison was conducted using multiple regression models that controlled for demographics, Team Nutrition membership and grant funding. A similar comparative analysis of sample schools was conducted with the healthy meal

preparation scale and the positive environmental factors scales (eating environment scale and healthy venue offerings scale).

Hypothesis 2: *The number of CSHT meetings held in the last year is positively associated with the number of: 1) healthy eating policies (written and enforced), and 2) positive environmental factors (I. adequate, safe and encouraging cafeterias and serving areas, and II. healthy food preparation and offering practices).*

The healthy eating scale score percentages were compared between four groups: 1) schools that did not hold a CSHT meeting in the last 12 months, 2) schools that held one meeting, 3) school that held 2-3 meetings and 4) schools that held more than 3 meetings. This comparison was conducted using a multiple regression model that controlled for demographics, team nutrition membership and grant funding. Similar comparative analyses of sample schools were conducted with the healthy meal preparation scale and the positive environmental factors scales (eating environment scale and healthy venue offerings scale).

Hypothesis 3: *The number of representatives on a CSHT is positively associated with the number of: 1) healthy eating policies (written and enforced), and 2) positive environmental factors (I. adequate, safe and encouraging cafeterias and serving areas, and II. healthy food preparation and offering practices)*

The scale score percentage of healthy eating policies were compared between four groups: 1) schools that had a CSHT with less than 5 representatives or no CSHT, 2) schools with 5-6 representatives on a CSHT, 3) schools with 7-8 representatives on a

CSHT, and 4) schools with more than 8 representatives on a CSHT. This comparison was conducted using a multiple regression model that controlled for demographics, Team Nutrition membership and grant funding. Similar comparative analyses of sample schools were conducted with the healthy meal preparation and serving practices scale and the positive environmental factors scales (eating environment scale and healthy venue offerings scale).

Hypothesis 4: *Schools' healthy offering policies are associated with healthy offering practices in school food distribution venues.*

For this hypothesis, the average healthy eating policy scale score percentage was compared to the average healthy venue offering scale score percentage using multiple regression analysis controlling for the number of CSHT meetings held, student enrollment, income, school grade level, Team Nutrition membership and grant funding. The number of CSHT meetings held was the only CSHT characteristic added to the model because it was the only significantly associated CSHT characteristic with the scale and the addition of all of the CSHT characteristics caused excessive collinearity in the model.

Next, a comparison of the healthy venue offering scale and Michigan State Board of Education Policy on Quality Food and Beverages Served Outside of the National School Lunch Program (MSBE Healthy Eating Policy) was performed. The healthy venue offering scale score percentages were compared between schools that have adopted the MSBE Healthy Eating Policy and schools that have not adopted the policy using a

multiple regression model controlling for school demographics, Team Nutrition membership and grant funding.

Finally, comparisons of individual venue offering policies to the corresponding individual healthy offering practices were conducted. Six venues (classroom parties, fundraisers, school events, a la carte stations, school stores and vending machines) were analyzed to determine if specific healthy eating policies were associated with practices among schools that completed the HSAT. Specifically, logistic regression was used to compare of the proportion of schools with a particular policy (i.e. prohibits the sale of foods with low nutrient value in school fundraising) to the proportion of schools that practiced the corresponding action (i.e. offers healthy foods and beverages in school fundraisers).

CHAPTER 3: RESULTS

3.1 Characteristics of Schools that Completed the HSAT

The characteristics of schools that completed the HSAT along with comparisons between these schools and Michigan schools are described in this section. From October of 2004 until February of 2007, 332 Michigan schools completed the HSAT self-assessment. This sample represents approximately 6.5% of Michigan schools.

3.1.1 Type of School

Table 3.1 describes the types of schools present in the sample and in the Michigan school population along with the percentage of schools from each school type that completed the HSAT. The majority of the sample schools were considered public schools (92.5%), while 7.5% were private, charter or other (juvenile detention centers and an ancillary facility) schools. This distribution reflects the general composition of the state school population, however a larger percentage of public schools were represented in the HSAT sample than in the Michigan school population (72.0%). Within the state population, the percentage of public schools that completed the HSAT (9.6%) was larger than the percentage of private, charter or other schools (2.0%). Schools that were classified as "Other" were dropped from the rest of the study analysis due to the differences (e.g. students live at the school) between these schools and the rest of the sample.

Table 3.1: Type of School

	HSAT		Michigan		HSAT/MI◊
Type	**N**	**% (SE)**	**N**	**% (SE)**	**% (SE)**
Public	307	92.5 (1.5)	3187	72.0 (0.6)	9.6 (1.6)
Private	11	3.3 (1.0)	854	19.3 (0.6)	1.3 (1.1)
Charter	11	3.3 (1.0)	280	6.3 (0.4)	3.9 (1.0)
Other	3	0.9 (0.5)	105	2.4 (0.2)	2.9 (0.6)
Total	***332***	***100***	***5130***	***100***	***6.5***

◊ Percentage of schools in the state of Michigan that completed the HSAT in each school type category

3.1.2 School Grade Classification

The sample of schools included a diverse range of grade classifications. Table 3.2 describes the grade classification of schools present in the sample and the state population along with the percentage of schools from each grade classification in the state that completed the HSAT. Although many more elementary schools completed the HSAT (N=142) than schools of any other grade classifications, middle schools (N=49), high schools (N=57) and schools with a combination of these grade levels (N=84) were also represented. Middle schools were the school group with the highest percentage of the state population to complete the HSAT (10% HSAT/MI). Schools that did not provide traditional primary or secondary education were excluded from the school population description. These schools included ancillary, special education, alternative education, career and technical education (CTE), and adult education facilities.

Table 3.2: School Grade Classification

	HSAT		Michigan		HSAT/MI◊
Grade Classification	**N**	**% (SE)**	**N**	**% (SE)**	**% (SE)**
Elementary (K-6)	142	43.2 (2.7)	1967	45.5 (0.8)	7.2 (2.8)
Middle (6-8)	49	14.9 (2.0)	492	11.4 (0.5)	10.0 (2.0)
High (9-12)	57	17.3 (2.1)	699	16.2 (0.6)	7.5 (2.2)
Ele-Mid (K-8)	30	9.1 (1.6)	701	16.2 (0.6)	4.3 (1.7)
Ele-High (K-12)	27	8.2 (1.5)	297	6.9 (0.4)	9.0 (1.6)
Mid-High (6-12)	24	7.3 (1.4)	167	3.9 (0.3)	13.8 (1.5)
Total	***332***	***100.0***	***4426***	***100.0***	***7.5***

◊ Percentage of schools in the state of Michigan that completed the HSAT in each school grade classification

3.1.3 Student Enrollment

The average number of students enrolled per building in the sample was similar to that of the state average based on grade classification, in which middle schools enrolled more students than elementary schools, and high schools enrolled more students that middle schools (see Table 3.3). School enrollment ranged from 56 to 2,873 students. The average number of students enrolled per school building in the sample was 531. Collectively more than 176,000 students were enrolled in schools that completed the HSAT.

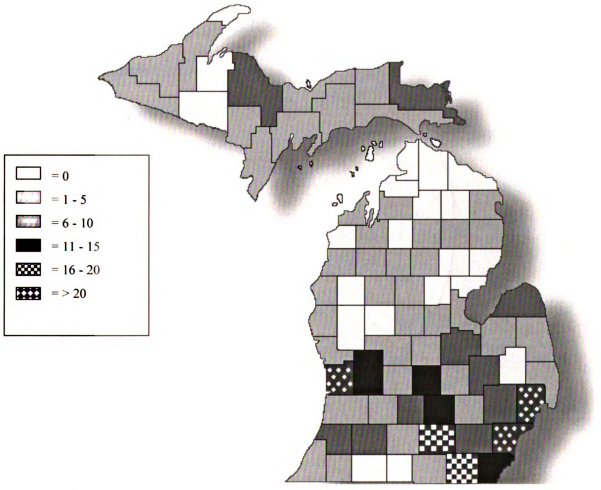
Table 3.3: Average Student Enrollment per School

	HSAT		Michigan	
School Classification	**Students**	**SE**	**Students**	**SE**
Elementary (K-6)	437	23.4	386	3.5
Middle (6-8)	535	32.8	606	11.2
High (9-12)	954	86.3	878	24.7
Ele-Mid (K-8)	482	51.7	478	13.7
Ele-High (K-12)	548	78.9	318	31.4
Mid-High (6-12)	525	86.2	447	29.3
Total	***531***	***23.1***	***489***	***6.0***

3.1.4 Location

Schools from counties across the state of Michigan completed the HSAT (see Figure 3.4). At least one school from 63 of Michigan's 83 counties completed the HSAT during the data collection period. Wayne (32 schools), Ottawa (22 schools) and Macomb (21 schools) had the most schools that completed the HSAT within a county. In five counties (Alcona, Alger, Crawford, Lenawee and Luce) 50% or more of the schools completed the HSAT (see Appendix B).

Figure 3.4: School Location: Number of Schools that Completed the HSAT in Michigan by County



3.1.5 Income: Free/Reduced Eligibility

The average percentage of enrolled students eligible for the National School Lunch Program's free or reduced price lunches in the sample was nearly 41%; one percent less than the Michigan average (Table 3.5). Middle schools had a higher average percentage of students eligible for free or reduced-price lunch (33.3%) than high schools (29.1%), and elementary schools had a higher percentage (44.5%) than middle schools. The percentages in the state population, based on school classification, followed the same pattern as the sample (i.e., high schools had a lower percentage than middle schools, which had a lower percentage than elementary schools).

Table 3.5: Average Percentage of Free/Reduce Students per School

School Classification	**HSAT**		**Michigan**	
	%	**SE**	**%**	**SE**
Elementary (K-6)	44.5	2.2	40.9	0.6
Middle (6-8)	33.3	3.7	35.5	1.1
High (9-12)	29.1	2.6	32.0	0.9
Ele-Mid (K-8)	55.3	5.8	58.5	1.5
Ele-High (K-12)	40.4	3.9	53.5	2.5
Mid-High (6-12)	44.6	5.2	43.5	1.9
Total	***40.6***	***1.4***	***41.8***	***0.4***

3.1.6 Team Nutrition/Grant Funding

Table 3.6 describes the number of schools in the sample who were members of Team Nutrition at the time they completed the HSAT and the number of schools that received a grant that required completion of the HSAT for funding. The majority of schools (60.8%) in the sample were members of Team Nutrition at the time they

completed the HSAT. These schools (from the sample) represented 21.6% of the Team Nutrition schools in Michigan. Team Nutrition participation among schools of different grade classifications ranged from 57.1% to 69.2%.

Less than half of the sample schools (41.0%) received a grant during the data collection period that required them to complete the HSAT and implement a nutrition or physical activity change in the school (see Table 3.6). Middle schools were nearly twice as likely to be a grant recipient as elementary schools in the sample; 59.2% of middle schools and 30.3% of elementary schools received grants. The percentage of Team Nutrition member schools that received a grant was 46.8%, while only 32.0% of schools that were not members of Team Nutrition were grant recipients. This difference was not statistically significant.

Table 3.6: Prevalences of Team Nutrition Schools and Grant Recipient Schools among School that Completed the HSAT

School Grade Level	TN Member		Grant Recipient	
	N	% (SE)	N	% (SE)
Elementary (K-6)	89	62.7 (4.1)	43	30.3 (3.9)
Middle (6-8)	28	57.1 (7.1)	29	59.2 (7.1)
High (9-12)	34	59.6 (6.6)	26	45.6 (6.7)
Elementary-Middle (K-8)	18	60.0 (9.1)	12	40.0 (9.1)
Elementary-High (K-12)	14	51.9 (9.8)	12	44.4 (9.7)
Middle-High (6-12)	18	75.0 (9.0)	13	54.2 (10.4)
Total	***202***	***60.8***	***135***	***41.0***

3.2 Who was involved in the HSAT process?

3.2.1 Coordinated School Health Team Presence and Oversight

Among schools that completed the HSAT between October of 2004 and February of 2007, 94% of them had a Coordinated School Health Team (CSHT) and the majority (70.8%) of the schools reported that their CSHT oversaw healthy eating as at least one of its functions (see Table 3.7).

Table 3.7: Coordinated School Health Team Presence and Oversight

HSAT Schools with:	**N**	**% (SE)**
No CSHT	20	6.1 (1.3)
CSHT does not oversee healthy eating	76	23.1 (2.3)
CSHT oversees healthy eating	233	70.8 (2.5)
Total	***329***	***100.0***

3.2.2 Coordinated School Health Team Meeting Frequency

Most schools (63.1%) in the sample with a CSHT had at least one CSHT meeting in the last year prior to completing the HSAT (see Table 3.8). Twenty-three percent of the schools held one meeting, 20% held two or three meetings, and 20% held four or more meetings. However, 114 schools (36.9%) did not have a CSHT meeting in the last year.

3.2.3 Coordinated School Health Team Member Composition

The composition of CSHT's varied among schools (see Table 3.9). School administration and physical education were the most common categories to be represented on a CSHT (94.5% and 90.6% respectively). Student and community

representatives were the least common on CSHT's (46.0% and 59.6% respectively). The average number of member categories represented on a CSHT was 7.8 member types. A few schools (14 schools) had less than 5 member categories represented on their team (see Table 3.10). Most schools (59.8%) had 8 or more member categories represented on their team.

Table 3.8: CSHT Meeting Frequency during the Last 12 Months

Number of CSHT meetings	None	1 Time	2-3 Times	4 or More Times	*Total*
N	114	71	63	61	***309***
% (SE)◊	36.9 (2.7)	23.0 (2.4)	20.4 (2.3)	19.7 (2.3)	***100.0***

◊ Percentage of schools in each meeting frequency category

Table 3.9: Coordinated School Health Team Members

CSHT Member Type	N	% (SE) ◊
School Administrator	292	94.5 (1.3)
Nutrition Services Representative	269	87.1 (1.9)
Physical Education Teacher	280	90.6 (1.6)
Health Teacher	226	73.1 (2.5)
Parent/Guardian	230	74.0 (2.5)
School Nurse/ Health Provider	207	67.0 (2.7)
School Counselor/ Psychologist/ Social Worker	195	63.1 (2.7)
Student	142	46.0 (2.8)
Teacher (other than PE or Health)	220	71.2 (2.6)
Community Representative	184	59.6 (2.8)
Other	185	59.9 (2.8)

◊ Percentage of CSHT's with representation from the category

Table 3.10: Number of Member Categories Represented on CSHT

Number of Member Categories	Number of CSHT	% (SE) ◊
1 representative	1	0.3 (0.3)
2 representatives	1	0.3 (0.3)
3 representatives	6	1.9 (0.8)
4 representatives	6	1.9 (0.8)
5 representatives	27	8.7 (1.6)
6 representatives	39	12.6 (1.9)
7 representatives	44	14.2 (2.0)
8 representatives	54	17.5 (2.2)
9 representatives	68	22.0 (2.4)
10 representatives	30	9.7 (1.7)
11 representatives	33	10.6 (1.8)
Total	***309***	***100.00***

◊ Percentage of CSHT's with each number of member categories

3.3 Associations between CSHT's and School Characteristics

Associations between school characteristics and the presence of a CSHT based on a logistic regression analysis are displayed in Table 3.11. The regression model included school grade-level categories, Team Nutrition membership, and percentage of free or reduced eligible students, student enrollment and grant funding as covariates. Team nutrition membership was the only school characteristic in the model significantly associated ($P<0.01$) with the presences of a CSHT in schools. Schools that were members

of Team Nutrition were more likely (odds ratio = 4.06) to have a CSHT than non-Team Nutrition schools.

Table 3.11: Associations between school characteristics and presence of a CSHT

School Characteristic	Odds Ratio	Coefficient	SE
School Grade Classification			
Primary school (reference)	1.00	--	--
Secondary school	1.40	0.34	0.60
Combination school	3.47	1.24	1.08
Free/Reduced (%)	0.52	-0.65	1.07
Student Enrollment	0.61	-0.49	0.49
Team Nutrition Membership			
Non-Team Nutrition member (reference)	1.00	--	--
Team Nutrition member**	4.06	1.40	0.53
Grant Funding			
Non-grant recipient (reference)	1.00	--	--
Grant recipient	1.13	0.13	0.55

Regression Model: $R^2 = 0.11$, F-value <0.01

*=P<0.05; **P<0.01

Among sample schools with CSHT's, associations between CSHT's that oversaw healthy eating and school characteristics based on a multiple regression model are displayed in Table 3.12. The regression model included grade-level categories, Team

Nutrition membership, and percentage of free or reduced eligible students, student enrollment and grant funding as covariates. Grade-level was the only school characteristic in the model significantly associated (P<0.05) with the presence of a CSHT that oversees healthy eating in the school. Secondary schools were more likely (odds ratio = 2.44) to have a CSHT that oversaw healthy eating than primary schools.

Table 3.12: Associations between School Characteristic and Presence of a CSHT that oversees Healthy Eating

Variable	Odds Ratio	Coefficient	SE
School Grade Classification			
Primary school (reference)	1.00	--	--
Secondary school*	2.44	0.89	0.36
Combination school	1.95	0.67	0.45
Free/Reduced (%)	0.79	-0.23	0.64
Student Enrollment	1.20	0.18	0.28
Team Nutrition Membership			
Non-Team Nutrition member	1.00	--	--
Team Nutrition member	1.53	0.43	0.32
Grant Funding			
Non-grant recipient	1.00	--	--
Grant recipient	0.60	-0.51	0.32

Regression Model: $R^2 = 0.18$, F-value < 0.01

*=P<0.05; **=P<0.01

3.4 What are the prevalences of policies, environments and programs related to healthy eating among schools that have completed the HSAT?

3.4.1 Healthy Eating Polices

The prevalences of written, and written and enforced school policies related to healthy eating among schools that completed the HSAT were low. Less than 40% of the schools reported having a written, or written and enforced policy on each of school-wide and venue specific healthy eating policy items (see Table 3.13 and Table 3.14). However, 118 schools (35.8%) reported adopting the comprehensive Michigan State Board of Education Policy on offering healthy foods and beverages in venues outside of school meals (MSBE Healthy Eating Policy). The most likely policies to be written and enforced were polices prohibiting withholding food as a punishment (20.4%) and regulating the hours of vending machines with foods of low nutritional value (21.6%). The least likely policies to be written and enforced were policies prohibiting the sales of foods with low nutritional value in fundraisers (4.6%), requiring predominately healthy foods be sold at school events (5.8%), and prohibiting the use of food as a reward (5.8%). The policies that were most likely to be written but not enforced were policies requiring predominately healthy foods be offered in classroom parties (17.0%), prohibiting the sales of foods with low nutritional value in fundraisers (12.2%), and requiring predominately healthy foods be offered at school events (11.5%).

Table 3.13: Percentage of Schools with School-Wide Healthy Eating Policies

Policy Description N=329	No Written Policy % (SE)	Written Policy % (SE)	Written & Enforced % (SE)
Prohibits food as a reward	84.5 (2.0)	9.7 (1.6)	5.8 (1.3)
Prohibits food withholding punishment	71.7 (2.5)	7.9 (1.5)	20.4 (2.2)

Table 3.14: Percentage of Schools with Healthy Eating Policies for School Venues

Policy Description N=329	NA % (SE)	No Written Policy % (SE)	Written Policy % (SE)	Written & Enforced % (SE)
Offer Predominately Healthy Foods and Beverages (in venue)				
Classroom Parties	NA◊	75.4 (2.4)	17.0 (2.1)	7.6 (1.5)
School Events	5.5 (1.3)	77.2 (2.3)	11.5 (1.8)	5.8 (1.3)
School Stores	47.1 (2.8)	39.5 (2.7)	6.1 (1.3)	7.3 (1.4)
A la carte	21.3 (2.3)	51.7 (2.8)	9.4 (1.6)	17.6 (2.1)
Prohibits sale of low nutrition value foods				
Fundraisers	1.8 (0.7)	81.5 (2.1)	12.2 (1.8)	4.6 (1.2)
Regulates hours that foods of low nutrition value are sold				
Vending Machines	34.0 (2.6)	36.8 (2.7)	7.6 (1.5)	21.6 (2.2)

◊ NA = The HSAT item which assessed classroom parties did not have NA as a response option (see 3.2.1.1 Healthy Eating Policies)

3.4.2 Healthy Food Offering Practices

Schools in the sample had a variety of healthy offering practices (see Table 3.15). All schools in the sample had at least one healthy eating venue (offered healthy food/beverage choices to students or offered no food/beverage choices to students) outside of school meals (vending machines, a la carte, school stores, concessions, school events, classroom parties or fundraisers). Twenty-one schools reported all 7 of the school venues assessed were healthy eating venues. The most common healthy eating venues were school stores (72.0%), a la carte (69.9%) and vending machines (67.5%), and least common were fundraisers (17%), classroom parties (19.5%) and school events (26.4%).

Table 3.15: Percentage of Healthy Eating Venues among HSAT Schools

Schools offered healthy foods choices (or no food choices) in: N=329	**No % (SE)**	**Yes % (SE)**
Vending Machines	32.5 (2.5)	67.5 (2.5)
A la carte	30.1 (2.5)	69.9 (2.5)
School Stores	28.0 (2.5)	72.0 (2.5)
Concessions	46.2 (2.8)	53.8 (2.8)
School Events	73.5 (2.4)	26.4 (2.4)
Classroom Parties	80.5 (2.2)	19.5 (2.2)
Fundraisers	83.0 (2.1)	17.0 (2.1)

3.4.3 Eating Environment Elements (Cafeteria/ Eating Area)

Results of the analysis of school eating environments indicated little variation among schools that completed the HSAT (see Table 3.16). Greater than 80% of the sample schools indicated that all of the eating environmental items listed on the HSAT applied to their school. The most common eating environmental element to be reported was providing appropriate eating surfaces for children (97.0%), and the least common factor reported was providing an attractive cafeteria environment (84.2%).

Table 3.16: Prevalences of Eating Environment Elements

Eating Environmental Elements	**N**	**% (SE)**
Clean eating surfaces	314	95.4 (1.2)
Cafeteria structures do not need repair	315	95.7 (1.1)
Appropriate eating surfaces for children	319	97.0 (0.9)
Enough eating surfaces for all students	316	96.1 (1.1)
Proper adult supervision and role modeling in cafeteria	283	86.0 (1.9)
Drinking foundations available	315	95.7 (1.1)
Appropriate noise level in eating area; not silent	316	96.1 (1.1)
Opportunity for hand washing	294	89.4 (1.7)
Attractive cafeteria environment	277	84.2 (2.0)

3.4.4 School Meals Programs

Schools' participation in the National School Lunch Program was nearly universal (98.8%); however, fewer schools participated in the School Breakfast Program (85.7%) (see Table 3.17).

Table 3.17: Prevalences of USDA School Meals Program Participation

School Meal	N	% (SE)
USDA School Breakfast	282	85.7 (1.9)
USDA School Lunch	325	98.8 (0.6)

3.4.5 Meal Period Characteristics

The structure of the meal period described by HSAT items was nearly constant among schools in two areas: 1) meal time did not conflict with other activities (98.2%) and 2) meals are fully accessible to all students (99.7%) (see Table 3.18). In addition, most schools gave students at least 10 minutes to eat breakfast and 20 minutes to eat lunch (77.5% and 71.4% respectively). However, only 15.5% of schools scheduled recess or free time before lunch.

3.4.6 Nutrition Information and Student Opinions

More than half of the sample schools provided positive and consistent messages about healthy eating throughout the school (59.6%) and displayed nutrition information or had it readily available (51.7%), while fewer schools highlighted healthy items on menus or other posted information (36.2%)(see Table 3.19). Additionally, 55.3% of

schools conducted surveys (verbal or written) with students to obtain opinions about the foodservice program or food preferences for school meals.

Table 3.18: Prevalences of School Meal Period Characteristics

School Meal Characteristic	N	% (SE)
Meals are fully accessible to all students	328	99.7 (0.3)
Meals that include a variety of foods	283	86.0 (1.9)
Meals that include appealing foods	313	95.1 (1.2)
Meals that include low-fat foods daily	271	82.4 (2.1)
Lower fat meats every day	192	58.4 (2.7)
≥10 mins to eat break after students obtain food	225	77.5 (2.3)
Recess before lunch rather than after	51	15.5 (2.0)
≥20 mins to eat lunch after students obtain food	235	71.4 (2.5)
Meal time doesn't conflict with other activities	323	98.2 (0.7)

Table 3.19: Prevalences of Nutrition Information and Student Food Service Surveys

Scale Items	N	% (SE)
Displaying nutritional information for foods served or having it readily available	170	51.7 (2.8)
Highlighting healthy items on menus or other posted information	119	36.2 (2.7)
Conducting surveys with students to obtain opinions about the foodservice program or food preferences	182	55.3 (2.7)
Positive and consistent messages about healthy eating are provided throughout the school	196	59.6 (2.7)

3.4.7 Healthy Meal Preparations and Serving Practices

Healthy meal preparation and serving practices that could reduce the amount of fat and calories in a dish were common among sample schools (see Table 3.20). However, not all practices were equally as prevalent. The majority of the sample schools baked, roasted or broiled meat more often than fried (87.8%), served cooked meats in portion sizes of three ounces or less (91.5%), prepared vegetables with minimal fat (94.2%), thoroughly drained fat from ground meats (86.6%), and cooked with non-stick spray or pan liners (91.2%). Fewer schools offered sauces, dressings or dips in low-fat or non-fat options and had portion sizes limited to one-ounce servings (60.5%), served skinless poultry (63.2%), and used low-fat or non-fat real cheese (58.1%).

Table 3.20: Prevalences of Healthy Preparation and Serving Practices

Scale Items	N	% (SE)
Baking, roasting or broiling meat more often than frying	289	87.8 (1.8)
Sauces, dressings or dips offered included low-fat or non-fat options and portion size was limited to one-ounce servings	199	60.5 (2.7)
Serving skinless poultry	208	63.2 (2.7)
Using low-fat or non-fat real cheese	191	58.1 (2.7)
Serving cooked meats in portion sizes of three ounces or less	301	91.5 (1.5)
Preparing vegetables with minimal fat	310	94.2 (1.3)
Thoroughly draining fat from ground meats	285	86.6 (1.9)
Cooking with non-stick spray or pan liners	300	91.2 (1.6)

Scale score percentages (healthy eating policy scale, eating environment scale, healthy venue scale and meal preparation scale) varied greatly by school (see Table 3.21). The average scale score percentages ranged from 18.7% (Healthy Eating Policy) to

92.8% (Eating Environment). However, on each scale some schools achieved 100%, the maximum score. In contrast, the minimum score (0%) was achieved on the healthy eating policy scale by 159 schools. The mean percentage score was greater for the healthy eating venue scale (45.4%) than the healthy eating policy scale (18.7%), and the mean percentage score of the eating environment scale (92.8%) was greater than the healthy meal preparation and serving practices scale (83.9%).

Table 3.21: Average Scale Scores for Schools that Completed the HSAT

Scale	Mean (%)	SE (%)	Range (%)
Healthy Eating Policy	18.7	1.4	0.0 – 100.0
Eating Environment	92.8	0.6	33.3 – 100.0
Healthy Venue	46.6	1.4	0.0 – 100.0
Healthy Meal Preparation	79.1	1.2	0.0 – 100.0

3.5 Associations between School Characteristics and Healthy Eating Policy

The next analyses determined associations between school characteristics and healthy eating policies in schools within the HSAT sample. The healthy eating policy scale and whether or not the school had adopted the MSBE Healthy Eating Policy were regressed separately with school characteristics.

Two school characteristics were associated with the healthy eating policy scale: Team Nutrition membership and frequency of CSHT meetings in the last year (Table 3.22). Schools that were members of Team Nutrition had average policy scores higher than non-member schools when controlling for presence of a CSHT overseeing healthy eating, student enrollment, free/reduced lunch eligibility, school grade level and grant funding. Schools that were members of Team Nutrition scored, on average, 0.5% higher

on the healthy eating policy scale than non-Team Nutrition schools. Furthermore, schools with CSHT's that met at least four times in the past year (prior to completing the HSAT) had healthy eating policy scores 0.6% higher, on average, than schools that had no CSHT meetings in the past year when controlling for the same set of school characteristics.

In addition, two school characteristics were significantly associated with adoption of the Michigan State Board of Education Policy on Offering Healthy Food and Beverages in Venues Outside of the Federally Regulated Child Nutrition Programs (MSBE Healthy Eating Policy) (see Table 3.23). Schools that received a grant for healthy eating or physical activity were less likely (odds ratio = 0.52) to have adopted the MSBE Policy than non-grant recipients when controlling for presence of a CSHT overseeing healthy eating, student enrollment, free/reduced lunch eligibility, school grade level and grant funding. The second characteristic, frequency of CSHT meetings in the last year, was positively associated with adoption of the policy. Schools with a CSHT that met 2-3 times in the last year prior to completing the HSAT and met four or more times in the last year were more likely (odds ratio = 2.07 and 3.05, respectively) to have adopted the MSBE Healthy Eating Policy than schools that did not have a CSHT meeting in the past year.

Table 3.22: Associations between School Characteristics Healthy Eating Policy Scale based on a Multiple Regression Model

School Characteristics	Unstandardized Coefficient	SE
School Grade Classification		
Primary school (reference)	--	--
Secondary school	0.05	0.15
Combination School	0.21	0.20
Student Enrollment	-0.03	0.12
Free/Reduced (%)	-0.29	0.29
Team Nutrition Membership		
Non-Team Nutrition member	--	--
Team Nutrition member**	0.46	0.14
Grant Funding		
Non-grant recipient (reference)	--	--
Grant recipient	-0.11	0.13
CSHT Presence & Oversight		
No CSHT (reference)	--	--
CSHT (w/o health eating oversight)	-0.02	0.29
CSHT oversaw healthy eating	0.20	0.26
Number of representatives on CSHT		
0-4 representatives (reference)	--	--
5-6 representatives	0.22	0.27
7-8 representatives	0.25	0.25
>8 representatives	0.20	0.25
Number of CSHT meetings last year		
No meetings (reference)	--	--
1 meeting	0.18	0.17
2-3 meetings	0.20	0.16
>3 meetings**	0.63	0.17

Regression Model: $R^2 = 0.18$, F-value = 0.02, *= P<0.05, **= P<0.01

Table 3.23: Associations between School Characteristics and Adoption of MSBE Healthy Eating Policy based on a Logistic Regression Model

School Characteristics	Unstandardized Coefficient	SE	Odds Ratio
School Grade Classification			
Primary school (reference)	--	--	1.00
Secondary school	0.06	0.31	1.07
Combination School	0.05	0.40	1.05
Student Enrollment	0.11	0.24	1.12
Free/Reduced (%)	0.03	0.58	1.03
Team Nutrition Membership			
Non-Team Nutrition member	--	--	1.00
Team Nutrition member	0.27	0.28	1.31
Grant Funding			
Non-grant recipient (reference)	--	--	1.00
Grant recipient*	-0.66	0.28	0.52
CSHT Presence & Oversight			
No CSHT (reference)	--	--	1.00
CSHT (w/o health eating oversight)	-0.39	0.63	0.67
CSHT oversaw healthy eating	0.66	0.56	1.93
Number of representatives on CSHT			
0-4 representatives (reference)	--	--	1.00
5-6 representatives	0.66	0.51	1.94
7-8 representatives	0.62	0.48	1.86
>8 representatives	0.80	0.47	2.23
Number of CSHT meetings last year			
No meetings (reference)	--	--	1.00
1 meeting	-0.50	0.38	0.61
2-3 meetings**	0.99	0.36	2.70
>3 meetings**	1.11	0.37	3.05

Regression Model: $R^2 = 0.10$, F-value < 0.01, *= P<0.05, **= P<0.01

3.6 Associations between School Characteristics and Eating Environmental Elements

According to the multiple regression model conducted assessing associations between school characteristics and eating environment scale scores, two school characteristics (student enrollment and income) were associated with the eating environment (see Table 3.24). Student enrollment was inversely associated with the eating environment scale scores when controlling for presence of a CSHT overseeing healthy eating, student enrollment, free/reduced lunch eligibility, school grade level and grant funding ($P=0.03$). In other words, greater student enrollment was associated with less positive eating environmental factors. Further, the percentage of students eligible for free/reduced price lunches was inversely associated with eating environment scale scores in the same model ($P<0.01$). Hence, greater free/reduced price lunch eligibility was associated with less positive eating environmental factors.

Table 3.24: Associations between School Characteristics and Eating Environment Scale Scores Based on a Multiple Regression Model

School Characteristics	Unstandardized Coefficient	SE
School Grade Classification		
Primary school (reference)	--	--
Secondary school	-0.01	0.02
Combination School	-0.01	0.02
Enrollment*	-0.03	0.01
Free/Reduced**	-0.11	0.03
Team Nutrition Membership		
Non-Team Nutrition member	--	--
Team Nutrition member	0.02	0.01
Grant Funding		
Non-grant recipient (reference)	--	--
Grant recipient	-0.02	0.01
CSHT Presence & Oversight		
No CSHT (reference)	--	--
CSHT (w/o health eating oversight)	-0.01	0.03
CSHT oversaw healthy eating	0.00	0.03
Number of representatives on CSHT		
0-4 representatives (reference)	--	--
5-6 representatives	-0.02	0.03
7-8 representatives	-0.01	0.02
>8 representatives	0.00	0.02
Number of CSHT meetings last year		
No meetings (reference)	--	--
1 meeting	-0.01	0.02
2-3 meetings	0.03	0.02
>3 meetings	-0.02	0.02

Regression Model: $R^2 = 0.09$, F-value = 0.02, *= P<0.05, **= P<0.01

3.7 Associations between School Characteristics and Venue Offerings

Based on a multiple regression analysis, only one school characteristic, school grade-level, was significantly associated with the healthy venue scale (Table 3.25). Secondary and combination schools, on average, had lower healthy venue scale scores ($P<0.05$) than primary schools when controlling for CSHT characteristics, student enrollment, free/reduced lunch eligibility, school grade level and grant funding. None of the CSHT characteristics were significantly associated with the healthy venue scale.

Table 3.25: Associations between School Characteristics and Healthy Venue Scale Scores Based on a Multiple Regression Model

School Characteristics	Unstandardized Coefficient	SE
School Grade Classification		
Primary school (reference)	--	--
Secondary school**	-0.11	0.04
Combination School**	-0.15	0.05
Student Enrollment	-0.01	0.03
Free/Reduced (%)	-0.11	0.07
Team Nutrition Membership		
Non-Team Nutrition member	--	--
Team Nutrition member	0.05	0.03
Grant Funding		
Non-grant recipient (reference)	--	--
Grant recipient	0.05	0.03
CSHT Presence & Oversight		
No CSHT (reference)	--	--
CSHT (w/o health eating oversight)	-0.05	0.07
CSHT oversaw healthy eating	0.00	0.06
Number of representatives on CSHT		
0-4 representatives (reference)	--	--
5-6 representatives	-0.02	0.06
7-8 representatives	-0.09	0.05
>8 representatives	-0.03	0.06
Number of CSHT meetings last year		
No meetings (reference)	--	--
1 meeting	-0.04	0.04
2-3 meetings	0.06	0.04
>3 meetings	-0.03	0.04

Regression Model: $R^2 = 0.11$, F-value < 0.01, *= P<0.05, **= P<0.01

3.8 Associations between School Characteristics and Healthy Meal Preparation and Serving Practices

Several school characteristics (school grade classification, Team Nutrition membership and CSHT characteristics were associated with the healthy meal preparation scale based on a multiple regression model (see Table 3.26). Secondary schools had 0.1% higher average healthy meal preparation scale scores than primary schools, and schools that were members of Team Nutrition had 0.1% higher healthy meal preparation scale scores on average than non-member schools. In regards to CSHT characteristics, the presence of a CSHT that oversaw healthy eating, the CSHT size and meeting frequency were all positively associated with the meal preparation scale. Schools with a CSHT that oversaw healthy eating had 0.1% higher meal preparation scores than schools without a CSHT. Schools with a CSHT that had 5 or more member types had 0.1%-0.2% higher healthy meal preparation scale scores than schools with 4 or fewer member types on a CSHT. Schools that held 2 or 3 CSHT meetings in the last year had 0.1% higher meal preparation scores than schools that did not hold a CSHT meeting.

Table 3.26: Associations between School Characteristics and Healthy Meal Preparation Scale Scores based on a Multiple Regression Model

School Characteristics	Unstandardized Coefficient	SE
School Grade Classification		
Primary school (reference)	--	--
Secondary school**	0.13	0.03
Combination School	0.08	0.04
Student Enrollment	0.00	0.02
Free/Reduced (%)	0.00	0.06
Team Nutrition Membership		
Non-Team Nutrition member	--	--
Team Nutrition member*	0.06	0.03
Grant Funding		
Non-grant recipient (reference)	--	--
Grant recipient	-0.03	0.03
CSHT Presence & Oversight		
No CSHT (reference)	--	--
CSHT (w/o health eating oversight)	0.07	0.06
CSHT oversaw healthy eating*	0.14	0.05
Number of representatives on CSHT		
0-4 representatives (reference)	--	--
5-6 representatives*	0.11	0.05
7-8 representatives**	0.14	0.04
>8 representatives**	0.16	0.04
Number of CSHT meetings last year		
No meetings (reference)	--	--
1 meeting	-0.01	0.03
2-3 meetings*	0.08	0.04
>3 meetings	0.01	0.04

Regression Model: $R^2 = 0.18$, F-value < 0.01, *= P<0.05, **= P<0.01

3.9 Associations between Healthy Eating Policies and Healthy Offering Practices

The final analyses determined associations between school healthy eating policies and healthy food offering practices in the HSAT sample. The healthy eating policy scale and whether or not the school had adopted the MSBE Healthy Eating Policy were regressed separately with the healthy venue scale. This was followed by independent regressions of venue specific healthy food offering policies with the corresponding venue food offering practices (see Table 3.28).

According the regression analyses, the healthy eating policy scale was not associated with the healthy venue scale. However, the MSBE Healthy Eating Policy was associated (P=0.08) with the healthy venue scale. Schools that adopted the MSBE Healthy Eating Policy, on average, had 0.1% higher healthy venue scale scores than schools that did not adopt the policy when controlling for school demographics, Team Nutrition membership, grant funding and CSHT characteristics.

In relation to venue specific associations, schools with a written and enforced policy to offer predominately healthy foods in classroom parties were more likely (odds ratio = 4.50) to report having healthy classroom parties than schools without a policy. Furthermore, both schools with a written policy and schools with a written & enforced policy were more likely (odds ratio = 2.46 and 8.09, respectively) to have healthy fundraisers than schools without a policy. Similarly, schools with a written policy and schools with a written & enforced policy were more likely (odds ratio = 2.46 and 8.09, respectively) to have healthy school events than schools without a policy. Healthy a la carte, vending machine, and school store policies were not significantly associated with the corresponding offering practices. However, healthy school store written and enforced

policies showed a weak statistical (P=0.07) association with corresponding venue offerings.

Table 3.27: Associations between Healthy Eating Policies and Corresponding Healthy Offering Practices based on Multiple Logistic Regression Models

School Food Venue	Coefficient	SE	Odds Ratio
Classroom Parties			
No policy (reference)	--	--	1.00
Written policy	0.53	0.40	1.69
Written & enforced policy**	1.51	0.52	4.51
Fundraisers			
No policy (reference)	--	--	1.00
Written Policy*	0.90	0.46	2.46
Written & Enforced**	2.09	0.64	8.09
School Events			
No policy (reference)	--	--	1.00
Written**	1.36	0.43	3.91
Written & Enforced*	1.40	0.60	4.05
School Stores			
No policy (reference)	--	--	1.00
Written	0.26	0.58	1.30
Written & Enforced	1.10	0.61	3.00
A la carte			
No policy (reference)	--	--	1.00
Written	-0.11	0.49	0.89
Written & Enforced	0.69	0.46	1.98
Vending Machines			
No policy (reference)	--	--	1.00
Written	-0.36	0.54	0.70
Written & Enforced	-0.23	0.36	0.79

Regression models controlled for school demographics, Team Nutrition membership, grant funding and significant CSHT characteristics.

* = P<0.05, ** = P<0.01

CHAPTER 4: SUMMARY AND DISCUSSION

4.1 Summary of Findings

4.1.1 Characteristics of Schools that Completed the HSAT

From October of 2004 to February of 2007, 332 Michigan schools completed the online HSAT self-assessment. This self-selected sample was composed of a wide range of school types (public, private, charter and others), grade levels (primary, secondary and combinations), incomes (percentage of students eligibility for free/reduced lunches ranged from 5% to 98%), and locations (multiple counties).

The study sample shared some similarities with the state school population. In both the HSAT sample and in Michigan, public schools were the most prevalent type of school, elementary schools were the most prevent grade level, and high schools had the greatest average student enrollment per building. Additionally, less than a 2% difference in the average percentage of free and reduced lunch eligible students was found between the sample and in Michigan.

Many schools in the sample had actively pursued resources to enhance the health of their school. In addition to completing the HSAT, 61% were members of Team Nutrition and 41% received at least one grant to enhance nutrition or physical activity at their school.

4.1.2 Who Was Involved in the HSAT Process

Coordinated school health teams (CSHT's) were prevalent among the sample schools. Within the sample, 94% had a CSHT and 71% had a team that oversaw healthy eating in the school. Schools that were members of Team Nutrition were more likely to

have a CSHT than non-Team Nutrition schools. Secondary schools were more likely to have a CSHT that oversaw healthy eating when compared to primary schools. CSHT's meetings were held at least once in the past year (prior to completing the HSAT) by 63% of the schools. CSHT's included representation from school administration, faculty, staff, the student body and the community. Schools had an average of 8 different member types represented on their CSHT's.

4.1.3 Prevalences of School Eating Policies, Programs and Environments

The healthy eating policies assessed by the HSAT were not widely prevalent. For each of the nine policy items assessed in the study, less than 40% of the schools had written or adopted a corresponding policy. The average healthy eating policy scale score percentage was only 19%. Policies most likely to be written and enforced among the available items were prohibiting withholding food as a punishment (20%) and regulating the hours of vending machines with foods of low nutritional value (22%). In contrast, fundraising and school events were among the least likely venues to have a healthy offerings policy (5% and 6% respectively). The comprehensive MSBE Healthy Eating Policy was adopted by 36% of the schools. School policies were not reported if a school did not have a particular food distribution venue. School stores and vending machines (accessible to students) were absent in 47% and 31% of the schools respectively.

All schools in the sample had healthy offering practices in at least one venue outside of school meals (vending machines, a la carte, school stores, concessions, school events, classroom parties or fundraisers). Schools achieved an average of 47% on the healthy venue offering scale. School fundraisers (17%), classroom parties (20%) and events (26%) were the least likely venues to offer healthy food choices, and school stores

(72%), a la carte (70%) and vending machines (68%) were the most likely venues to offer healthy foods.

Responses to school eating environment items indicated that more than 80% of the schools in the sample applied all of the healthy environmental elements mentioned at their school. The average eating environment scale percentage score was 93%. Sample schools generally provided safe, adequate and encouraging eating environments based on HSAT items. Schools' participation in the National School Lunch Program was nearly universal (99%); fewer schools participated in the School Breakfast Program (86%). Schools indicated providing time and access to meals for all students including at least 10 minutes to eat breakfast (78%) and 20 minutes to eat lunch (71%).

Information was available to assist students in making healthy food choices in 64% of the schools in the form of nutrition information about foods served or highlighting healthy items available. Student surveys were conducted about the school's food service in 55% of the schools and 60% of schools said they provided a consistent positive message about healthy eating throughout the school. At least one healthy meal preparation or serving practice to decrease fat was utilized by each school in the sample. Preparing vegetables with minimal fat was the most common (94%) and using low-fat or fat-free real cheese was the least common (58%). Sample schools scored an average of 82% on the healthy meal preparation scale.

4.1.4 Association between School Characteristics and School Policies, Programs and Environments

School characteristics including characteristics of CSHT's were associated with healthy eating policies, the eating environment, healthy food offerings and healthy meal

preparation practices. One of the associated characteristics was grade level. School grade level was associated with healthy venue offerings and healthy meal preparation practices. Secondary and combination schools were associated with lower healthy venue scale scores than primary schools, but higher healthy meal preparation scores than primary schools. Other associated characteristics included student enrollment and income. Higher student enrollment and percentages of free/reduced lunch eligible students were associated with lower eating environmental scale scores, and higher percentages of free/reduced lunch eligible students alone were associated lower healthy venue offering scale scores. Collectively, school demographics were both positively and negatively associated with different areas of the school healthy eating environment.

CSHT characteristics showed significant positive associations with several scales. Schools with a CSHT that oversaw healthy eating had higher healthy meal preparation scores that schools without a CSHT. CSHT meeting frequency was positively associated with health eating policy scale scores and adoption of the MSBE Healthy Eating Policy. Schools that held at least 3 CSHT meetings in the last year had higher healthy eating policy scores and were more likely to adopt the MSBE Healthy Eating Policy than schools that did not hold a CSHT meeting in the last year. In regards to CSHT membership, schools with a CSHT comprised of more than 6 member categories had higher healthy meal preparation scores than schools with fewer than 6 member categories represented on their CSHT. Overall, CSHT characteristics including a CSHT overseeing health eating, meeting at least 3 times per year and having representation from at least 7 different types of members were associated with some desirable policy and environment outcomes.

External support from Team Nutrition and grant funding had conflicting associations. Team nutrition membership was associated with higher healthy eating policy scale scores and healthy meal preparation scale scores when compared to schools that were not members of Team Nutrition. However, grant funding was negatively associated with the adoption of the MSBE Healthy Eating Policy. Schools that received grants were less likely to have adopted the MSBE Healthy Eating Policy than school that did not receive a grant.

4.1.5 Associations between School Healthy Eating Policies and Practices

Associations between healthy offering policies and healthy offering practices were detected in some, but not all of the venues, assessed. The collective analysis of healthy offering policies and healthy offering practices in multiple venues did not yield a significant association (the healthy eating policy scale was not associated with the healthy venue scale). However, the comprehensive MSBE Healthy Eating Policy had a weak positive association with the healthy venue scale. In a series of independent analysis of individual policies with corresponding practices, a significant positive association was seen in three venues and no association was observed in three others. School healthy fundraising and healthy school event policies written or written and enforced were positively associated with healthy offering practices in these venues. Also, written and enforced healthy classroom parties policies were associated with healthy offering practices in the venue. In contrast, no associations were detected between healthy offering policies and practices in school stores, a la carte and vending machines; although the school store comparison of policies and practices was nearly significant. Overall,

between healthy offering policies and healthy offering practices in various school venues were inconsistent.

4.2 Discussion of Findings

4.2.1 Utilization of School Health Enhancement Resources

The Healthy School Study demonstrated the wide-spread use of the HSAT among Michigan schools. A large diverse group of Michigan schools (332 schools) completed the HSAT between October 2004 and February 2007. These schools utilized the self-assessment tool to evaluate their school's health environment in the eight areas of the CDC Coordinated School Health Model including nutrition services and school health environment. [112]

The sample of schools that completed the HSAT was generally representative of the Michigan school population in terms of school type, grade classification and income. Since completion of the HSAT was voluntary, the composition of the sample suggests three things about the HSAT process. First, the HSAT appeals to the diverse collection of schools that are found in Michigan. Second, a wide-variety of schools are aware of the HSAT's availability. Finally, schools have been actively pursuing resources to enhance the health of their schools.

The prevalences of Team Nutrition membership and grant funding also indicate that schools in Michigan are actively pursuing resources to improve their schools' health. During the 2005-2006 school year, 936 schools in Michigan were members of Team Nutrition, 202 of which completed the HSAT during the data collection period (October 2004 to February 2007). [81] In regards to grant funding, at least 164 schools applied for and received a grant for nutrition or physical activity-related resources. [113] The

considerable participation in voluntary programs designed to provide resources to address school health needs demonstrates schools' desire to pursue school health and willingness to utilize resources made available by outside organizations and institutions.

Schools that received a grant were required to complete a grant eligibility process (see Table 3.6). Prior to receiving funding, schools were mandated to complete the HSAT and develop a plan of action for utilizing grant funds once received. Schools that completed the HSAT during this phase had not yet utilized grant resources to enhance their school health environment. Therefore, it is likely that data collected from the HSAT reflects the schools environments prior to grant-induced changes. Hence, the HSS's assessment of the grant recipient schools does not reflect the effectiveness of the grant programs.

4.2.2 CSHT Characteristics and the Coordination School Health Model

Nearly all of the schools (94%) in the sample formed a CSHT, which is a key component of the state and federally recommended coordinated school health model. [14, 15] When compared to another study, the percentage of schools in the HSS with a CSHT was considerable higher than the percentage of schools (65%) with a school health council or team according to the 2006 Mississippi School Wellness Principals Survey (MSWPS 2006). [114] One potential contributor to the variation in the findings is the differences in the data collection tools. First, the MSWPS 2006 utilized a random sample of schools, as compared to the HSS which utilized data collected from schools that voluntarily completed the HSAT. Next, the HSAT, used in the HSS, instructs school to form a CSHT before beginning the assessment, while the MSWPS 2006 does not request the formation of a CSHT, rather it only inquires if a team is present. Finally, schools likely voluntarily

completed the HSAT as part of the coordinated school health process to improve school, which includes the formation of a CSHT, while the principals who completed the MSWPS 2006 were likely not using the survey as a school health improvement tool. Therefore, the interpretation of the findings from the two data collection tools should be different. The HSS's findings may describe the percentage of schools with a CSHT who are actively participating in the coordinated school healthy process by assessing the school's health, whereas the MSWPS 2006 may describe the general school population of the area surveyed. From this one can theorize that CSHT's may be more common among schools that are actively participating in the coordinated school health self-assessment process (HSAT) than a generally surveyed school population (MSWPS 2006), but additional evidence is needed to support this theory.

Within the HSS sample, the CSHT formed varied in oversight responsibility, membership composition and meeting frequency. Most schools (71%) placed the oversight of healthy eating as a responsibility of the CSHT. When compared to a national sample from the third School Nutrition and Dietary Study (SNDS III), a greater percentage of schools in the HSS had a CSHT to oversee healthy eating than the percentage of schools with a nutrition/health advisory council to address healthy eating in the SNDS III (22%). [54] Similar to differences observed in the comparison of the HSS to the MSWPS 2006, the contrast in findings between the HSS and SNDS III may be related to differences in the data collection tools. Like the MSWPS 2006, the SNDS III survey is a surveillance tool and not a school healthy improvement tool. This may lead to the following interpretation; schools that are actively participating in the coordinated school

health self-assessment process (HSAT) may be more likely to have a CSHT to oversee healthy eating than a general school population (SNDS III).

The CSHT's in the HSS sample were composed of representatives of several different areas of the school body (e.g. school administration, food service, teaching staff, parents and students); eight different representatives types on average were reported to be active members on the CSHT's. This finding is consisted with previous studies that found a diverse group of stakeholders can be incorporated into a CSHT. [115, 116, 117] Furthermore, the formation of a school health council or CSHT can be used to involve key stakeholders such as parents, teachers, healthcare professionals and others in the school health.

Finally, the findings regarding CSHT meeting frequency could be interpreted in several ways. The large portion of schools (37%) with a CSHT that did not hold at least one CSHT meeting in the last year may describe two different situations. In the first situation, schools had newly formed their CSHT and may have begun using the coordinated school health model when they completed the HSAT. On the other hand, schools may have had a CSHT in place for a considerable amount of time and this team was not actively meeting during the last year. The first theory represents a possible positive trend. Schools that did not have a CSHT in the past are forming teams and beginning to move through the school health improvement process. In contrast, the second theory represents a negative trend. Schools with established CSHT are not meeting regularly and may be inactive in overseeing school health. More information is needed, including the date the CSHT were formed, to determine if either theory or a combination of the theories accurately explains the findings. Despite the lack of CSHT meetings held by some schools, many other schools had CSHT meetings (63%) and most

of these schools held multiple meetings in the last year (64%). This could be considered evidence that the schools in the HSS sample are actively working to address school health.

4.2.3 Prevalences of Eating Policies, Programs and Environments

The majority of the schools in the sample (52%) had at least one written healthy eating policy. This demonstrates support for healthy eating within many of the schools. On the other hand, 48% of schools had none of the assessed policies. In a study of Minnesota high schools French et al found results comparable to the HSS findings; many schools (68%) did not have of a policy about food and nutrition. [118] One potential contributor to the low prevalence of school nutrition policies in the Minnesota study was that only 65% of principals surveyed felt that school nutrition policy was important. Therefore, the perceived lack of importance of school nutrition policy could be one barrier to adopting school nutrition policies.

Differences in the prevalences of policies between school venues may also warrant consideration. Notable variation in the prevalences of healthy food offering policies was found between school venues. For example, 13% of schools had a policy regarding food offerings in school stores, while 29% had a policy regarding vending machines. Similar significant variations in the prevalences of school nutrition policies by venue have been detected in other studies as well. [54, 118, 119]

The prevalences of healthy offering practices, like that of policies, varied between venues. Healthy food choices were most likely to be available in school stores, a la carte food service and vending machines while healthy choices were less available in fundraisers, classroom parties, and school events. These findings were similar to an

earlier study conducted in the state, regarding offering practices. In a review of Michigan schools that completed the School Health Index conducted by Murphy, 17% of schools offered healthy food choices in classroom parties as compared to the HSS which found 19% offered healthy classroom options. [120] However, additional findings from the Murphy's review recorded an increase of 22% in healthy food offerings among the same schools after grant funding and assistance was distributed. Murphy's findings led her to suggest a combination of grant funding and technical assistance may lead to improvements in offering practices.

The cafeteria eating environments and participation in national school meal programs were similar among sample schools based on the HSAT assessment. A great majority of schools (80%– 99%) gave positive responses to HSAT items regarding the cafeteria eating environment and school meals programs. However, one exception was noted. Only 15% of schools provided recess (or free time) before lunch. This finding is consistent with a previous study of Michigan schools by Grost and colleagues. [121] Among 1999-2004 healthy school environment grant recipients, 11% of schools offered recess before lunch. Since there is a growing body of literature that shows benefits to recess before lunch (reduced plate waste and increased physical activity), efforts to support schools in adopting this practice could be beneficial. [122, 123]

Healthy meal preparation techniques that could reduce fat and calories in school meals were prevalent among sample schools. However, some differences existed between the percentages of schools that utilized each technique. For example, 58% of schools used low-fat or non-fat real cheese in cooking, while 91% cooked with non-stick spray or pan liners. A similar pattern of prevalences was reported by O'Toole et al. based on the

School Health Policies and Programs Study 2006 (SHPPS) (see Table 4.1). [53] In both the HSS and the SHPPS, the percentage of schools that used low-fat or non-fat cheese was considerably lower than the percentage of schools that used non-stick spray or pan liners. The noted similarities in healthy meal preparation techniques may be due to common factors in both samples, such as the utilization of USDA commodity foods. These foods (e.g. chicken) are available to all schools that participate in the NSLP. [124] Therefore, an investigation of common resources available to schools' food services may provide additional insight.

Table 4.1 Comparison of Healthy Meal Preparation Techniques: HSAT vs SHPPS

HSAT item	% of schools in sample	SHPPS item	% of schools in sample
Cooking with non-stick spray or pan liners	90.7	Using nonstick spray or pan liners instead of grease or oil	89.8
Using low-fat or non-fat real cheese	57.5	Using part skim or low-fat cheese instead of regular cheese	45.9
Thoroughly draining fat from ground meats	86.5	Draining fat from brown meat	87.4
Serving skinless poultry	62.7	Removing skin from poultry or using skinless poultry	54.6
Baking, roasting or broiling meat more often than frying	87.7	Roasting, baking, or broiling meat rather than frying	83.6

4.2.4 Associations between School Characteristics and Policies, Programs and Environments

The HSS findings revealed associations between school characteristics and healthy eating policies, the eating environment, healthy food offerings and healthy meal preparation practices. Characteristics associated with these policies and environments could be classified in three ways: 1) demographics, 2) CSHT characteristics, and 3) external resources. Demographic characteristics with significant associations to eating policies or environments included school grade classification, student enrollment and income. In order to demonstrate how variations in the healthy eating environment may occur in relation to demographics in the HSS, this section further explores the relationships between grade level classification and eating environments beginning with healthy meal preparation items.

Based on the HSS analysis, secondary schools were associated with lower healthy venue scale scores and higher healthy meal preparation scores than primary schools. Two hypotheses could explain the differences between the healthy venue scale and meal preparation scale scores of various grade levels. First, primary schools inherently have an advantage in receiving points on the healthy venue scale. Points on the scale were awarded not only for offering healthy foods in the venues, but also for not offering any foods in the venues. In the study sample, 61% of primary schools reports not having student accessible vending machines compared to only 7% of secondary schools. Therefore, assessing primary and secondary schools separately, given a large enough sample, may be beneficial.

The second hypothesis, attempts to describe the differences between meal preparation scale scores based on grade level classification. On the meal preparation scale, schools are rewarded for offering healthfully prepared foods. The more healthy meal preparation techniques used and healthy foods offered, which correspond to HSAT items, the greater the school's health meal preparation scale score. Since secondary schools traditionally offer more meal options than primary schools, there is a greater likelihood that they will offer the foods in question. This however, does not ensure that healthier meals are being consumed in the schools with more choices. A better approach could be to assess school meals based on a content analysis of the schools' menus. The associations between demographic factors and the HSS policies and environment scales demonstrate the importance of controlling for these variables when assessing school healthy eating environments.

The CSHT may be a valuable component of school health, in particular healthy eating. As hypothesized, CSHT characteristics were associated with positive eating environments and healthy offering policies. Specifically, the presence of a CSHT that oversees healthy eating was positively associated with higher healthy meal preparation scores. School meals are a central component of the school eating environment and would likely be addressed by a CSHT that oversees healthy eating. In addition to the presence of a team, other CSHT characteristics, CSHT composition and meeting frequency, may be related to a healthier school. Larger CSHT's with 7 or more representatives had significantly higher healthy meal preparation scale scores schools than schools with fewer than 5 members. In terms of meeting frequency, schools received higher healthy eating policy scores when their CSHT met at least 3 times in the past year

(compared to schools that did not hold a meeting). Different CSHT characteristics may play unique roles in the healthy eating promotion. Therefore, schools may benefit from have not only having a CSHT, but holding multiple meetings annually and having representatives from many areas of the school community. However, additional research is needed to further investigate this theory.

External support may play a key role in the school health environment as well. Both Team Nutrition membership and grant funding utilization may have positive benefits for school health. Team nutrition membership was positively associated with healthy eating policies and healthy meal preparations in the HSS, and utilization of grant funding was related to improvements in the school healthy eating environment in the review by Murphy. [121] The resources provided by groups outside of the school may assist in establishing a healthy eating environment and continuing to explore this relationship may be beneficial.

4.2.5 Associations between Policies and Practices

Evidence to support a relationship between healthy eating policies and healthy offering practices was inconsistent. Three of the six individual venue policies and practice analyses yielded significant positive associations (classroom parties, fundraisers and school events), while the other three venues did not (school stores, a la carte and vending machines). This inconsistency of associations was replicated when the healthy venue scale was assessed with the healthy eating policy scale and the MSBE Healthy Eating Policy. The healthy eating policy scale was not associated with healthy venue scale, but was positively associated with the MSBE Healthy Eating Policy. These

inconsistent findings suggest that other factors not in the models, such as venue manager or vendor, may play a significant role in the association of policy and practice.

4.3 Strengths and Limitations

There were strengths and limitations to the Healthy Schools Study. The study sample, 329 schools, was sufficiently large to determine many significant differences. However, in some ways this sample was less than ideal. The sample contained a diverse group of schools that shared some similarities with the Michigan school population, but the sample was not representative of the state because the schools were not randomly selected. Schools that completed the HSAT voluntarily may have been more motivated to address school health than schools that did not choose to complete the HSAT. In turn, these motivated schools may have higher prevalences of healthy eating policies and environments than the general population. Another limitation to the sample was the disproportionately small number of schools without a CSHT. The sample contained only 20 schools that did not have a CSHT. Additional significant findings may have been determined if a greater number of schools in this category were present in the sample.

If completed by a random sample of Michigan schools, the use of the HSAT self-assessment as a surveillance tool has both strengths and limitations. Notable strengths of the HSAT were: 1) its ability to provide information about multiple areas of the school health environment including policy and practices, and 2) its assessment of multiple elements in each area, which allowed for the creation of scales during analysis. Limitations of the HSAT as a surveillance tool included self-reporting inaccuracies and some subjective questioning. An example of subjective questioning from the HSAT is found in item 4.1d:

"During the past 12 months, has school food service staff consistently followed practices to reduce fat and calories in meals offered to students such as: Preparing vegetables with minimal fat."

Preparing vegetables with minimal fat could be interpreted in multiple ways. Since many vegetables can be steamed without the addition of any fat, one may or may not, perceive sautéing vegetables in vegetable oil as being prepared with minimal fat. By further defining these terms, consistency of reporting may increase. However, overall, the data collected from the sample through the HSAT provide enough specificity to gather information about the school eating environment required for the HSS.

4.4 Conclusion and Recommendations for the Future

The HSS assessment of the HSAT revealed information about the tool as well as the schools that utilized it. The study's findings demonstrated that the HSAT can be completed by a wide-variety of schools, which compliments the diversity of the Michigan school system. Schools that voluntarily completed the HSAT displayed some desirable (i.e. healthy meal preparation practices) and undesirable (i.e. lack of healthy eating policy) characteristics. In summary, the prevalence of healthy eating policies, practices and environments varied. Part of this variation in the sample was associated with differences in school characteristics including demographics, CSHT characteristics and external resources. Each of the three CSHT characteristics assessed (a CSHT that oversaw healthy eating, CSHT member representation and meeting frequency) and Team Nutrition membership was associated with a desirable healthy eating outcome. Although this study was able to determine the existence of statistical associations between school characteristics (e.g. CSHT characteristics and Team Nutrition membership) and school

health markers (e.g. healthy eating policies and offering practices), intricacies of these relationships are still unknown. Future studies may consider investigating these relationships with a longitudinal model to determine causality. Furthermore, inconsistent findings between healthy offering policies and corresponding offering practices may also warrant future investigations to understand these phenomena. Additionally, findings from this study call for further exploration into the potential benefits of external resources and formation of an active multi-disciplinary CSHT that oversees healthy eating for the promotion of health eating within primary and secondary schools.

APPENDIX A: Michigan State Board of Education Healthy Eating Policy

Michigan State Board of Education

Policy on Offering Healthy Food and Beverages In Venues Outside of the Federally Regulated Child Nutrition Programs

The Michigan State Board of Education recognizes and acknowledges, through its policy on coordinated school health programs,[1] that "schools cannot achieve their primary mission of education if students and staff are not physically, mentally and socially healthy." Establishing healthy eating behaviors during the school-age years can make an important contribution to short and long-term disease prevention and health promotion.[2]

The Board believes that schools should provide a campus-wide environment supporting student adoption of healthy eating behaviors. Students should be given the opportunity to learn and practice these behaviors by having access to healthy food and beverage choices.

The Board's 1973 Food and Nutrition Policy Statement provided guidelines for elementary school students only. Given the current health issues faced by school age children in this state, the 2003 policy encourages all Michigan school buildings to adopt the recommendations listed below, regardless of age/grade level.

This policy focuses on one component of a healthy school environment: to ensure that healthful food choices are offered in venues that are within the school/district's control but outside federally regulated child nutrition programs. These venues include, but are not limited to, vending machines, a-la-carte sales, food rewards, fundraisers, school stores, concessions, school parties, activities, and meetings. In addition, this policy is consistent with recommended actions outlined in The Role of Michigan Schools in Promoting Healthy Weight[3] and goals of the Michigan Action for Healthy Kids coalition.[4]

The purpose of this policy is to ensure that students have access to food that meets their nutrient requirements to promote health and foster learning. Food and beverages that compete with this policy's purpose should be discouraged. Healthy food and beverages that comply with this policy's purpose should predominate in all school venues.

The Board recommends that each school building offer and promote the following food and beverages in all venues outside federally regulated child nutrition programs. Appendix A provides background research supporting each recommendation.

1 Coordinated School Health Programs to Support Academic Achievement and Healthy Schools, September 2003. 2 Healthy People 2010: Understanding and Improving Health, Stock Number: 017-001-00550-9. 3 The Role of Michigan Schools in Promoting Healthy Weight, A Consensus Paper. Michigan Department of Education, Michigan Department of Community Health, and the Governor's Council on Physical Fitness, Health and Sports, September 2001. 4 Action for Healthy Kids Coalition. www.actionforhealthykids.org

1. Offer whole and enriched grain products that are high in fiber, low in added fats and sugars, and served in appropriate portion sizes consistent with the current United States Department of Agriculture standards.

2. Offer fresh, frozen, canned or dried fruits and vegetables using healthy food preparation techniques. Offer 100 percent fruit juice in 12-ounce servings or less.

3. Offer nonfat, low-fat, plain and/or flavored milk and yogurt. Offer nonfat and/or low-fat real cheese, rather than imitation cheese. Offer the following serving sizes: yogurt in eight-ounce servings or less, milk in 16-ounce servings or less, cheese in 1.5-ounce (two-ounce, if processed cheese) servings or less.

4. Offer nuts, nut butters, seeds, trail mix, and/or soybean snacks in one-ounce portions or less. Offer portions of three ounces or less of cooked lean meat, poultry, or fish using healthy food preparation techniques.

5. If offered, serve accompaniments (sauces, dressings, and dips) in one-ounce servings or less.

Because excess calories are stored as body fat, children who eat more calories than their bodies require are at increased risk for becoming overweight in childhood and obese as adults. Limiting the portion sizes of foods served can decrease calorie intake. Excess dietary fat may provide excess calories and may also increase the risk for chronic diseases. Added sugars add excess calories and contribute to weight gain or lower consumption of more nutritious foods.

1. Grain Food Research and Rationale: Offer whole and enriched grain products that are high in fiber, low in added fats and sugars, and served in appropriate portion sizes that are consistent with the current United States Department of Agriculture standards.

- Grains provide essential vitamins and minerals, and provide fiber if they are a whole grain. Whole grains contain the entire grain kernel. Examples include whole-wheat flour, bulgur, oatmeal, rye bread, whole cornmeal, and brown rice. Whole grains, when eaten with other healthful foods, may help decrease the risk of many chronic diseases. Moreover, whole grain foods containing fiber promote proper bowel function and have been shown to trigger the feeling of fullness with fewer calories.

- Nutrients are lost when grains are milled, including B vitamins, iron, and dietary fiber. "Enriched" grains are grains to which iron, folic acid and other B vitamins, including niacin, thiamine and riboflavin are added back to the grain mixture after milling. Over the years, enrichment has helped eliminate many nutrition-related diseases.[5]

2. Fruits and Vegetables Research and Rationale: Offer fresh, frozen, canned, or dried fruits and vegetables using healthy food preparation techniques. Offer 100 percent fruit juice in 12-ounce servings or less.

- The benefits of eating a minimum of five servings of fruits and vegetables each day cannot be overstated. Not only is fruit and vegetable intake associated with decreased risk for cardiovascular system diseases[6] and cancers,[7] but stronger bones as well.[8] Unfortunately, children and adolescents do not eat enough fruits and vegetables and, as a result, may be at higher risk for developing chronic diseases later in life.[9] Fruit juice offers no nutritional advantage over whole fruit. Excessive juice consumption may result in an increase in calorie intake and may contribute to the development of obesity.

[5] "Get on the Grain Train." United States Department of Agriculture Dietary Guidelines for Americans. May 2002. (http://www.usda.gov/cnpp/Pubs/Brochures/GrainTrainPamphlet.pdf)

[6] JAMA, 1999; 282:1233-1239.; KJ Joshipura, FB Hu, et al. "The Effect of Fruit and Vegetable Intake on Risk for Coronary Heart Disease." Annals of Internal Medicine. 134:1106-1114. 2001.

[7] J Natl Cancer Inst 2000;92(1):61-8.

[8] Am J Clin Nutr 1999;69:727-36.

[9] JA Pesa and LW Turner. "Fruit and vegetables intake and weight control behaviors among U.S. youth." Am J Health Behavior. 25(1):3-9. 2001.

3. Dairy Food Research and Rationale: Offer nonfat, low-fat plain, and/or flavored milk and yogurt. Offer nonfat and/or low-fat real cheese rather than imitation cheese. Offer the following serving sizes: yogurt in eight-ounce servings or less, milk in 16-ounce servings or less, cheese in 1.5-ounce (two-ounce, if processed cheese) servings or less.

- Milk, cheese, and yogurt are excellent sources of many essential nutrients (such as calcium), including those that are often lacking in the diets of children and teens. Nutrients within dairy products may help reduce the risk of cavities and chronic diseases such as osteoporosis, hypertension and some cancers. Many reputable health professional organizations recommend that children and teens choose low-fat milk, cheese, and yogurt to get the calcium (and other nutrients) they need for strong bones and overall health.

4. Meat, Beans, and Nut Food Research and Rationale: Offer nuts, nut butters, seeds, trail mix, and/or soybean snacks in one-ounce portions or less. Offer portions of three ounces or less of cooked lean meat, poultry, or fish using healthy food preparation techniques.

- Nuts, seeds, beans, meats, eggs, poultry and fish offer protein and other valuable nutrients such as zinc, iron, and B vitamins. Protein supplies amino acids, which are building blocks that build, repair, and maintain body tissues.

5. Accompaniments Rationale: If offered, serve accompaniments (sauces, dressings, and dips) in one-ounce servings or less.

- Limiting the portion sizes of accompaniments served with food can decrease calorie intake. Excess dietary fat may provide excess calories and may also increase the risk for chronic diseases. Added sugars may add excess calories and contribute to weight gain or lower consumption of more nutritious foods.

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APPENDIX B: Location of HSAT Schools by County

County Code	County	HSAT		Michigan		HSAT/MI◊
		Schools	Percent	Schools	Percent	Percent
01	Alcona	1	0.30	2	0.06	50.0%
02	Alger	3	0.90	5	0.15	60.0%
03	Allegan	5	1.51	40	1.17	12.5%
04	Alpena	1	0.30	12	0.35	8.3%
05	Antrim	5	1.51	12	0.35	41.7%
06	Arenac	0	0.00	6	0.18	0.0%
07	Baraga	0	0.00	5	0.15	0.0%
08	Barry	1	0.30	15	0.44	6.7%
09	Bay	2	0.60	34	0.99	5.9%
10	Benzie	0	0.00	7	0.20	0.0%
11	Berrien	2	0.60	72	2.10	2.8%
12	Branch	0	0.00	15	0.44	0.0%
13	Calhoun	5	1.51	61	1.78	8.2%
14	Cass	2	0.60	20	0.58	10.0%
15	Carlevoix	0	0.00	13	0.38	0.0%
16	Cheboygan	0	0.00	11	0.32	0.0%
17	Chippewa	6	1.81	18	0.53	33.3%
18	Clare	1	0.30	13	0.38	7.7%
19	Clinton	11	3.31	29	0.85	37.9%
20	Crawford	2	0.60	4	0.12	50.0%
21	Delta	5	1.51	15	0.44	33.3%
22	Dickinson	3	0.90	10	0.29	30.0%
23	Eaton	8	2.41	42	1.23	19.0%
24	Emmet	0	0.00	12	0.35	0.0%
25	Genesee	8	2.41	148	4.32	5.4%
26	Gladwin	0	0.00	8	0.23	0.0%
27	Gogebic	3	0.90	8	0.23	37.5%
28	Grand Traverse	3	0.90	26	0.76	11.5%
29	Gratiot	2	0.60	22	0.64	9.1%
30	Hillsdale	1	0.30	22	0.64	4.5%
31	Houghton	4	1.20	17	0.50	23.5%
32	Huron	6	1.81	15	0.44	40.0%
33	Ingham	15	4.52	99	2.89	15.2%
34	Ionia	5	1.51	27	0.79	18.5%
35	Iosco	0	0.00	15	0.44	0.0%
36	Iron	0	0.00	6	0.18	0.0%
37	Isabella	2	0.60	19	0.55	10.5%
38	Jackson	20	6.02	55	1.60	36.4%
39	Kalamazoo	6	1.81	76	2.22	7.9%

◊Percentage of Michigan Schools to complete the HSAT in each county

County Code	County	HSAT		Michigan		HSAT/MI◊
		Schools	Percent	Schools	Percent	Percent
40	Kalkaska	0	0.00	9	0.26	0.0%
41	Kent	13	3.92	223	6.51	5.8%
42	Keweenaw	0	0.00	0	0.00	NA
43	Lake	0	0.00	4	0.12	0.0%
44	Lapeer	0	0.00	33	0.96	0.0%
45	Leelanau	1	0.30	6	0.18	16.7%
46	Lenawee	19	5.72	37	1.08	51.4%
47	Livingston	3	0.90	40	1.17	7.5%
48	Luce	1	0.30	2	0.06	50.0%
49	Mackinac	2	0.60	9	0.26	22.2%
50	Macomb	21	6.33	227	6.62	9.3%
51	Manistee	1	0.30	13	0.38	7.7%
52	Marquette	6	1.81	26	0.76	23.1%
53	Mason	1	0.30	15	0.44	6.7%
54	Mecosta	0	0.00	19	0.55	0.0%
55	Menominee	1	0.30	14	0.41	7.1%
56	Midland	2	0.60	33	0.96	6.1%
57	Missaukee	1	0.30	3	0.09	33.3%
58	Monroe	12	3.61	46	1.34	26.1%
59	Montcalm	1	0.30	29	0.85	3.4%
60	Montmorency	0	0.00	4	0.12	0.0%
61	Muskegon	5	1.51	72	2.10	6.9%
62	Newaygo	0	0.00	22	0.64	0.0%
63	Oakland	10	3.01	348	10.15	2.9%
64	Oceana	1	0.30	16	0.47	6.3%
65	Ogemaw	0	0.00	5	0.15	0.0%
66	Ontonagon	1	0.30	4	0.12	25.0%
67	Osceola	2	0.60	13	0.38	15.4%
68	Oscoda	1	0.30	2	0.06	50.0%
69	Otsego	0	0.00	11	0.32	0.0%
70	Ottawa	22	6.63	75	2.19	29.3%
71	Presque Isle	0	0.00	6	0.18	0.0%
72	Roscommon	2	0.60	11	0.32	18.2%
73	Saginaw	6	1.81	79	2.31	7.6%
74	St. Clair	4	1.20	57	1.66	7.0%
75	St. Joseph	0	0.00	30	0.88	0.0%
76	Sanilac	2	0.60	23	0.67	8.7%
77	Schoolcraft	1	0.30	4	0.12	25.0%

◊Percentage of Michigan Schools to complete the HSAT in each county

County Code	County	HSAT		Michigan		HSAT/MI◊
		Schools	Percent	Schools	Percent	Percent
78	Shiawassee	2	0.60	33	0.96	6.1%
79	Tuscola	2	0.60	28	0.82	7.1%
80	Van Buren	6	1.81	38	1.11	15.8%
81	Washtenaw	9	2.71	87	2.54	10.3%
82	Wayne	32	9.64	624	18.21	5.1%
83	Wexford	1	0.30	11	0.32	9.1%
	Total	***332***	***100***	***3427***	***100***	

◊Percentage of Michigan Schools to complete the HSAT in each county

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