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The impact of a school garden on nutrition knowledge, attitudes and behaviors of urban youth

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**The impact of a school garden on nutrition
knowledge, attitudes and behaviors of urban youth**

A Thesis Submitted to the
Yale University School of Medicine
in Partial Fulfillment of the Requirements for the
Degree of Doctor of Medicine

by

Erica Rose Menkel Mintzer

2009

Abstract

Hypothesis: A garden-based high school curriculum and school lunch program positively impact the nutrition knowledge, attitudes, behaviors and health outcomes of participating urban youth.

Specific aims:

1. To characterize the objectives and implementation of the Common Ground High School's garden-based curriculum and school lunch program
2. To evaluate the effectiveness of the program in promoting healthy nutrition knowledge, attitudes, behaviors and health outcomes among Common Ground students

Methods: Mixed quantitative and qualitative methods were used to conduct the program evaluation. The Common Ground curriculum was characterized through in-depth staff interviews and review of relevant policies and procedures. Surveys on nutrition attitudes, knowledge, and behavior were administered in the Fall and Spring at Common Ground and two comparison schools. Student focus groups were conducted at the three schools. Demographic data and body mass index data were gathered at Common Ground and one of the comparison schools. Direct observations were conducted in the cafeterias of the three schools; students were served vegetables during three different typical lunch periods, and the number of students that tasted and ate the vegetables were counted.

Results: Common Ground students learn about health, nutrition and the food system through coursework in the organic garden, the school lunch program, and informal interactions with teachers and staff. Students at comparison schools desire higher quality school food and more control over what is served. Students at Common Ground have more knowledge about the food system than students at comparison schools, but not more knowledge about basic nutrition. Students at Common Ground ate 6.6 and 9.0 servings per week of fruits and vegetables at school at the beginning and end of the school year, respectively, while students at Comparison School #2 ate 7.7 and 6.9 servings per week. In the cafeteria observations, students at comparison schools ate more of the familiar vegetables than students at Common Ground. Students at Common Ground ate more of the unfamiliar vegetables. Average BMI of students at Common Ground from freshmen to seniors is 27.4, 26.1, 23.4, and 26.3 kg/m². At Comparison School #2, average BMI of freshmen to seniors is 26.5, 24.1, 26.6 and 29.7 kg/m² (ANOVA shows $p = 0.0622$).

Conclusion: Common Ground's garden-based curriculum and school lunch program positively influences students' nutrition knowledge, attitudes, behavior, and health outcomes. Similar interventions should be implemented in other schools and school systems in order to improve population health.

Acknowledgements

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Introduction

Childhood obesity has emerged as one of the leading public health problems in the United States and globally. In the US from 1967-1970 to 2003-2004, the prevalence of obesity in adolescents ages 12 to 19 increased from 4.6% to 17.4% [1, 2]. High Body Mass Index (BMI) in children and adolescents is associated with multiple cardiovascular risk factors such as unhealthy levels of lipids, insulin and blood pressures [3]. Obesity in adolescents is particularly dangerous because obese adolescents are more likely to become obese adults [4], with resulting increased risk for chronic diseases such as type 2 diabetes, hypertension, and heart disease. In Connecticut, more than 3,000 people die each year from obesity and its complications, and the state's obesity-related health costs were \$856 million in 2003 [5].

Though the childhood obesity epidemic has gained national attention, many questions remain as to the most important contributing factors and the most effective interventions to address the complex problem. A growing body of research aims to understand the relationship between childhood obesity and a variety of factors such as genetics, education, socioeconomic status, food availability, media and advertising, neighborhood safety and the built environment. Though the fundamental cause of childhood obesity is greater caloric intake than expenditure, a variety of biologic, cultural, economic and environmental[6] factors may precipitate this imbalance.

Interventions for childhood obesity exist at the levels of hospitals and clinics, schools, local, state and federal government, and public advertising campaigns. School interventions have ranged from banning the sale of soft drinks on school grounds [7], providing healthier school lunches, and implementing nutrition and physical education

programs. Studies have shown that school interventions for childhood obesity can have positive effects on the educational potential and health of students [8, 9].

The mission of the Common Ground High School (Common Ground), a charter public high school in New Haven, CT, is to “graduate students with the knowledge, skills and motivation to live healthy, productive and sustainable lives...through authentic learning that develops ecological literacy, academic accomplishment, strong character, and a commitment to community.” As stated, promoting health is a core tenet of the school’s philosophy, and the commitment is embedded in the ecology-based curriculum. One of the main connections between environment and health that the school’s curriculum explores is food. Through interdisciplinary courses that use the school’s organic garden as the classroom, a Youth Crew in which students are paid to work in the garden after school, a cooking program in which students help prepare healthy food, and a lunch program that regularly serves fresh vegetables from the garden, students actively learn about where their food comes from, and the impact of various foods on the environment and their health.

Traditional school nutrition programs do not emphasize student involvement in the production and preparation of food. Garden-based interventions such as community gardens have been evaluated in other settings with positive impacts found on nutrition, physical activity, food security, and community development [10]. The few studies that have evaluated gardens in school settings have found positive impacts on the likelihood of children to taste vegetables [11], the ability of children to identify fruits and vegetables, attitudes toward vegetable consumption [12], and quantity of fruits and

vegetables consumed [13]. Most evaluations of school gardens have been conducted for children younger than high school age.

Common Ground is a unique intervention in that the garden has been a central part of the school since its creation in 1998. This study attempts to evaluate if the high school students' direct involvement in food production and preparation, as well as the school's lunch program, have positive impacts on their nutrition knowledge, attitudes and behaviors.

Statement of purpose

This is an observational, longitudinal cohort study that assessed the effects of the garden-based curriculum at Common Ground among participating high school students regarding promotion of healthy nutrition knowledge, attitudes and behavior.

Study aims

1. To characterize the objectives and implementation of the Common Ground High School's garden-based curriculum and school lunch program
2. To evaluate the effectiveness of the program in promoting healthy nutrition knowledge, attitudes and behavior among Common Ground students

Hypotheses

A garden-based high school curriculum positively impacts the nutrition knowledge, attitudes, behaviors and health outcomes of participating urban youth.

Hypothesis #1:

Youth attending the Common Ground school have more knowledge of nutrition, and healthier attitudes and behaviors related to food than youth attending other schools with similar demographics.

Hypothesis #2:

Over the course of the school year, students at Common Ground High School gain nutrition knowledge and their food attitudes and behavior become healthier. The change over the course of the year is greater at Common Ground than comparable high schools without a garden-based curriculum.

Hypothesis #3:

Students in their senior year at Common Ground High School have more nutrition knowledge and healthier food attitudes and behaviors than students in their freshman year. The difference is greater at Common Ground than at comparable high schools without a garden-based curriculum.

Hypothesis #4:

Youth attending Common Ground are more likely to taste and eat vegetables than youth attending comparable high schools without a garden-based curriculum. This likelihood increases as students spend more time at Common Ground. The likelihood that students will taste and eat an unfamiliar vegetable increases if the vegetable is grown in the garden.

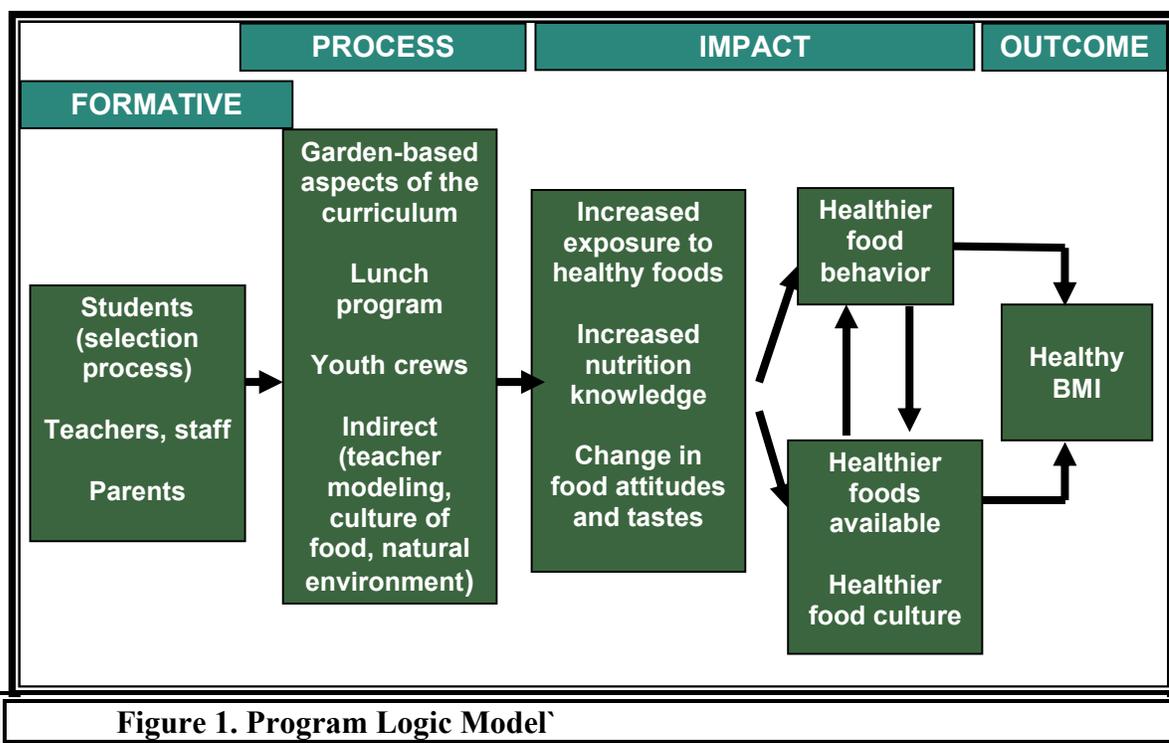
Hypothesis #5:

Mean BMI and the percentage of overweight students are lower among students at Common Ground High School than among students at comparable schools without a garden-based curriculum.

Methods

Two comparison public charter high schools were selected, one in New Haven (Comparison School #1) and one in Bridgeport (Comparison School #2). The comparison schools were selected due to their similar size and student demographic to Common Ground. In addition, the comparison schools both lack a garden-based curriculum. The lunches served at the comparison schools generally consist of pre-processed foods, rarely including fresh vegetables, as is common in public schools throughout the United States. Prior to gathering data, approval of the protocol was obtained from the Yale School of Medicine Human Investigations Committee with specific permission to study vulnerable subjects (minors). All data was gathered in accordance with the approved protocol.

The study followed the program evaluation framework depicted in Figure 1. Formative elements describe the specific context of the program, including key stakeholders, enabling policies and available resources. Such elements have important consequences for how the program is designed and implemented, and are useful in considering the degree to which the program may be replicated in other contexts. The goal of the process evaluation was to assess how the stated objectives and structure of the program are implemented in practice. Impacts include near-term changes due to the intervention activities, while outcomes refer to long-term health consequences due to the program's impacts. This study attempts to describe the effectiveness of the Common Ground intervention by evaluating each step of the program logic model described in Figure 1 [14].



intervention were characterized by in-depth interviews with teachers and staff, reviewing relevant documents, data and procedures, and observation of the curriculum. Impacts were evaluated by conducting focus groups with students, surveys on nutrition knowledge, attitudes and behaviors, and a quantitative observation of food choices in the cafeteria. The surveys and cafeteria observations were conducted at the beginning and the end of the school year at Common Ground and the comparison schools. Student focus groups and in-depth teacher and staff interviews were conducted at both comparison and Common Ground schools. Outcomes were evaluated by comparing BMI of students at Common Ground with students at comparison schools. Table 1 presents the methods used to evaluate each program element, described in further detail below.

Table 1. Evaluation methods for each program element

Program element	Evaluation method
Formative elements	<ul style="list-style-type: none"> • In-depth interviews with staff and teachers • Analysis of student demographic data • Review of relevant policies and procedures
Process	<ul style="list-style-type: none"> • In-depth interviews with staff and teachers • Review of curriculum documents • Direct observation of curriculum • Focus groups with students
Impact	<ul style="list-style-type: none"> • Focus groups with students • Surveys on nutrition knowledge, attitudes and behaviors • Observation of cafeteria food choices
Outcome	<ul style="list-style-type: none"> • BMI data

In-depth interviews

In-depth interviews were conducted with teachers and staff at the Common Ground and comparison schools. Interviewees included school directors, kitchen staff and teachers involved with food and nutrition aspects of the curriculum. Each interview lasted approximately 45 minutes, and was recorded on audiotape. The interviewer asked open-ended questions in order to understand the goals, structure and implementation of the food and nutrition programs, and perceived impacts on the students' nutrition-related knowledge, attitudes and behavior. The interview guide is presented in Appendix A.

Student focus groups

The goal of the student focus groups was to identify potential impacts and mechanisms of action of the program through in-depth conversations with students. Five total focus groups were conducted at Common Ground and comparison schools. Each focus group lasted approximately 60 minutes, and was comprised of four to seven students. Participants were selected by the directors of the schools, with instructions to choose students with diverse perspectives that would feel comfortable talking in a group.

Two researchers were present in the room; one conducted the interview, and one served as note-taker. The conversation was recorded on audiotape. The interview guide for the student focus groups is included in Appendix B. Focus groups were conducted until no new themes were uncovered.

Survey

The survey collected information on students' nutrition knowledge, attitudes and behavior in order to test hypotheses #1-3. A copy of the survey is attached as Appendix C. Questions were drawn from previously used and validated surveys from the USDA [15], the CDC [8] and the Rudd Center for Food Policy and Nutrition [16]. The survey was administered at the beginning and the end of the school year to all students at both Common Ground and Comparison School #2, except freshmen were not surveyed at the end of the school year at Comparison School #2. The survey was administered to the sophomore class at Comparison School #1 at the beginning of the school year. The survey was administered by teachers during class time. All students were advised that participation was voluntary.

Cafeteria observations

Cafeteria observations were conducted at the beginning and end of the academic school year at all three schools. Students were served three different vegetables during three typical lunch periods. Two of the vegetables were familiar (carrots and green salad), and one was generally unfamiliar, but grown in the garden at Common Ground (kale in the Fall and collard greens in the Spring).

For each observation, all students were served the vegetable in a container. Students had the option of immediately placing the container with the vegetable untasted on a table. At the end of the lunch period, all vegetable containers were collected. The containers were separated into three groups: (1) untasted; (2) tasted (more than half full); and (3) eaten (less than half full). Two observers counted the number of containers in each group.

Body mass index

BMI data was collected as an indicator of health outcomes due to the program. The school nurse collected height and weight data of all students at Common Ground. Height and weight data of all students was also collected by the school nurse at Comparison School #2.

Statistical analysis

Focus groups and in-depth interviews

The Director and Kitchen Staff at each school were interviewed, as well as four additional staff members and teachers at Common Ground. A list of staff members that participated in in-depth interviews at each school is presented in Table 2 .

Table 2. Staff interviews	
School	Staff member interviewed
Common Ground (n=7)	School Director Associate Director Chef Site Manager Environmental Educator Director of Community Programs
Comparison School #1 (n=2)	Director Kitchen staff
Comparison School #2 (n=2)	Director Food Director

23 students participated in a series of five focus groups. The characteristics of the students in each focus group are presented in Table 3.

Table 3. Student focus group composition	
Focus Group	Characteristics of students
Common Ground Group #1	9 th grade, male 10 th grade, female 10 th grade, male 12 th grade, female 12 th grade, male
Common Ground Group #2	10 th grade, female 10 th grade, female 10 th grade, female 11 th grade, male
Comparison School #1 Group #1	9 th grade, male 9 th grade, female 10 th grade, female 10 th grade, male
Comparison School #1 Group #2	9 th grade, female 9 th grade, female 10 th grade, female 10 th grade, female 11 th grade, female
Comparison School #2	9 th grade, male 10 th grade, female 10 th grade, male 12 th grade, male 12 th grade, female

The in-depth staff interviews and student focus groups were recorded on audiotape and transcribed, except for the second Common Ground focus group, during which the tape recorder stopped working and handwritten notes were taken instead. During each of the focus groups, a note-taker wrote down reactions and body language not captured on audiotape. A coding team of four people with expertise in pediatrics, qualitative analysis and critical reading read the transcripts and notes independently.

Recurrent themes were noted and text was clustered under these themes until saturation was achieved (no new themes emerged). The output of the student focus group analysis was identification of key themes regarding students' nutrition attitudes and behavior. The output of the staff interview analysis was detailed information regarding formal and informal elements of nutrition education at each school, and perceived nutrition impacts on students of the curriculum and food program.

Surveys

T-tests were used to compare normally distributed variables and chi square analysis for categorical variables. The survey included repeated measures for each hypothesis. Differences were analyzed between the beginning and the end of the school year, between freshmen and seniors, and between students at Common Ground and control schools. Due to the small size of the Common Ground High School, we focused on changes over time in a cohort of students in order to increase the power.

Cafeteria experiments

For each cafeteria observation, an average score was calculated using the following scoring scheme: zero points for each untasted serving; one point for tasted; and two points for eaten.

Body mass index

BMI of each student was calculated from height and weight data collected. BMI percentile was determined for each student based on BMI, sex and age according to methodology defined by the Centers for Disease Control (CDC) [17]. In accordance with the standards established by the CDC [18], children and adolescents with a BMI at or

above the 95th percentile for their age are classified as obese. Children and adolescents with a BMI at or above the 85th percentile and below the 95th percentile for their age are classified as overweight. The percentages of students that are normal weight, overweight and obese for their age were calculated for the Common Ground and comparison schools using chi square analysis. Means of Common Ground and comparison school BMI data were compared using t-tests. Trends in BMI from freshmen to senior year were also compared using analysis of variance.

Results

This section presents the results of the methodology described above. Formative elements, process, impacts and outcomes of the educational program at Common Ground are described successively.

Formative elements

Information about the formative elements for the Common Ground and comparison schools was obtained through written material describing the schools, and interviews with staff and school directors. Common Ground was established in 1997 by the New Haven Ecology Project. The mission statement is presented below:

“Common Ground High School is based on the fundamental concept of ecology: all living and non-living things on the earth are connected and interdependent. The study of natural systems reveals simple yet powerful concepts that help us understand human systems as well. An ecological framework goes beyond science; the study of nature includes human nature.

“Common Ground High School graduates students with the knowledge, skills and motivation to live healthy, productive and sustainable lives. We do so through authentic learning that develops ecological literacy, academic accomplishment, strong character, and a commitment to community.”

The word “healthy” in Common Ground’s mission statement enables the school to allocate additional resources to its food program. The comparison schools, which are also charter schools, do not explicitly mention health in their mission statements. Therefore, they must allocate resources preferentially to fulfilling their missions of college preparation and citizen education.

Charter schools, by definition, are publicly funded schools that may be exempt from certain local and state requirements in order to have more autonomy over curriculum. However, they are still accountable to meet some testing and performance requirements. Students apply for admission, and are selected by lottery with no admission or testing requirements. Therefore, students and families may self-select to attend particular schools because of an affinity with the school’s mission. Some selection preference is given to students who live locally to the school.

Common Ground was originally established as an experiential, small school of 67 students. As a result, the school attracted a relatively high proportion of students that were failing in other academic settings and were seeking more personalized attention. Since its establishment, Common Ground has increasingly accepted students that are attracted to the school’s environmental focus, not just its small size. In addition, increasingly stringent state and national testing requirements have shaped a more conventional curriculum, thus attracting more mainstream students. However, Common Ground still is comprised of a higher percentage of low-income students, for which eligibility for free or reduced lunch is a proxy, and special education students compared with the two comparison schools. Each school is comprised of approximately 60% African American students. Table 4 shows the percentages of students qualifying for free

or reduced lunch and special education, and the racial composition of students at each of the three schools.

Table 4. Percentages of students qualifying for free or reduced lunch and special education, race and ethnicity

	<i>Common Ground (n=145)</i>	<i>Comparison School #1 (n=161)</i>	<i>Comparison School #2 (n=251)</i>
Free or reduced lunch	79%	60%	66%
Special education	16%	12%	8%
Am. Indian/Alaska Native	0%	0%	0%
Asian/Pacific Islander	1%	0%	0%
Hispanic	28%	19%	33%
African American	58%	63%	65%
Caucasian	13%	11%	2%
Unspecified	0%	0%	0%

Table 5 shows the self-reported grade, gender and race of students that completed the survey in both the Fall and Spring. Only students at Common Ground and Comparison School #2 completed the surveys at the beginning and end of the school year. Since no freshmen students at Comparison School #2 completed the surveys in the Spring, the grade distribution is significantly different between the two schools. There are no other significant differences in the demographics of the students who completed the surveys at the two schools.

Table 5. Self-reported grade, gender, and race of students that completed the survey in both the Fall and Spring

	Common Ground (n=59)		Comparison School #2 (n=28)	
	N	%	N	%
9th grade	20	34%*	0	0%*
10th grade	25	42%	7	25%
11th grade	10	17%	4	14%
12th grade	4	7%*	17	60%*
Female	36	61%	19	68%
Male	23	39%	9	32%
Caucasian	5	8%	1	4%
African	25	42%	12	43%

American				
Hispanic	15	25%	8	29%
Asian	1	2%	0	0%
Native American	1	2%	0	0%
Other	12	20%	7	25%

*=p<0.05

Process

As presented in **Error! Reference source not found.**, the Process of the intervention at Common Ground includes all aspects of the food program, both formal and informal, that might have an impact on student nutrition. This includes the students' interactions with the garden, the nutrition curriculum, interactions with teachers and staff, and the lunch program.

The formal parts of the curriculum in which students interact with the garden or learn about health and nutrition are presented in

Class	Description
Harvest Class	Harvest Class is a required interdisciplinary Spanish and Science in which food serves as the unifying theme. Students spend three hours per week in the school's organic garden, learn about biological processes and nutrition, and learn Spanish vocabulary related to food and health.
Egg and Seed	Egg and Seed is a required Spring block class in which students start the garden and raise chickens for food.
Site Class	Site class is a one hour per week Fall and Spring elective class in which students work on various projects around the school's site, including caring for animals.
Physical Education	Students engage in a range of physical activity, including hiking in the nearby state park and athletics. Health and fitness education is integrated into the curriculum.
Youth Crew	Students apply to be part of the Youth Crew. They are hired and paid to do work in the organic garden and school grounds after school and during the summer.
After School	Participating students engage in cooking and community service projects.

Table 6. Three required classes (Harvest Class, Egg and Seed, and Site Class)

directly involve the garden. All students must take each of these three classes once, and

can do so in any grade. Thus, the classes are comprised of students of mixed grades, and not all students are formally interacting with the garden every semester or every year.

Harvest Class is a Fall interdisciplinary class, combining science and beginning Spanish. Students spend three hours per week in the school's organic garden, harvesting vegetables, preparing the garden for next year's planting, and learning about biological processes. Students have many opportunities to taste vegetables as part of the class. Food provides the context for learning beginning Spanish vocabulary and grammar. The class includes a field trip to New York City's Museum of Natural History where students learn about pre-Colombian agriculture in the Americas. For the final project, students prepare a traditional Hispanic meal for parents.

Egg and Seed is a required Spring class in which students are involved with planting of the garden and care of the chickens. The course content includes information about food security issues. Site Class is a required class in which students are involved with all aspects of maintaining the site, including work in the garden, taking care of the animals, construction, and trail maintenance.

Class	Description
Harvest Class	Harvest Class is a required interdisciplinary Spanish and Science in which food serves as the unifying theme. Students spend three hours per week in the school's organic garden, learn about biological processes and nutrition, and learn Spanish vocabulary related to food and health.
Egg and Seed	Egg and Seed is a required Spring block class in which students start the garden and raise chickens for food.
Site Class	Site class is a one hour per week Fall and Spring elective class in which students work on various projects around the school's site, including caring for animals.
Physical Education	Students engage in a range of physical activity, including hiking in the nearby state park and athletics. Health and fitness education is integrated into the curriculum.
Youth Crew	Students apply to be part of the Youth Crew. They are hired and paid to do work in the organic garden and school grounds after school and during the summer.
After School	Participating students engage in cooking and community service

projects.

Table 6. Garden-based and health-related aspects of the curriculum at Common Ground
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In addition to the formal aspects of the curriculum, there are informal ways in which students learn about food and nutrition. The lunch program, less than two years old at the time this data was collected, exposes students to new, healthy and fresh foods, with an emphasis on sourcing as much as possible from the school's organic garden. The chef is given a budget, and has a large amount of autonomy over preparing the meals. Teachers eat with the students, often eating the same cafeteria food as the students. Since most teachers are sympathetic to the nutrition goals of the school, they provide informal encouragement, part of the so-called hidden curriculum, for students to try new foods and eat healthily. Similar interactions are frequent in the classrooms and outdoor learning environments. In transcripts from the in-depth interviews, two staff members at Common Ground describe their interactions with students around food and nutrition:

“They ask what we’re eating, especially if it’s something weird like tabouli or hummus. They’ll say, that’s nasty, what is that?”

“Mostly because they want to try it, or they want to taste.”

“I try to tell them when I see that they’re putting 10 gallons of mayonnaise on their sandwiches, or they’re making salad soup with all the dressing. I try and tell them, you just made that the most unhealthy thing on your plate by putting a cup of dressing on it... Often, they’re like ‘really?’ They have no idea that mayonnaise is bad for them. They have no concept.”

Likewise, another Common Ground teacher describes:

“We eat lunch with the kids every day. So, every day there’s someone who’s having a conversation about food and what they’re putting in their bodies, and why.”

Impacts

The impacts of the Common Ground curriculum on students are best presented by considering changes in three nutrition-related categories: attitudes, knowledge and behaviors. Results from the various quantitative and qualitative research methodologies utilized in this study are presented below to describe impacts on student attitudes, knowledge and behavior.

Attitudes

The data describing student attitudes were gathered from the student focus groups, in-depth staff interviews, and student surveys. The coding themes, derived from transcripts of student focus groups and in-depth interviews, are presented in Appendix D. Attitudes are presented by theme below, illustrated by key results from the surveys and descriptive quotes from the focus groups. Many of the attitudes about food and nutrition were shared by students at Common Ground and comparison schools. Points of difference between students at different schools and within the same school are emphasized below.

Student food preferences

In the focus groups, students assert that their preferences for food depend on the type, quality, freshness, flavor and preparation. The exchange below from students at Comparison School #2 illustrates some of these preferences:

[Interviewer:] “Do they serve vegetables ever?”

“Yeah, they do.”

“Green beans and carrots”

“I don’t know why they don’t serve broccoli, because broccoli is good.”

“I love broccoli.”

“Collard greens, yeah.”

“They need to put some seasoning in our food.”

“We need more seasoning. I don’t know what they do. It’s so bland!”

[Interviewer:] “What’s wrong with the green beans?”

“The green beans? It’s just so disgusting. My mother makes hers at least she puts something to give it flavor.”

“They come out of the can.

“They’re so dry.”

“They just take it out of the can, microwave it.

“They nasty.”

“That whole syrup and stuff. They don’t even let it drain.”

Familiarity

In the above passage, students mention that they like broccoli and collard greens, which are generally familiar vegetables among African American youth. Student preference for familiar vegetables is described by a staff member at Common Ground, who states:

“They love broccoli, which is always amazing to me. Collards and kale they’ll eat, because that’s familiar to them.”

Students seem more likely to try foods that appear familiar to them. A Common Ground staff person describes that students often judge vegetables by their appearance, and become more open to eating them when they are used to them:

“Some kids, they’re just never going to try anything different, and some kids will. We used to see big changes, because it used to be with the packaged food service we only had iceberg lettuce for salad. It came as iceberg lettuce with shredded carrots and cabbage in it. In the spring, when the first garden lettuce was ready, it was so different. And the first time we would serve it the kids would say, ‘that’s nasty, it looks like tree leaves,’ because we had the oak leaf lettuce. They’d say we were serving them leaves, and it was in the ground, and they weren’t going to eat it, and it was nasty. Once they would start trying it, they would really like it, and we would go from being able to serve a tiny bowl of salad each lunch period to being able to serve one of those giant bowls and go through the whole thing. I remember, about five years ago, there was a time when we saw a huge change in how much salad they would eat when they got used to it and they realized that it wasn’t, you know, tree leaves. Now that we’re getting the salad mix from the food bank, we can get the nicer lettuce mix year-round, with spinach and mixed greens. Whether it’s our salad or whether from the food bank it looks more the same year-round, so it’s harder to see the difference.”

A question from the survey addressed the theme of familiar foods by asking about which vegetables the students had tasted and whether or not they like them. Table 7 shows that students tend to have a higher opinion of vegetables that are more familiar, such as carrots and celery, than unfamiliar vegetables such as kale and chard. According to this question, collard greens are liked more than other vegetables. Kale is liked by Common Ground students significantly more than by Comparison School students in the Fall.

Table 7. Opinion of vegetables in Fall and Spring

	Common Ground (n=44)			Comparison School #2 (n=25)		
	% like a little or a lot		% with improved opinion+	% like a little or a lot		% with improved opinion+
	Fall	Spring		Fall	Spring	
Carrots	74%	73%	10%*	64%	63%	4%*
Celery	42%	44%	31%	46%	48%	25%
Collard greens	50%*	56%	29%	73%*	63%	20%
Potatoes, baked	88%	82%	13%	100%	89%	12%
Corn	82%	86%	22%	96%	85%	8%
Peas	58%	70%	22%	69%	69%	21%
Kale	22%*	22%	30%	0%*	19%	21%
Tomatoes	61%	54%	18%	76%	67%	21%
Broccoli	77%	76%	16%	89%	77%	13%
Beans (green, string, or snap)	72%	70%	25%	96%	63%	17%
Chard	12%	14%	27%	4%	19%	28%
Cauliflower	34%	24%*	23%	54%	56%*	28%
Cucumber	65%	64%	25%	85%	85%	24%
Spinach	41%	43%	21%	42%	59%	32%
Bean sprouts	26%	22%	30%	12%	23%	25%
Radishes	18%	18%	34%	23%	22%	16%
Peppers (red, green or yellow)	50%	52%	20%	81%	70%	12%
Mushrooms	29%	30%	16%	27%	33%	28%

Bok choy	10%	12%	25%	0%	15%	24%
Zucchini	25%	22%	18%	23%	33%	32%
Summer squash (yellow)	18%	18%	18%	40%	44%	17%
Butternut squash	20%	18%	23%	27%	41%	16%
+Improvement in score if never tried=0, like=1, like a little=2, like a lot=3 *p<0.05						

Freshness

Students value fresh food instead of canned, frozen or processed food. A student at Comparison School #1 describes a preference for fresh instead of frozen vegetables:

“I stopped eating corn when my grandmother moved. My mom used to buy bagged collard greens, she doesn’t make it fresh, and I just can’t eat those because my grandmother always made it fresh. I stopped eating tomatoes too, because my grandmother used to grow those fresh. And after my grandmother left I looked at tomatoes differently, gross.”

A student at Comparison School #1 explains that processed and frozen food does not taste as good as fresh food:

“How you can tell if it’s food or not: if it doesn’t taste like it has a taste at all... When you go to the store and you buy the freezer thing, like the Weight Watchers, you put it in the microwave, and when you take it out and you eat that it has taste to it. But then if you actually make it homemade, it has a taste, it tastes like the way it’s supposed to taste.”

Preparation

Students care about how food is prepared. “Seasoning” is mentioned in the first passage of this section as an important aspect of food. The student prefers his mother’s green beans to the school’s because she adds seasoning and flavor. Likewise, the statement, “they don’t even let it drain,” refers to poor preparation of the food.

Repeatedly, students use words like “homemade”, “cooked,” and “real” to describe food that is prepared well. When asked what he means by “real” food, one student at Comparison School #1 states:

“Food that they have to cook and they don’t just have to put in the microwave. Not like flash-freeze food. It’s not like put it in the microwave 30 seconds, then, here’s your lunch. Like actually have to take some time to put some love into my food.”

Similarly, students at Common Ground recognize the difference between the food that the school chef prepares and the food that arrives pre-prepared from an outside food service contractor:

“They [outside food service] provide the meals cooked. And we just gotta heat it up. Usually it comes warmed up. Because I’ve been in there when Miss Rhonda gets the orders.”

“I’d rather have it cooked by our own person than have them cook the food. Because it taste better, instead of having it cooked and it comes to you.

“It does taste better when she cooks it.”

“We can tell the difference.”

“She adds seasoning, and they don’t.”

“Even with the seasoning it doesn’t taste right.”

“But when Miss Rhonda cooks the food herself it tastes better.”

Students care about where food comes from

In the focus groups, students discussed the importance of food source. For one Common Ground student, knowing where her food comes from is important. Her statement below suggests that raising animals in factory farms and processing them is not as healthy or moral as raising them locally:

“I like where our food comes from, because sometimes we have community breakfasts, and, you know, we have chickens out there. And so most of the food we know where it comes from. It’s not being processed, or from a factory farm or something like that. That’s what I like about it, I know where it is coming from.”

Another Common Ground student asserts that the source of food affects the taste of the food, saying:

“Most foods, we don’t know where it came from and it tastes nasty. But if we knew where it was coming from, and we cook it, it tastes good.”

Students from comparison schools also emphasize the importance of knowing where their food comes from. These attitudes seem to have been cultivated by students’ families and culture, since they are not directly addressed at school. The student quoted below feels more comfortable when he knows where his food is from. Specifically, he trusts his neighbor and father more than the broader food system for providing his fish:

“There’s a guy who lives across the street, he fishes. And he gives my father fish. When my father buys fish from the store I don’t eat it, I don’t trust it. But when he gets it from my neighbor, my father washes it and he skins it. I only eat it when he gets it from my neighbor.”

Table 8 shows the percentages of students at Common Ground and Comparison School #2 that care about where their food comes from in the Fall and the Spring, and the percentages of students who valued food source more in the Spring than in the Fall. Though the results are not significantly different, students at Common Ground tend to value food source more than the other students, and more of them changed their opinion to value it more at the end of the school year.

Table 8. Percentages of students who care about food source as demonstrated by agreement with the following statement

STATEMENT	Common Ground (n=44)		Comparison School #2 (n=24)	
	% students that agree a little or a lot	% that agree more in Spring than	% students that agree a little or a lot	% that agree more in Spring than

	Fall	Spring	Fall	Fall	Spring	Fall
I like knowing where my food comes from	34%	28%	13%	22%	15%	7%

*=p<0.05

Linked to food source is the issue of food safety, which students mention in the focus groups as an important concern. One student describes his concerns about the safety of certain fast food:

“Mad Cow’s! I don’t eat at KFC any more. KFC puts so many steroids in their chicken that some of them have two heads and stuff, and it’s really gross.”

A direct food safety concern is that food can make one sick because it is spoiled or contaminated. Unsafe food is a direct link between nutrition and health that the students understand well. Students at Comparison School #1 did not trust that the school food would be safe to eat:

“Because people will be like, my stomach hurts. And I say, and you’re eating the school lunch!”

“Not only that, because last time the milk was actually spoiled. You taste it and it’s all spoiled and nasty. I see a lot of people don’t get it because it’s nasty.

“What are those things called? Those long things that you dip the... we had them yesterday...Those! They be molded. Seriously. They have green on them.”

Some students also understand the long-term health effects of nutrition, and prefer certain foods based on their nutritional value. Attitudes toward nutrition and healthy eating are complex and varied among students, as presented in the section below.

Attitudes about nutrition and health

Though attitudes about health, and specifically the role of nutrition, varied among the students in the focus groups, some common themes emerged. Many students understood that nutrition is important. For example, one student at Comparison School #1 understands the long-term implications of eating poorly, and believes her school

should serve healthier food. She also articulates some other attitudes outlined in this section, such as “real” food, described above, and the idea of a “trial period”, which relates to the section below on the importance of control. She says:

“We should have more salads because a lot of people like the salad. We need a trial period every year. Different types of healthy food that people like. Like real grilled chicken salad. Like real chicken breast that’s cut up. Stuff like that, that’s good for people. Because the stuff in this school is not helping anybody, it’s just killing people, that’s all.”

While many students in the focus groups value health and nutrition, some students do not feel that it is an important priority. One student at Comparison School #1 describes how his peers commonly do not value nutrition as much as other aspects of food:

“A lot of people don’t realize their health--it’s really really bad, they’re just like, oh it’s food.”

Even among students who do value health and nutrition, some thought that healthy eating was difficult. One student from Comparison School #2 describes her attempts to stay on a diet. She asserts that environmental factors, such as food advertising and availability of unhealthy food, make it difficult to eat well:

“Because everything question you. You could be on a diet and you see that commercial come along. Or I don’t know, like when I was in this program, I went to UConn, they had the salad bar next to the fried food and you’d just turn and be like, oh that looks better.”

<p>Table 9. Percentages of students who believe it is hard to prevent obesity as demonstrated by agreement with the following statements</p>

STATEMENT	Common Ground (n=44)			Comparison School #2 (n=24)		
	% students that agree a little or a lot		% that agree more in Spring than Fall	% students that agree a little or a lot		% that agree more in Spring than Fall
	Fall	Spring		Fall	Spring	
It is hard to figure out what to eat in order to be healthy and prevent obesity	21%	15%	18%	8%	11%	13%
Managing weight and preventing obesity takes a lot of effort	44%	30%	14%	21%	17%	10%

*=p<0.05

Being healthy was often described as a chore; though virtuous and important, it is difficult and certainly not enjoyable. A student at Comparison School #1, quoted below, dichotomizes healthy and unhealthy food in terms of tasting bad and tasting good, and cites the need for balance:

“Because it’s gotta balance out. You gotta have something unhealthy that tastes good and something healthy that tastes eh.”

For many students, their primary health concern was body weight. Several times in the focus groups, the concept of body weight was used interchangeably with health.

For example, one student says:

“Cereal is healthy because on the news it was like you can go on a Cheerios diet, you can’t eat nothing but cereal, you won’t gain weight, you’ll actually lose weight.”

Concerns about weight were tied very closely to concerns about body image. One student describes:

“A lot of girls you talk to, they say oh, I’m really fat, but then they’re a twig. They could be anorexic.”

Losing or maintaining weight, whether for body image or health, was the primary reason that many students cared about nutrition.

Attitudes about school food

In the focus groups, students often complain about school food. A student from Comparison School #2 says about school lunch, “They just be giving us garbage.” In several focus groups, students claimed that other schools had better school lunch. For example, a student at Common Ground describes a cafeteria at another high school:

“They got Subway and a pizza store in there. In other high schools, they have soda machines, they have candy machines, they have ice cream machines. Here, we have a juice machine.”

As shown in Table 10, students at Common Ground believed there were more healthy options at their school than students at Comparison School #2, and they believed school made it easier to eat healthy foods. There was no significant difference between the schools in the response to the question about whether students want more healthy choices at school.

Table 10. Percentage of students that think school lunch is healthy as demonstrated by agreement with the following statements

STATEMENT	Common Ground (n=44)			Comparison School #2 (n=24)		
	% students that (dis)agree a little or a lot Fall	% students that (dis)agree a little or a lot Spring	% that (dis)agree more in Spring than Fall	% students that (dis)agree a little or a lot Fall	% students that (dis)agree a little or a lot Spring	% that (dis)agree more in Spring than Fall
My school makes it hard to eat healthy foods (students that disagree)	69%	74%*	20%*	50%	28%*	63%*
My school offers lots of healthy options (agree)	72%*	57%*	26%	48%*	24%*	25%
I wish my school provided more healthy choices for foods and drinks (agree)	37%	16%	28%	26%	27%	42%

*=p<0.05

The kitchen staff at Comparison School #1 also had very strong opinions about the poor quality of the food. During an in-depth interview of three kitchen workers,

comments included, “Basically the food stinks,” and, “They treat these inner-city kids like garbage. To me, they feed them from the bottom of the barrel.”

The kitchen staff also denied that the food was healthy at Comparison School #1, stating, “They say the food is nutritious but it’s all processed foods.” In terms of vegetables, they stated that there are very few options served, and students do not usually take what is offered:

“They’ll get either corn, which is very seldom, but some of them do take it. So it’s string beans, they don’t take the string beans, they don’t take the carrots. So basically it’s string beans and carrots!”

“The vegetable on Friday is mashed potatoes!... I’ve never known mashed potatoes to be a vegetable.”

Importance of control

A very common attitude that emerged in the focus groups was the importance of student control over food. One way in which high school students desired control in the cafeteria was by having food choices. Desired food options included sandwich bars and salad bars, both characterized by the choice and control they offer to students. One student at Common Ground states:

“I think they should have a buffet type thing here where you can get what you got. So instead of serving one thing every day they should have three different things.”

At Common Ground, the tasting of foods was a specific way in which teachers and kitchen staff gave students control. The school chef encourages students to try different foods, but asks for nothing more beyond tasting. She describes her approach to introducing students to new foods:

“Especially last year, I did a lot of variety. I wanted to see if they liked spicy, if they liked... I had them trying different spices they’d never tried before, different combinations they’d never tried before. So they’ve gotten better...I’m like, you don’t know if you don’t like it if you’ve never had it. If you’ve tried it, don’t like it, that’s fine. But at least try it.”

Tasting new foods in the garden and the cafeteria is viewed as an opportunity for students to form opinions and perhaps encounter foods they like. A teacher who works with Common Ground students in the garden states:

“I feel like they’re pretty good with sampling stuff in the garden. Beans, carrots, all sorts of stuff that they’ll sample directly in the garden.”

Since tasting new foods permits students to form their own preferences, it grants them control over the kinds of food they eat. A Common Ground student stated in a focus group, “You try something and you know exactly what you like.”

Given the importance of control, students had strong opinions about rules governing the way they eat. In the following discussion, Common Ground students debate the value of the school rule that they must take a vegetable at every lunch period. For one student in particular, the rule requiring him to take a vegetable feels very wrong. Even if he only has to take “a leaf”, and he does not have to eat it, he still does not like being forced. Other students are not against the rule, understanding the larger goal of improving the health of students and the environment.

“There’s something I really really hate in this school. Every time you go into the lunch room, you can’t leave the kitchen until you have a green.”

“They say if you don’t get your greens, then you got detention.”

“It’s a health issue, they want you to be healthy.”

“They always put a salad out every day or they’ll have a vegetable like broccoli or squash or whatever, and they say if you don’t take your greens, then you’re getting a detention.”

“You don’t have to eat it, you just gotta take it. But I don’t know what is the difference.”

“They’re trying to get us to eat it. That’s why they tell us to take it.”

“There’s some things that I eat, but the things they be giving.”

[Interviewer:] “How do you feel about the things that they’re making you take?”

“It feels like they’re trying to force us.”

“They’re telling you to grab it. They say you can grab as small as you want, you just take a little bit but you don’t have to eat it.”

“You can take just a leaf.”

“I know, but they still try to force it on you.”

“If they was forcing you they would sit next to you and tell you here you got to eat it. That’s forcing you.”

[Interviewer:] “I understand that they make you take the food, you don’t really have to eat it. Is that a good thing? A bad thing?”

“It’s good. For some people they think it’s good because they’re trying to make you have a healthy body and a healthy habitat.”

Just as rules were not popular with the teenage students, having control over decision-making in regards to school food was viewed as very important. The previous year at Comparison School #1, students had circulated a petition calling for improvements in school food. Students in the focus group were frustrated by the lack of response to their efforts at students activism, feeling like they had no power or control over the situation. One student describes:

“The proposal that we did last year was when we had this boy for president, and he wrote some type of something, like if you want better food at [Comparison School #1], then put your name here. We went around and people put their names, and it was a lot of people, but the only thing is, nothing happened. We gave it to the principal, nothing happened though. So I guess people are tired of doing proposals and nothing happening.”

Students debated circulating another petition, but some felt it would be futile.

Students felt very distant from the process and decision-makers that determined what was served for lunch. Students understood that the locus of control over what is served in the cafeteria is beyond even their school principal. Someone higher up has to listen. One student stated:

“Another problem is that the people we give to it, for example the principal, it’s hard to get it past him since he has so much on his plate, so my idea would be to give it to the superintendent of schools, or to give it to the Board of Ed, or to give it to the people who are in charge of this.”

This feeling of powerlessness over what is served in the cafeteria at Comparison School #1 is in sharp contrast to students at Common Ground. Because the chef at Common Ground has autonomy in the kitchen, and students have direct access to her, students have some power over what is served for lunch. The student quoted below is proud of the influence she has on the chef, which stems largely from their personal relationship. She describes how she had a direct impact over what was served that day for lunch:

“She cooked today, but that was because I asked her, ‘Miss Rhonda, can we make tacos next week?’ She said sure....because she loves me! If you all want something for lunch, ask me.”

Another way in which students at Common Ground assert control over their school food is through direct participation in the process of producing it. Through their involvement in the garden, students develop a sense of ownership of what they eat. As described by a Common Ground staff member:

“I think that the kids that have been in Youth Crew and the kids that have been in Site Class and Harvest Class, both, have a little bit more ownership and a bit more pride in the garden.”

Similarly, students generally thought positively about opportunities to cook because it allows them to participate in the process of food production. The only downside to cooking, from the perspective of the student quoted below, is the guidelines, which infringe upon student control over the process:

“Sometimes when they let the students cook, it comes out really well. And they let you do that, which is really cool. You do still have guidelines, but it is good.”

Students' direct access to the kitchen at Common Ground is in contrast to students at Comparison School #1. Unlike at Common Ground, students have no involvement with preparation of school food, and thus feel detached from the process. When discussing space needs for improving school food, one student states, "I don't know what's in the kitchen!"

The desire for control over school food also extends to kitchen staff. The cafeteria staff at Comparison School #1 lamented turning the public school food service over to an outside contractor because of the deterioration of the quality of the food as well as their own loss of control in the kitchen. A cafeteria worker describes:

"Before [the outside food service contractor] took over, we used to do our own food, everything was fresh. Of course the chicken was frozen, but it was regular chicken. It wasn't the processed stuff like chicken tenders, and stuff like that. It was regular chicken. We baked it. We barbecued it."

Knowledge

Results from the surveys and focus groups related to student knowledge of food, health and nutrition are presented in this section.

Nutrition knowledge

Several survey questions asked about basic nutrition knowledge such as food groups and micronutrients. Table 11 through Table 13 summarize student responses to these questions. In general, students at Common Ground had more correct answers when identifying food groups. Students at Comparison School #2 had more correct responses to the questions about micronutrients.

Table 11. Percentage of students that identified the correct food group in the Fall and Spring

	Common Ground (n=54)	Comparison School #2 (n=28)
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	Fall	Spring	Fall	Spring
Broccoli (veg)	94.64	94.55	92.86	85.19
Strawberries (fruit)	94.64	92.73	92.86	85.71
English muffin (bread)	81.82	86.79	89.29	80.77
Yogurt (dairy)	80.77	94.34	92.59	80.77
Butter (fat)	22.64	49.06*	25.93	7.41*
Chicken (meat)	92.73	96.3*	96.43	81.48*
Fish (meat)	81.13	85.19	81.48	77.78
Milk (dairy)	94.34	92.59	85.19	78.57
Potatoes (veg)	80	75	71.43	69.23
Eggs (meat)	44.44*	56.6	14.81*	30.77
Candy (sweets)	94.44	80.77	82.14	85.19
Tomato (veg)	51.85	58.82	37.04	40.74
Cake (sweets)	86.79	64.15	82.14	81.48
Apples (fruit)	90.91	86.79	81.48	74.07
Cheese (dairy)	90.74	80.77	81.46	77.78
Cooked cereal (bread)	37.25	43.4	46.43	55.56
Corn (veg)	90.38	84.31	82.14	74.04
Soft drinks (sweets)	79.25	76.47	71.43	80.77
Beans (meat)	13.46	32.08*	3.57	3.85*
Cold cereal (bread)	42.31	41.18	44.44	59.26

*p = < 0.05

Table 12. Percentage of students who correctly identified the healthier food choice

	Common Ground (n=45)		Comparison School #2 (n=26)	
	Fall	Spring	Fall	Spring
Whole wheat vs. white bread	72.73	75	74.07	75
Brown vs. white rice	18.18*	40.91*	61.54*	60.87*
Spinach vs. iceberg lettuce	62.22	55.56	57.69	52.17
Unsaturated vs. saturated fat	69.05	73.17	69.57	66.67

*p<0.05

Table 13. Percentage of students that identified correct nutrient associated with food group

FOOD GROUP	Common Ground (n=46)		Comparison School #2 (n=27)	
	Fall	Spring	Fall	Spring
Bread (<i>Carbohydrate</i>)	40.91	27.27*	62.5	57.14*
Vegetable (<i>Vitamins and Nutrients</i>)	43.59*	64.29	78.26*	56.52

Fruit (<i>Fiber</i>)	45	55	69.57	63.64
Milk (<i>Calcium</i>)	17.5	14.29	4	4.35
Meat (<i>Protein</i>)	58.54	47.62	72	54.55
Fat and oil (<i>Saturated Fat</i>)	54.76*	62.22	79.17*	60.87

*p <0.05

When describing how they apply their knowledge to making food choices, students at Common Ground differed from students at the comparison schools. In the focus groups, students from Comparison School #1 state that they do not pay much attention to nutrition information on labels:

“I don’t look at labels.”

“It depends, if it’s a cereal box, I look at that and say ‘there’s nothing fun on that’, then I’ll look at the back where they have all the games. I look for vitamins. I look for words I don’t know.”

In contrast, a student at Common Ground describes how she started paying attention to nutrition labels based on what she learned at school:

“I read the labels now. I look at the calories. I didn’t know about calories before, but I learned that calories are actually energy and if you don’t burn it, it turns into fat.”

Knowledge of obesity-related diseases

Based on the surveys, students seem to be familiar with diseases associated with overweight. As shown in Table 14, students were better at identifying disease associated with overweight (type 2 diabetes, heart disease), than recognizing that osteoporosis and anemia were not associated with overweight.

Table 14. Percentage of students who correctly identified health problems associated with being overweight

	Common Ground		Comparison School #2	
	Fall	Spring	Fall	Spring
Type 2 diabetes (% yes)	68.09	63.04	64.29	54.17
Osteoporosis (% no)	32.56	47.62	55.56	45.45

Heart disease (% yes)	68.89	65.22	55.56	66.67
Anemia (% no)	41.86	52.27	46.15	43.48

* = $p < 0.5$

Knowledge of food system

One of the main learning objectives at Common Ground is to teach students the importance of where their food comes from. As described by the school director:

“The farm ... is a way to interest students in science and to help them understand that we depend on the natural world, that human behavior impacts the natural environment, and that considering that circle, those impacts on the natural environment impact our health...And I would be worried about what percentage of kids understand that whole circle, that whole message.”

There is evidence from the survey that at least some Common Ground students are learning the connection between the environment and health. Table 15 shows that more students at Common Ground than at Comparison School #2 understand the connection between environment and health, though this result is not significant.

Table 15. Percentage of students who understand the connection between environment and health as demonstrated by agreement with the following statements

STATEMENT	Common Ground (n=44)			Comparison School #2 (n=24)		
	% students that agree a little or a lot		% that agree more in Spring than Fall	% students that agree a little or a lot		% that agree more in Spring than Fall
	Fall	Spring		Fall	Spring	
Taking care of the environment is important to me	31%	29%	22%	21%	13%	5%
My health depends on the environment	18%	14%	12%	13%	9%	11%

*= $p < 0.05$

Some students in the focus groups at Common Ground also seem to understand the connections between the environment, food and health. When describing his

participation in the Youth Crew, a student refers to “food” when talking about the garden and animals:

“During the summer we take care of the food here, we put the mulch on and take care of the animals and stuff.”

When describing what he learned from being part of the Youth Crew, the same student says, “to work with others and to respect our food and our nature.”

The process of raising animals for food was universally a very powerful experience for the Common Ground students. Participating in the process of slaughtering chickens gave students first-hand knowledge of where meat comes from. One student describes:

“Murdering the chicken after we raised them, it changed my whole idea of chicken. It changes how you think about outside food, too, because you learn where that stuff came from.”

Some survey questions addressed how much students know about the food system and its effects on health. One set of questions, presented in Table 16, addressed the question of whether biology or the environment has an affect on the obesity epidemic. In general, more students agreed with the statements that environment affects obesity than the statements that biology affects obesity. More students at Common Ground than at Comparison School #2 agreed more with the environment statements in the Spring than in the Fall.

Table 16. Percentage of students who believe that biology and the environment affect obesity as demonstrated by agreement with the following statements

STATEMENT	Common Ground (n=44)		Comparison School #2 (n=24)	
	% students that agree a little or a lot Fall Spring	% that agree more in Spring than Fall	% students that agree a little or a lot Fall Spring	% that agree more in Spring than Fall

Biology and genetics affect how much people weigh	9%	16%	16%	12%	11%	9%
It is easier to eat healthy food when there is no junk food around	47%	31%	17%	26%	20%	7%
Advertising contributes to people's preferences for unhealthy foods	20%	21%	17%	17%	14%	5%
The high cost of healthy foods, compared to unhealthy foods, contributes to obesity	32%	14%	10%	12%	8%	3%
Living in an environment that makes exercise and physical activity easier helps to prevent obesity	34%	38%	22%*	17%	13%	2%*
The types of foods that are available plays a role in whether people become overweight	26%	23%	21%*	20%	9%	2%*

In the focus groups, students at the Comparison Schools in particular seemed to appreciate genetic causes of obesity and obesity-related diseases. One student at Comparison School #1 explained the familial etiology of diabetes:

“You about to get type II diabetes? Anyone else in your family have type II diabetes? That’s why.”

In another focus group at Comparison School #1, a student explained that biology differentially affects the rate at which individuals metabolize food:

“...my best friend, she’s like really, really small. I used to always compare myself to her when I was smaller. But then I’ll think, it’s not about that. She eats a lot, but she has high metabolism.”

Another survey question that aimed to gauge knowledge of the food system was the open-ended question asking students to define “organic” in their own words. Table 17 presents the percentages of students who defined organic correctly in the Fall and

Spring. In the Spring, significantly more students at Common Ground defined organic correctly than at Comparison School #2.

Table 17. Percentage of students who correctly defined "organic" in their own words

	Fall	Spring
Common Ground (n=34)	35.9	42.9*
Comparison School #2 (n=15)	13.6	0*

*p<0.05

Other questions, presented in Table 18, asked about students' perceptions of buying food that is local and organic. In general, students at Common Ground seemed to understand the positive impacts of local and organic food more than at Comparison School #1, though these results are not statistically significant.

Table 18. Percentage of students who know about the impacts of buying local and organic food as demonstrated by agreement with the following statements

STATEMENT	Common Ground (n=44)			Comparison School #2 (n=24)		
	% students that agree a little or a lot		% that agree more in Spring than Fall	% students that agree a little or a lot		% that agree more in Spring than Fall
	Fall	Spring		Fall	Spring	
Buying organic food is better for the environment	40%	33%	14%	14%	14%	12%
Vegetables grown locally taste better than vegetables that come from farther away	28%	16%	12%	6%	9%	10%
Buying food that is produced locally is better for the environment	21%	18%	15%	4%	11%	13%
Fresh foods are more nutritious than processed foods	33%	33%	12%	21%	19%	3%
Vegetables grown locally are healthier than vegetables that come from further away	26%	21%	9%	7%	6%	5%
My health depends on the environment	18%	14%	12%	13%	9%	11%
Organic food is healthier than conventional food	30%	26%	14%	12%	15%	9%

The lack of knowledge about food additives along the supply chain was evident in the focus groups at the comparison schools. In the exchange below from a focus group at Comparison School #1, two students discuss steroid injection in poultry production:

“Mad Cow’s! I don’t eat at KFC any more. KFC puts so many steroids in their chicken that some of them have two heads and stuff, and it’s really gross.”

“Are you serious? How do they put steroids in them?”

“They inject them!”

“So that means they have steroids in them?”

“The chicken has steroids in them to make them bigger so there’s more meat, and it’s really gross. After I ate their popcorn chicken on Christmas Eve I threw up all Christmas night.”

“How did you get that information?”

“Someone did a special report on it.”

“Really? I’m going to ask. I’m going to, seriously. ‘My friend said that you put steroids in your chicken, I need to know if that’s true.’”

[Interviewer:] “Do you care about that? What would you do if someone said the school cafeteria puts steroids in their food?”

“I would die!”

“I wouldn’t eat it”.

“That’s why I’m probably so big now!”

[Interviewer:] “Do you think that’s what most kids would think?”

“I don’t think most kids would care.”

“I think they would! If they knew someone was putting stuff in their food, they would be mad, really mad.”

Sources of Nutrition Knowledge

In the focus groups, students frequently mentioned sources of nutrition knowledge.

Family and culture

Families and cultural upbringing were important factors in shaping knowledge about nutrition and health. The student quoted recognizes that much of what she knows she absorbed passively as a child. When she became an adolescent, she acquired the tools to learn and question beyond how she was raised:

“I started thinking about my weight at the beginning of seventh grade. Because that’s when you start to think about more important things in life. When you’re a kid you don’t really think about it, you just do what you’re told and what you’re brought up to do.”

Several students described how much of what they learned about nutrition came from family members struggling with health problems such as diabetes and high blood pressure. One student describes how she and her mother worked together to learn about nutrition:

“We were thinking about designing a diet for my mother. She was always on a different diet and it didn’t work, so we started looking up something that would work. We started researching different foods that were good for you. And it was eating organic food and exercising. We started using that.”

While some students describe families as a useful source of health information, others do not find family helpful. One student describes a confrontation with her mother:

“I was about to eat junk food, and my mom said ‘oh, you shouldn’t eat that, it’s gonna make you gain weight.’ And I don’t like when they say that, it makes me mad, and then I’m like, ‘I’m gonna eat it now.’”

Health providers

Interactions with health providers are also sources of nutrition and health information. One student looks to her doctor as the most trusted authority about her health, saying, “As long as I go to the doctor and they say that I’m fine, I don’t care.”

Another student got angry when her doctor tried to tell her to do more physical activity, saying:

“I went to the doctors, and he asked me if I do sports. I play video games. And you’re asking me, do you run track or something? No, I sit at home and play video games. So I was like whatever. He said you need to get more involved in extracurricular activities, and you just look at them, like do your job. Who tells you that? Doctors!

They're like, oh, you need to play basketball, you need to do this, you need to do that. I keep up with my dog, that's enough."

Giving advice about weight and health is not always effective. Students, as well as adults, often dismiss advice that they do not want to hear. One student describes her family as not listening to doctors:

"Yeah, they got diabetes and all that. But where I come from, they're so hard-headed, and they don't like doctors, and they feel like doctors is dumb. So they don't take their medicines, they don't do what they gotta do."

Media

Media, particularly television and film, seemed to be an important and effective source of health and nutrition information for students in the focus groups. Students heard about an *E. coli* outbreak in spinach on television news. The film *SuperSize Me* seemed to have a large impact on many of the students. One student recalls the final scene:

"At the end of *SuperSize Me*, he did a little test and he put all the burgers and the fries in the thing, and the McDonald's fries lasted six months and they didn't have any mold on them. That can't be healthy!"

One student at Common Ground describes a film they watched in school, which seemed to have a large impact:

"They showed us videos about what they do with the animals. How they keep them in cages no wider than their body."

School

Although family and media are major sources of nutrition information, schools also seem to play an important role. At Common Ground, health education is integrated

into many aspects of the curriculum. One student at Common Ground states, “Here, instead of a school, it’s more like a health camp. A health boot camp.”

Nutrition education at Common Ground is integrated into the students’ involvement in the garden, as well as in individual interactions with teachers and guidance counselors.

A Common Ground student describes how he has learned about nutrition and vitamins through planting in the garden:

“I have learned about nutrition. They teach you how to plant potatoes, tomatoes, fruit. They teach you about vitamins. Your guidance counselors help a lot.”

Students at Comparison School #2, in contrast, described very little nutrition and health education at their school. In the discussion below, students describe that nutrition is subsumed into a very small part of health class, which students do not take very seriously:

“Mostly our Health was sex ed, that’s what our Health was.”

“They sit around asking all those stupid questions.”

“It seemed like they would take two weeks to a month to talk about alcohol and drugs. I know we did do the nutrition thing, but I can’t tell you anything about it, that’s how short it was. And then all month long it’s alcohol this, drugs that.”

“You just be learning about the reproductive system. That’s it.”

“They don’t teach you nothing about your health.”

[Interviewer:] “What would you want to learn about in health class?”

“It’s not really a major topic.”

“Health in general.”

“I don’t think about health that much. When I’m in health class, I take it like a blow-off. I do the work and that’s it.”

Behavior

Data from the surveys and focus groups gave insight into the nutrition behaviors of the students as well as how they make decisions about what to eat. Patterns of

behavior vary among students but include skipping meals, snacking, dieting, eating out with friends, and eating at home with family.

Skipping meals and snacking

One common pattern that emerged in the focus groups was skipping meals at school in combination with snacking after school. Many students rely on eating breakfast and lunch at school. If they skip either of these meals, then they eat whatever food they can find after school, which is often unhealthy. A student at Comparison School #1 says,

“A lot of people don’t eat breakfast in the morning, because, well, I wake up at 5 o’clock in the morning because I have to catch the bus early. I don’t have time to eat breakfast. A lot of other people don’t eat breakfast, too. And lunch is the closest meal to us and they give us horrible lunch.”

This same student describes what he eats after school:

“I go home, I walk in the door, I pour in a bowl some cereal. Then, some eggs, a popsicle, a sandwich.”

Similarly, at Comparison School #2, students discussed the consequences of skipping school lunch:

“I can’t perform well, I’m so stressed out, because I go back to 4th period, I’m so hungry, about to die.”

“And then they wonder why we be acting the way we acting. They just be giving us garbage.”

[Interviewer:] “So you’re hungry at the end of the day. So what happens after school?”

“Go home and eat everything! We have no food after I’m done.”

“Everything in sight.”

[Interviewer:] “What kinds of things do you eat when you go home?”

“A whole bunch of junk, cookies.”

“Everything.”

“Ice cream, Doritos, anything.”

“Exactly, because you haven’t eaten anything all day, you just binge on that food.”

A very small number of students bring lunch to school. According to the Fall surveys, 87% of Common Ground students and 60% of Comparison School #2 students brought their own lunch zero times in the week prior to the survey. In the Spring, these numbers decreased to 60% and 33% respectively. One student who does bring food from home to Comparison School #1 describes:

“Everybody else will go and get lunch, and I’ll be sitting there with my home lunch.”

Fast food consumption

Fast food consumption was a common behavior among students in this study. The survey data related to fast food behavior, presented in Table 19, shows there are no significant differences between Common Ground and Comparison School #2 students in terms of frequency of fast food consumption. A sensitivity analysis is presented in Table 20, excluding students who answered that they eat fast food more than seven times a week. In the sensitivity analysis, students on average consume fast food two to three times per week.

Table 19. Times per week that students report eating fast food

		Mean (SD)
Common Ground (n=56)	Fall	5.6 (7.9)
	Spring	4.6 (7.2)
	Percentage of students eating fast food less in the Spring than the Fall	35.7%
Comparison School #2 (n=28)	Fall	6.5 (8.3)
	Spring	5.6 (8.9)

	Percentage of students eating fast food less in the Spring than the Fall	39.3%
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*p<0.05

Table 20. Times per week that students eat fast food (more than 7 excluded)

		Mean (SD)
Common Ground	Fall (n=47)	2.5 (2.5)
	Spring (n=51)	2.0 (2.3)
	Percentage of students eating fast food less in the Spring than the Fall	27.7%
Comparison School #2	Fall (n=23)	3.0 (2.7)
	Spring (n=24)	2.2 (2.3)
	Percentage of students eating fast food less in the Spring than the Fall	34.8%

*p<0.05

Fast food was a prevalent theme in the focus groups. A student at Comparison School #2 described what he eats typically on the weekends:

“Chinese, McDonald’s, pizza, a lot of junk food, chips, cookies, soda, fried foods.”

Other students were more moderate in their fast food consumption, clearly aware of the negative health effects. In the discussion below among Common Ground students, students acknowledge that they try not to eat fast food too frequently:

“Once in a while I go out to eat with my friends. Not that much.”

“I do. We go to a lot of Chinese food. I try to go to McDonald’s once a month, but sometimes it doesn’t work.”

“I can’t do McDonald’s every day, because if you do McDonald’s over and over you’re going to get fatter and fatter and fatter.”

“Well I do Popeye’s once a week, really, because it’s right down the street from my house, so it’s convenient.”

Though many students enjoy fast food, they also recognize its problems and try to limit their consumption by going less often or only eating certain foods. Students in the

Common Ground focus group in particular seem to recognize the ills of fast food. One student describes how she now eats differently from her friends who attend other high schools:

“When I go out with my friends from middle school, we eat so differently. I’ll eat salad, fries and a drink. They eat salad, fries a burger and a drink. They say, ‘That’s all you’re eating?’”

Dieting

When discussing healthy eating, students often spoke about dieting, particularly in the focus group at Comparison School #1 that was comprised only of girls. One student in this group describes her attempts to diet:

“It’s something that everybody thinks about. If someone says they’re on a diet, they usually get that response, like, ‘you don’t need to lose weight.’ We usually get that. But I think it’s just a matter of finding a person who can encourage you or even, like at my best friend’s, this one time when we were trying some crazy diet a couple of years ago. It was just for fun though, and she went and did it with me, and we had a lot of fun. We actually kept it up for a long time.”

Dieting in order to lose weight is consistent with the attitude described above that it is difficult and not enjoyable to be healthy. This student actually enjoyed being on a diet because she did it with a friend. In general, though, other students view it as a form of self-deprivation, and discourage each other from doing it.

Table 21 presents responses to the survey question about whether students are trying to lose, gain, or maintain weight. There are no significant differences between students at the two schools, and approximately 50% of students at each are trying to lose weight. Table 22 shows the types of dieting behaviors that students are currently engaged in. Again, there are no significant differences between students at the two schools, except for a higher percentage of students at Comparison School #2 who take

laxatives. Exercise is the most popular behavior that students engage in to manage their weight.

Table 21. Percentage of students attempting to lose, gain or maintain weight

	Common Ground (n=53)		Comparison School #2 (n=26)	
	Fall	Spring	Fall	Spring
Lose weight	49%	47%	50%	46%
Gain weight	19%	13%	15%	21%
Maintain my current weight	19%	25%	27%	11%
I am not trying to do anything about my weight	13%	15%	8%	21%

*=p<0.05

Table 22. Percentage of students that engaged in behaviors to manage their weight during the past 30 days

	Common Ground (n=53)		Comparison School #2 (n=26)	
	Fall	Spring	Fall	Spring
Exercise	63%	60%	64%	71%
Eat less food, fewer calories, or foods low in fat	38%	33%	46%	46%
Reduce the amount of one type of food that you eat, such as carbohydrates	12%	24%	29%	32%
Go without eating for 24 hours or more (also called fasting)	7%	2%	7%	7%
Take diet pills, powders, or liquids without a doctor's advice (Do not include meal replacement products such as Slim Fast.)	0%	2%	0%	7%
Vomit	0%	0%	4%	4%
Take laxatives	2%*	0%*	18%*	14%*
Eat more	22%	27%	25%	18%

*=p<0.05

Eating fruits and vegetables

The food frequency questionnaire at the beginning of the survey captured the number of servings of fruits and vegetables that students ate in the past week both at home and at school. Table 23 presents these results. Students at Common Ground ate more fruits and vegetables at school and fewer vegetables at home in the Spring than in

the Fall, though these changes are not significant. A higher percentage of students at Common Ground than at Comparison School #2 ate at least 35 servings of fruits and vegetables total per week in both the Fall and the Spring, though this result is also not significant.

Table 23. Average number of fruits and vegetables consumed per week at Home and School in the Fall and Spring

School	Location	Date	N	Mean	Std. Dev.	Percentage eating at least 35 servings/wk
Common Ground	Home	Fall	51	15.2	17.0	
		Spring	55	13.3	14.0	
	School	Fall	46	6.6	10.0	
		Spring	52	9.0	9.8	
	Total	Fall	39	22.2	24.8	20.5%
		Spring	48	23.1	21.9	25.0%
Comparison School #2	Home	Fall	24	13.7	9.2	
		Spring	25	18.8	22.9	
	School	Fall	23	7.7	11.9	
		Spring	24	6.9	10.1	
	Total	Fall	22	20.7	15.3	13.6%
		Spring	22	26.4	25.3	18.2%

* $p < 0.05$ by chi square or t test

Disconnect between health knowledge and behavior

Many students described a disconnect between health knowledge and behavior; though they know how to eat well, in practice they eat poorly. Even if students know that a particular food is bad for their health, they often eat it anyway. As one student describes:

“I’m gonna eat it anyways. It don’t phase you after a while, because you’re gonna eat so much stuff that you know you ain’t supposed to eat. It don’t phase me, but I think about it.”

“The double cheeseburger, you know now they have the nutrition facts on the wrapper? The wrapper was sitting there, I’m eating my double cheeseburger, it said the

sodium was a thousand, I'm still eating, I'm like, 'that is a shame.' That's a lot of sodium, I'm still eating it."

Influences on decision-making

During the focus groups, students talked about influences on their eating decisions.

Mood

Some students claim that their decisions about what to eat depend on mood. One student describes how he decides what to eat:

"What you feel like eating. If you're in the mood for cheesy stuff you'll get pizza, if you're in the mood for a hamburger, you'll get a hamburger."

Another student acknowledges that her emotional state sometimes plays a role in what she eats, saying:

"Pressure. If I'm under pressure, or if I'm really depressed or upset, then I'll grab a huge bag of chips and sit on the couch and think about all the tough things."

One way that students decide what to eat is to use the idea of "balancing" healthy and unhealthy eating, as described in the section on attitudes. The student quoted below has developed a balanced way to make decisions about what she eats, based on what kind of activity she plans to do:

"I kind of eat depending on what I'm gonna do. If you know you're gonna be active that weekend, then you'll eat protein. If you want to stay at home then you want to eat more healthy. I like fruits a lot, that's kind of like my favorite food. It kind of balances."

Convenience, availability and speed

Convenience and availability play a role in what students eat. At home, students will often eat whatever is in the house or whatever a parent is serving for dinner.

Students also go out to eat based on convenience, according to this student:

“I do Popeye’s once a week really because it’s right down the street from my house, so it’s convenient.”

Another student said that sometimes ease and speed determine what he eats, saying:

“I’ll think, what’s easiest to make? What’s the quickest?”

Cost

Cost is an important factor that influences students’ decisions about eating. As one student describes, “Whoever got the money chooses.” When there are multiple food choices, cost often plays a deciding role. One student describes making a decision at a food court in the mall:

“It depends on how much money we got or where we’re at. Because if we’re at the mall there’s lots of different places, there’s Johnny Rockets, there’s a lot of places. Sbarro’s, that Italian pizza place, Chinese food, Subway, Taco Bell, all that stuff. It depends on how much money we got, and if we know somebody who working, to get free food.”

Cost is also an important factor in school cafeterias. In Comparison School #1, students eligible for free or reduced lunch tend to get the full lunch, while others get the a la carte options. A student explains:

“This stuff we have to buy: it’s beef patties, hot wings, popcorn chicken and then the free lunches allows you to get mashed potatoes and steak and gravy or chicken tenders...”

One student, who is likely not eligible for free or reduced lunch, describes how cost influences his purchasing decisions:

“The beef patties are a dollar fifty and the hot lunches are three dollars. That’s why I don’t buy any.”

Since students who can afford lunch tend to buy a la carte options, and the others get the hot lunch, then the type of food students eat becomes a status symbol. A staff member at this school’s cafeteria describes this phenomenon:

“The high school kids, a lot of them, they just buy the a la carte items, the beef patties, popcorn chicken and stuff versus the school lunch. The only kids that buy the school lunch are the ones that don’t have no money.”

Given the centrality of health and food in the educational approach at Common Ground, the school decided to remove cost as a factor in determining what students eat at school. At Common Ground, a staff member describes:

“We don’t charge anyone for lunch. Everybody eats for free. This is a decision we made about a year ago, because we realized that children weren’t eating because they had to pay.”

The responses to the survey questions presented in Table 24 demonstrate the price sensitivity of students at Common Ground and Comparison School #2. There is no significant difference between students at the two schools in terms of their willingness to pay more for organic or local food. A minority of students at the two schools are willing to pay more for organic or local food.

Table 24. Percentage of students willing to pay more for organic or local food as demonstrated by agreement with the following statements				
STATEMENT	Common Ground (n=44)		Comparison School #2 (n=24)	
	% students that agree a little or a lot	% that agree more in Spring than	% students that agree a little or a lot	% that agree more in Spring than

	Fall	Spring	Fall	Fall	Spring	Fall
I am likely to buy organic food even if it costs more	26%	14%	18%	22%	20%	35%
I am likely to buy food produced locally even if it costs more	17%	14%	26%	22%	16%	20%

*=p<0.05

Peers

Many students acknowledged that what their friends eat has a strong impact on what they eat. One student at Comparison School #1 describes the process of making a group decision about food:

“We ask everybody what they want and then we all get the same thing. It’s not usually very healthy.”

Students describe that the freedom and fun associated with spending time with friends is not conducive to healthy eating. Other students in this group describe:

“When I’m with my friends it’s like there’s no obligations, it doesn’t really matter. We just go out and have a good time and eat whatever we want. We’ll be like the first to go and get a sample. Or if we go to the movies, we go to McDonald’s and we put cheeseburgers in our bookbags, then we go to the movies and we have a ball.”

“When you’re with your friends it’s a lot harder to try to stay healthy, you’re having a good time and you’re not really thinking about what you eat. You eat a lot of bad stuff. Then I usually regret it later, because it makes my stomach hurt really bad.”

Table 25 shows the responses to the questions having to do with peer influence on eating behaviors. A minority of students agreed that seeing other kids eat certain foods makes them more likely to eat it. There is no significant difference between students at the two schools in terms of their stated susceptibility to peer pressure.

Table 25. Percentage of students who believe they are sensitive to peer pressure regarding food choices as demonstrated by agreement with the following statements

	Common Ground (n=44)	Comparison School #2 (n=24)
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STATEMENT	% students that agree a little or a lot		% that agree more in Spring than Fall	% students that agree a little or a lot		% that agree more in Spring than Fall
	Fall	Spring		Fall	Spring	
Seeing other kids eat healthy foods makes me more likely to eat them	26%	21%	14%	11%	13%	13%
Seeing other kids eat fast food makes me more likely to eat it	28%	24%	20%	33%	29%	29%

*=p<0.05

Family

Eating with family was a commonly reported behavior in both the surveys and the focus groups, and families seem to have a strong influence on student eating behaviors.

Table 26 shows the number of times per week that students eat dinner at home, according to the survey. There is no statistical difference between the two schools, and the average is 4.0 to 5.3 times per week.

Table 26. Times per week students eat dinner at home (more than seven excluded)

		n	Mean	Std. Dev.
Common Ground	Fall	45	5.3	2.1
	Spring	24	4.0	2.8
Comparison School #2	Fall	43	5.2	7.2
	Spring	23	4.5	2.6

*p<0.05

Students acknowledge the importance of how their families eat for shaping their eating habits. One student says:

“It’s what your parents are like, too. Sometimes I want to eat the right things, but my mom she cooks fried chicken. It’s hard not to eat fried chicken. So, it’s what your parents buy, what your parents put in.”

In the focus groups, it was clear that students' parents had varied eating habits. Some, like this student's family, generally did not eat healthy food. Other families, often motivated by obesity-related diseases like diabetes, were making efforts to eat healthy food together.

Table 27 shows student responses to the survey question about eating habits of the students' families. Most students did not agree that their families eat healthy food. There was no significant difference between students at Common Ground and Comparison School #1.

Table 27. Percentage of students who believe their families eat healthy food as demonstrated by agreement with the following statements

STATEMENT	Common Ground (n=44)			Comparison School #2 (n=24)		
	% students that agree a little or a lot		% that agree more in Spring than Fall	% students that agree a little or a lot		% that agree more in Spring than Fall
	Fall	Spring		Fall	Spring	
Most of the food I eat at home is nutritious and healthy	35%	25%	18%	26%	32%	35%
My family eats healthy food	47%	31%	18%	30%	36%	40%

*=p<0.05

Culture

Students recognized the importance of culture in influencing eating behaviors. At Comparison School #1, two students discuss the impact of culture:

“When my grandmother, when I was little, she thinks that when you're big, then you're healthier.”

“Yeah, so it's probably a different culture. What actually happened was that I started eating a lot of food. And when I moved from that my mom started giving me healthier food. And that's how I learned. It's like I have to balance everything though, because my father, he's African and where he comes from bigger women is healthier women.”

Cultural messages about food have an impact on student behavior. Students are sometimes influenced by multiple cultures, such as that of their families, their peers, their schools (such as the food culture at Common Ground), and broader popular culture, often communicated through media. A teacher at Common Ground describes some of the challenges to fulfilling the health and nutrition mission at the school:

“The kids come to us very rooted in a fast food culture, partly due to income, and parents being very busy and they’re being teenagers and having more autonomy. It feels like it’s a big uphill battle to have them not think of McDonald’s as their first choice for what they eat on the way home.”

Institutional factors

Institutional factors such as budget, kitchen facilities, organizational structure and governmental guidelines directly impact the type of food that is served in the cafeteria and thus what students eat. At Comparison School #1, the school director cites limited space and lack of control over the kitchen as a limitation to what they are able to serve in the cafeteria:

“Being in a temporary space where it’s not a full kitchen really limits the choices of what we have. I feel totally disconnected from the kitchen, meaning I just kind of manage whatever I can, but I really have no control over it because it’s not a full kitchen. The staff works for another school also, so that’s been a challenge.”

The kitchen staff at Comparison School #1 also described the limitations of the kitchen space and the organizational structure of the centralized kitchen for the school district:

“It dries out. These ovens are thermal ovens. It’s cooked when it comes from the Central Kitchen. What happens is we heat it. There are very few cooking kitchens in the system now. The ones that are cooking kitchens are the ones they make the most money off of... They get better food than most of the system. They still get the processed food, though, but they do get the fresh chicken then they can cook it up.”

Besides space and organization at the local level, policies at the state and national level also influence what is served in the cafeteria. The Federal Commodities Program in particular was described as an important source of low-cost food, but a limitation in terms of the quality and type of ingredients that are available. The Director of Comparison School #2 describes the institutional, financial and political barriers that limit the choices in the cafeteria:

“At the institutional level, we get most of the food from [institutional food service] and through the government commodities programs. The government commodities programs really dictate what type of foods we serve, it’s almost free. We just pay the shipping charges.”

Common Ground also participates in school lunch programs that provide some funding, and also come with nutritional requirements. The school director describes the arrangement and its impacts on the lunch program:

“We go through the federal school lunch program...I think there might be some money for that for breakfast and snacks...There are standard nutritional requirements. For the lunch program, people have to take one of each basic food group. There are some health requirements around that. We’ve also signed with the state requirements for serving healthy food all the time, and there are specific guidelines for that.”

Public charter schools in particular are sometimes constrained by their missions to focus resources in particular ways. Common Ground has committed to promoting health at the level of its mission statement, which allows it to allocate resources to its garden and school lunch program. For many other schools without a similar mission or wellness policy, it becomes difficult to justify spending more money on nutrition. The Director of Comparison School #2 describes how he wishes he could allocate more money to school lunches:

“If I had \$50,000 a year I’d have a salad bar every day... Because we’re a charter school, if I did have \$50,000 extra dollars, I’d have to use it towards our mission. It would be probably go to books and teachers.”

Cafeteria Observations

The cafeteria observations gave insight into behavior in the cafeteria at all three schools. The results from all the cafeteria observations are presented in Table 28. The percentage of students eating and tasting the vegetables is represented by a summary score for each observation. The data is described graphically in Figure 2 through Figure 4 by presenting the Fall and Spring scores for each school for each vegetable. The results will be discussed in the discussion section utilizing insight gained from the survey and focus group results.

Table 28. Results from cafeteria observations

School	Vegetable	Date	Students served	Bowls counted	% counted	Untasted		Tasted		Eaten		Score
						No.	%	No.	%	No.	%	
Common Ground	Carrots	9/20/2006	98	56	57%	40	71%	11	20%	5	9%	0.38
		5/1/2007	80	71	89%	44	62%	3	4%	24	34%	0.72
	Green salad	10/12/2006	87	71	82%	63	89%	2	3%	6	8%	0.20
		6/5/2007	62	62	100%	55	89%	1	2%	6	10%	0.21
	Kale	9/14/2006	86	54	63%	30	56%	8	15%	16	30%	0.74
Collards	5/9/2007	77	66	86%	36	55%	11	17%	11	17%	0.50	
Comparison School #1	Carrots	10/3/2006	58	54	93%	26	48%	10	19%	18	33%	0.85
		5/4/2007	74	60	81%	30	50%	3	5%	27	45%	0.95
	Green salad	10/26/2006	75	69	92%	21	30%	11	16%	37	54%	1.23
		5/24/2007	75	62	83%	27	44%	6	10%	29	47%	1.03
	Kale	10/6/2006	85	83	98%	58	70%	7	8%	18	22%	0.52
Collards	5/11/2007	80	74	93%	48	65%	15	20%	11	15%	0.50	
Comparison School #2	Carrots	9/21/2006	100	96	96%	69	72%	3	3%	24	25%	0.53
		5/2/2007	70	67	96%	31	46%	8	12%	28	42%	0.96
	Green salad	10/18/2006	96	93	97%	17	18%	17	18%	59	63%	1.45
		6/4/2007	68	64	94%	16	25%	9	14%	39	61%	1.36
	Kale	9/27/2006	88	84	95%	73	87%	6	7%	5	6%	0.19
Collards	5/10/2007	60	56	93%	45	80%	5	9%	6	11%	0.30	

Carrots

At all three schools, students ate more carrots in the Spring than in the Fall.

Students at the Comparison Schools ate more carrots than those at Common Ground in both seasons.

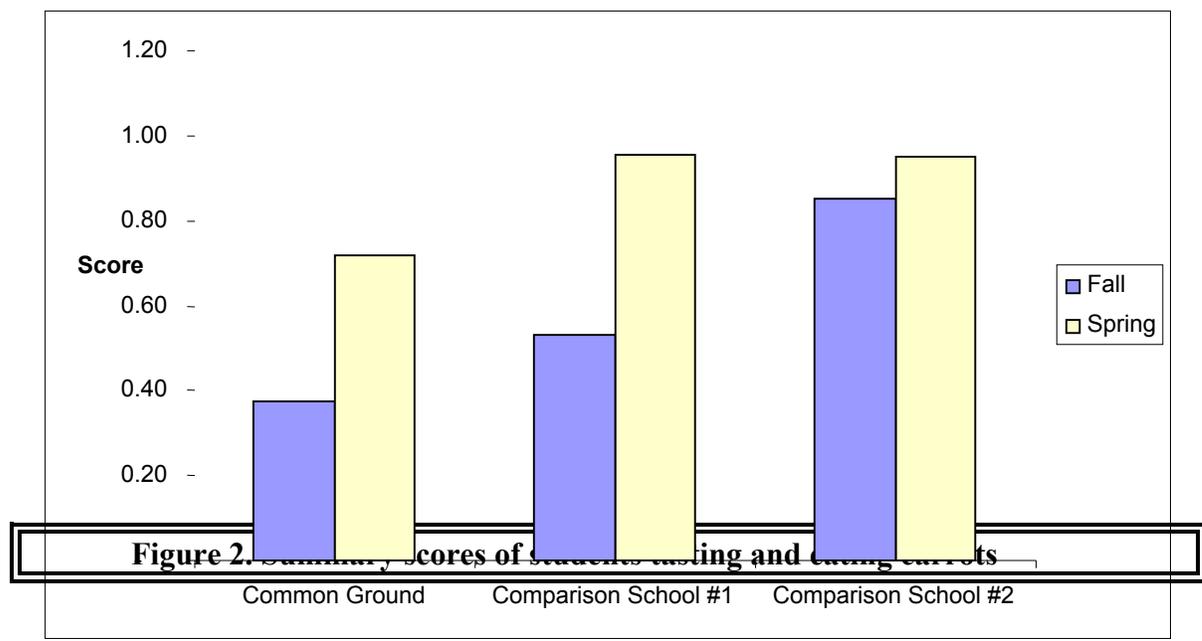
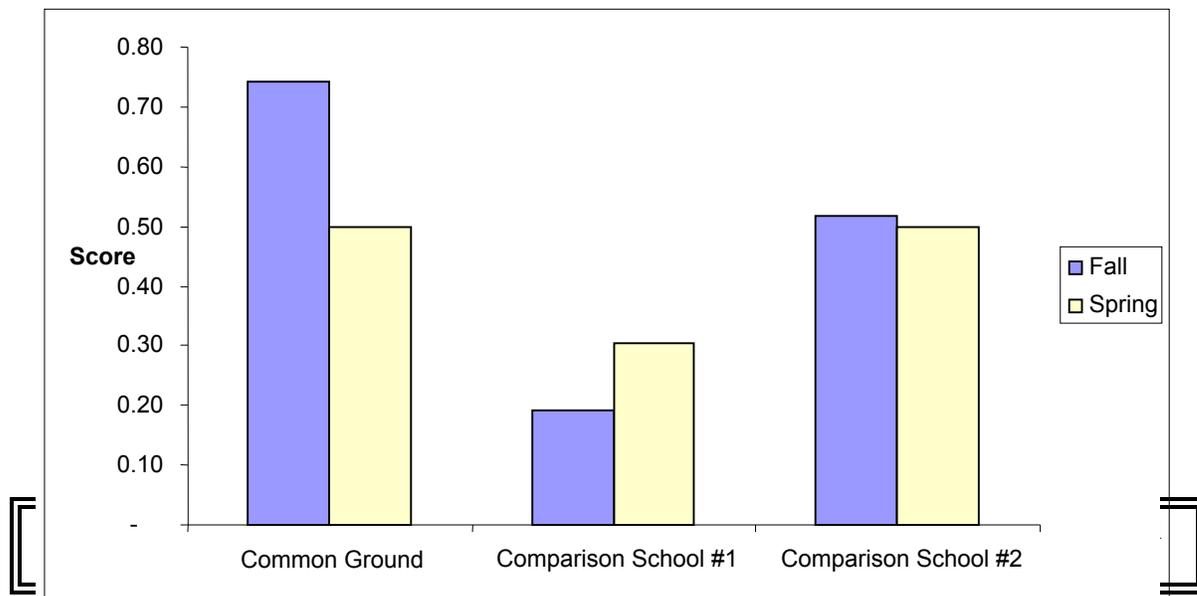


Figure 2. Summary scores of students eating and drinking carrots

Kale and Collard Greens

In the Fall, students ate more at Common Ground than at the Comparison Schools. At Common Ground, students ate less collard greens in the Spring than they ate kale in the Fall.



Salad

Students at Comparison Schools ate more salad both in the Fall and the Spring than at Common Ground. There were no significant changes between Fall and Spring at any of the schools.

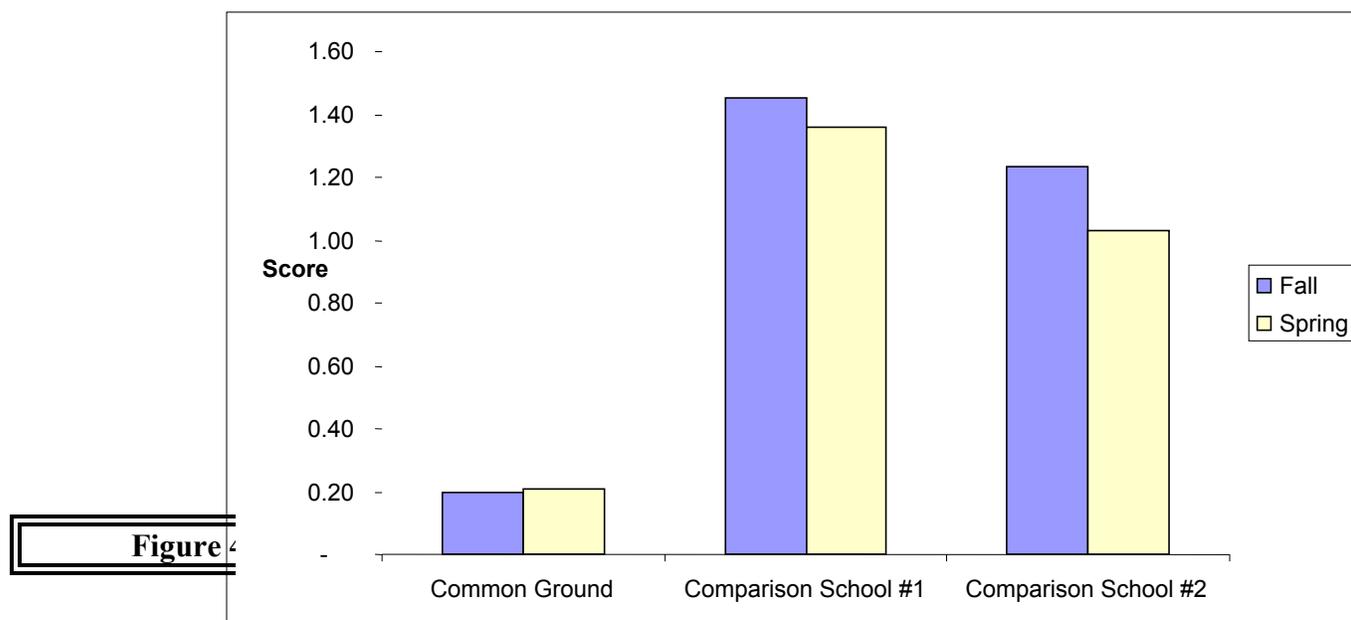


Figure 4

Outcomes - BMI Data

BMI data, a marker of health outcomes, is presented in this section. Table 29 shows the number of students at each school whose age, height, and weight were collected to calculate BMI.

Table 29. Percentage of students with BMI data collected

	Common Ground			Comparison School #2		
	Total students	BMI Collected	% Collected	Total students	BMI Collected	% Collected
Male	64	49	91%	52	48	92%
Female	79	58	63%	95	86	90%
9th grade	45	24	53%	46	46	100%
10th grade	56	47	84%	37	34	92%
11th grade	26	22	85%	28	25	89%
12th grade	16	14	88%	30	23	77%
All	143	107	75%	147	134	91%

Table 30 compares the average BMI of students at each school, by sex and grade. Average BMI is lower at Common Ground than Comparison School #2 in grades 11, 12 and overall, though this trend is not statistically significant.

Table 30. Average BMI by school, sex and grade†

Grade	Common Ground			Comparison School #2		
	Male	Female	All (SD)	Male	Female	All (SD)
9 th	27.5	27.2	27.4 (9.7)	27.7	26	26.5 (7.8)
10 th	26.9	25.4	26.1 (6.5)	23.1	24.8	24.1 (9.2)
11 th	22.9	23.9	23.4 (5.5)	26.1	27.1	26.6 (5.6)
12 th	24	28.7	26.3 (7.9)	27.7	30.2	29.7 (6.3)
All	25.8	25.9	25.9 (7.4)	25.7	26.1	26.4 (8.0)

†BMI means are not significantly different across schools by grade

Figure 5 shows average BMI by grade and school graphically.

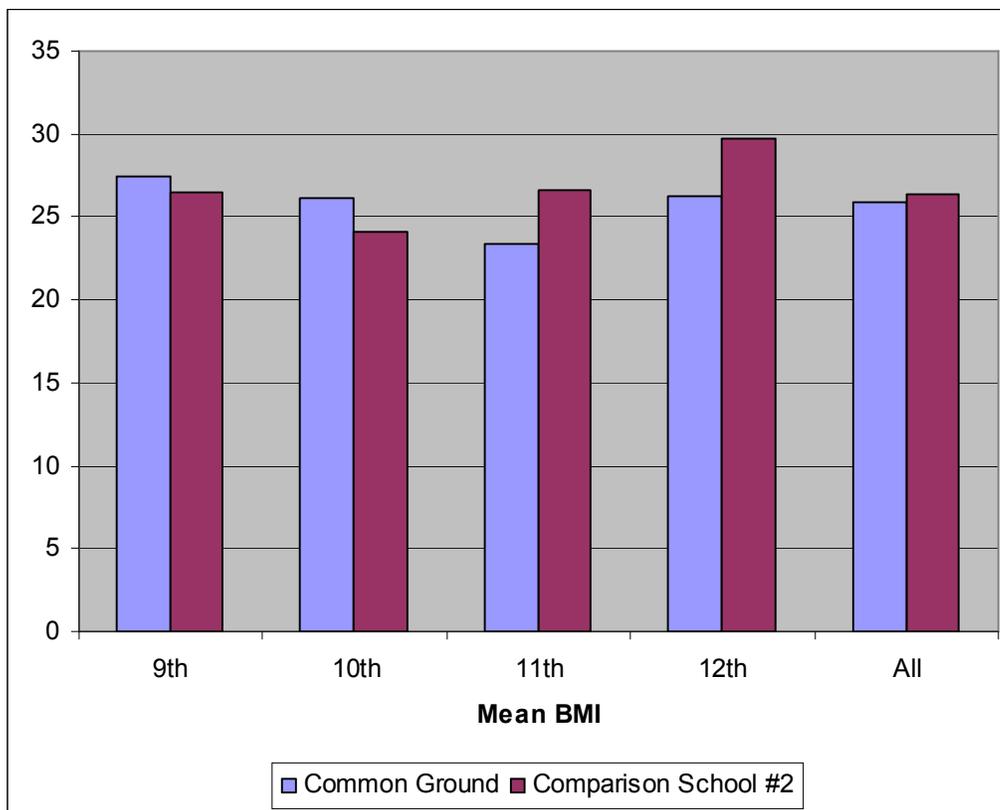


Figure 5. Average BMI by grade and school

In children and adolescents, BMI is only useful when compared to standard percentiles by age and sex. The CDC has developed weight categories based on average percentiles [19]. Children with BMI greater than the 95th percentile for age and sex are characterized as “obese.” Children with BMI between the 85th and 95th percentile for age are considered “overweight”. Children with “normal weight” are between the 5th and 85th percentiles. Children with BMI below the 5th percentile are considered “underweight”.

Table 31 and **Error! Reference source not found.** present the weight categories of male and female students from the Common Ground and Comparison #2 schools. There is a close to significant interaction ($p= 0.0622$) for weight category by grade and

school. Students at Comparison School #2 tend to have higher BMI in higher grades, whereas BMI at Common Ground tends to stay the same across grades.

Table 31. Percentages of students in each weight category*

		9th grade		10th grade		11th grade		12th grade		All	
		#	%	#	%	#	%	#	%	#	%
Common Ground	Underweight	0	0%	0	0%	2	10%	0	0%	2	2%
	Normal wt.	13	54%	22	47%	15	71%	9	64%	59	56%
	Overweight	1	4%	9	19%	2	10%	2	14%	14	13%
	Obese	10	42%	16	34%	2	10%	3	21%	31	29%
Comparison School #2	Underweight	1	2%	1	3%	2	7%	0	0%	4	3%
	Normal	23	50%	23	62%	13	46%	11	48%	70	52%
	Overweight	5	11%	4	11%	3	11%	4	17%	16	12%
	Obese	17	37%	9	24%	10	36%	8	35%	44	33%

*ANOVA shows $p = 0.0622$ for weight category by school and grade

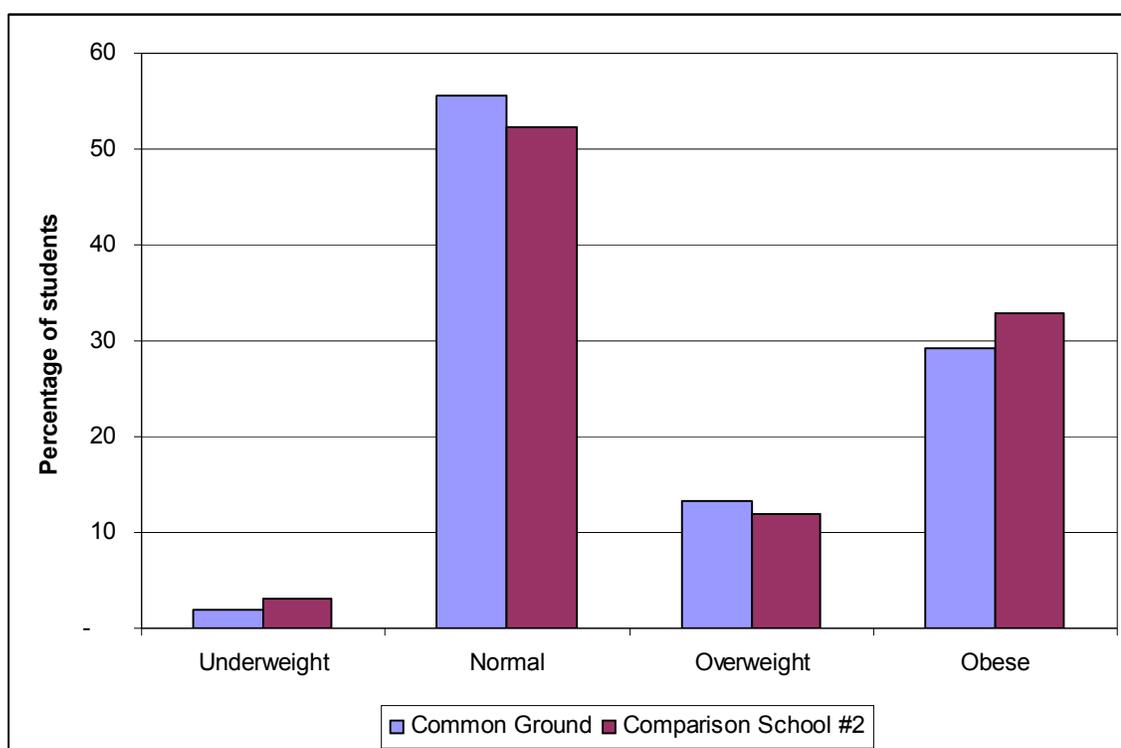


Figure 6. Percentage of students in each weight category by school

Discussion

This discussion attempts to synthesize and explain the qualitative and quantitative results of this study, and provide practical recommendations related to incorporating school gardens and school lunches with fresh ingredients into public schools. First, the initial hypotheses are evaluated according to the results obtained. Then, important aspects of the Common Ground curriculum and key impacts on nutrition attitudes, knowledge and behaviors are described. Limitations of this study are discussed, with recommendations for future research. Finally, recommendations, drawn from the lessons learned from this study, are offered for implementing garden-based curricula and healthy school lunch programs in schools and school systems.

Evaluation of hypotheses

The initial design of this study attempted to evaluate the overarching hypothesis, “A garden-based high school curriculum positively impacts the nutrition knowledge, attitudes, behaviors and health outcomes of participating urban youth.” Below, the five specific, testable hypotheses are evaluated according to the results obtained. Possible explanations for why results differed from the proposed hypotheses are elaborated in the sections that follow.

Hypothesis #1:

Youth attending the Common Ground school have more knowledge of nutrition, and healthier attitudes and behaviors related to food than youth attending other schools with similar demographics.

It is clear from the focus groups and in-depth staff interviews that Common Ground has positively influenced students’ nutrition knowledge, attitudes and behavior.

The survey data was less robust than the focus group data, largely due to the small number of students that completed the surveys in both the Fall and the Spring. It seems that students are impacted differentially, with only some students making large changes. Impacts on individual students were captured better in the focus groups than in the surveys.

Hypothesis #2:

Over the course of the school year, students at Common Ground High School gain nutrition knowledge and their food attitudes and behavior become healthier. The change over the course of the year is greater at Common Ground than comparable high schools without a garden-based curriculum.

The surveys aimed to capture changes in students' nutrition attitudes, knowledge and behaviors over the course of the school year. The small number of students that completed the surveys in both the Fall and the Spring, and the short amount of time between the two survey administrations made it difficult to capture many changes. However, in some areas, students at Common Ground did demonstrate positive changes. Specifically, students' knowledge related to the food system and where food comes from seems to have grown. In addition, the survey data showed that students were eating more vegetables at school in the Spring than in the Fall, and overall more students were reaching the recommended number of servings of fruits and vegetables per day. These results, however, were not statistically significant.

Hypothesis #3:

Students in their senior year at Common Ground High School have more nutrition knowledge and healthier food attitudes and behaviors than students in their freshman

year. The difference is greater at Common Ground than at comparable high schools without a garden-based curriculum.

Differences in nutrition knowledge, attitudes and behaviors between freshmen and seniors were not fully evaluated because of the small number of seniors that completed surveys at the three schools. The BMI data suggests, however, that Common Ground students gain less weight during their four years in high school than students at other schools.

Hypothesis #4:

Youth attending Common Ground are more likely to taste and eat vegetables than youth attending comparable high schools without a garden-based curriculum. This likelihood increases as students spend more time at Common Ground. The likelihood that students will taste and eat an unfamiliar vegetable increases if the vegetable is grown in the garden.

Findings from the cafeteria observations do not support this entire hypothesis. Students at Comparison Schools ate more of the familiar vegetables (carrots and green salad) than students at Common Ground. Students at Common Ground did eat more of the unfamiliar vegetable that was grown in the garden (kale) than students at the Comparison Schools. These results are explained in detail below.

Hypothesis #5:

Mean BMI and the percentage of overweight students are lower among students at Common Ground High School than among students at comparable schools without a garden-based curriculum.

Common Ground students did have lower average BMI than students at Comparison School #2, though this result was not significant. There were also more students in the normal weight category at Common Ground than at Comparison School #2. The most significant result ($p = 0.0622$ by ANOVA) was the trend that BMI at Common Ground did not increase for students from 9th to 12th grade, while BMI at Comparison School #2 did.

The Common Ground curriculum

Common Ground has been able to focus on improving the health of its students because it has committed to it at the level of its mission statement. From the program evaluation, there are two main features of Common Ground that distinguish it from other schools. One is the garden-based curriculum; students are required to complete coursework related to food in which they are actively learning in the garden. Some students choose to spend additional time in the garden, either through Youth Crew or the after-school program.

The second main difference between Common Ground and other schools is the lunch program. Students are routinely served food made from fresh ingredients, as much as possible from the garden. The students at Common Ground are exposed to a variety of new foods, which are in large part healthier than the foods to which they are accustomed to eating. Accordingly, each lunch period is educational in that it exposes children to healthy eating.

Beyond the garden and lunch programs, nutrition education is thoroughly integrated into the curriculum and school culture at Common Ground. Students are as

likely to learn about nutrition during informal interactions with teachers in the cafeteria as they are during class.

Impacts on nutrition attitudes

Data from the focus groups and surveys support that some students at Common Ground develop healthier attitudes about food, particularly in regard to the food system and where their food comes from. Common Ground students spoke eloquently in the focus groups about how the curriculum has altered their views about food. The process of slaughtering chickens, in particular, was a very powerful experience for many students.

Some students at the comparison schools also value nutrition and food source, and there were often no significant differences in the answers to the survey questions. Though this may be partly due to small sample size, it is important to recognize that many students at the comparison schools desired more healthy and fresh food in their cafeterias. The notion that inner-city youth do not like vegetables or value health and nutrition did not hold true for many students interviewed and surveyed in this study.

Students generally have very strong opinions about food, and one of the most important themes that emerged in this study is that students desire control over the food that they eat. Accordingly, students value involvement in the production of school food, tasting new foods, and access to the process of deciding what is served in the cafeteria. Rules such as requiring students to take a vegetable were not popular, though some students acknowledged their importance. In the Comparison Schools, lack of food choices and influence over what is served was very frustrating to students. Common

Ground students have greater control over what they eat at school, which will hopefully translate into more adventurous and healthier eating.

Impact on nutrition knowledge

In terms of nutrition knowledge, Common Ground students did not do significantly better than students at Comparison School #1 answering questions derived from USDA surveys related to nutritional content of specific foods and food groups. Students at Common Ground did do better answering questions about the food system, such as the definition of organic and the importance of the environment. This is likely because nutrition education at Common Ground is focused on broad concepts such as where food comes from and how it affects humans and the environment, rather than detailed curricular content about the nutritional content of different foods. Though traditional nutrition education focuses on providing information about food groups and micronutrients, there is little evidence showing that providing this type of information actually changes the way people eat. Common Ground's more holistic approach to examining nutrition and food systems may be more effective in changing behavior. Further research is needed to examine these questions.

A key difference between Common Ground and comparison schools is the sources of students' nutrition knowledge. While students at all the schools mentioned media, healthcare providers, and family as sources of nutrition knowledge, students at Common Ground received much more nutrition information at school. Students describe interactions with teachers, working in the garden and with the animals, and tasting new foods as important factors in increasing their nutrition knowledge. In contrast, students at comparison schools said they were not learning much about nutrition in their health class.

The educational approach of integrating nutrition education throughout the curriculum in an experiential way seems to be effective at Common Ground.

Impact on nutrition behaviors

From the surveys and focus groups, it was clear that students at Common Ground eat more fruits and vegetables at school than students at other schools. It is unclear, however, if the curriculum impacts student eating behavior outside of school. Some students asserted in the focus groups that their eating habits indeed have changed since starting school at Common Ground, both inside and outside of school. Students seem to be impacted differentially, however, with some students making drastic changes and others not changing at all. These types of individual changes were difficult to capture with the surveys, especially given the small sample size. The importance of school nutrition is clear; a higher percentage of students at Common Ground reach five recommended servings of fruits and vegetables per day even though students at Comparison School #2 eat more fruits and vegetables outside of school, according to the surveys.

Students asserted in the focus groups that factors such as cost, convenience, media and what other people are eating have strong impacts on their behavior. These influences can largely explain why students have difficulty applying nutrition information that they learn in school to eating decisions they make in the outside world. It also demonstrates the importance of creating a nutrition environment within schools that is conducive to healthy eating. Since many students in public schools eat both breakfast and lunch at school, school food is a very important source of their overall nutrition. When school food is of poor quality or poor value, students do not eat, or eat very little. Students then

turn to whatever food is available (usually unhealthy) when the school day is over. Alternatively, when school food is fresh, healthy, good quality, low cost or free, culturally appropriate, and there are sufficient choices, then students' overall nutrition is improved.

An important result from the surveys to highlight is that students at Common Ground do not engage in more harmful strategies to lose weight than students at the other school. From the focus groups, it seems that "dieting" is one of the only strategies that students at other schools know to achieve or maintain a healthy weight. An emphasis on dieting can lead to harmful behaviors such as fasting, eating unbalanced meals, purging, etc. Common Ground's holistic focus on healthy eating, instead of dieting, is possibly why students do not engage in harmful behaviors to lose weight.

Cafeteria observations

The results from the cafeteria observations were not consistent with the hypotheses generated at the beginning of this study. The expected result was that Common Ground students would eat more vegetables than students at comparison schools, and that they would increase their consumption more than the other students over the course of the school year. The actual results diverged from this expectation. The discussion below attempts to explain the unexpected results, drawing upon data from the qualitative parts of this study when possible.

Carrots

The most striking result from the carrot observation is that students at the Comparison Schools ate more carrots than at Common Ground in both the Fall and the Spring. There are several possible explanations for this. First, carrots are a familiar

vegetable to many adolescents. Accordingly, students at the Comparison Schools, who are not usually served fresh vegetables, may have been eager to eat them when presented with the opportunity. Indeed, from the focus group and survey data, students at Comparison Schools desire more fresh vegetables in the cafeteria. At Common Ground, however, students are presented daily with a choice of 2-3 vegetable dishes, so that the carrots may not have been as unusual, and therefore not as desirable. An additional factor was that the type and quality of the carrots were different at Common Ground. In the Fall, the carrots were organic sliced carrots grown in the school's garden. The carrots were unpeeled, and several students were observed saying the carrots were "dirty". In this case, the appearance and unfamiliarity of the vegetables, cited as an important factor in the focus groups, outweighed students' preference for vegetables they grew themselves. The store-bought carrots served at the other two schools were the uniform, lathed baby carrots that they may have been accustomed to eating. Lastly, blue cheese dressing was available at Comparison School #2 in the Fall, whereas it was not available for the carrots at Common Ground and the other Comparison School. Salad dressing was available at all three schools in the Spring. When available, students were observed eating carrots with generous portions of dressing.

Kale and Collards

In the Fall, students at Common Ground ate significantly more kale than the students at the Comparison Schools. Since kale is generally an unfamiliar vegetable to high school students, this result indicates that Common Ground students are more likely to eat and try an unfamiliar vegetable that is grown in their garden. Kale was in season during the Fall observation, and therefore Common Ground students were exposed to the

vegetable through their work in the garden. Students at the other schools were not as likely to try this vegetable. The results were complicated, however, by the fact that the kale served at Common Ground was cooked with turkey. Though the turkey was not visible, students may have been more likely to try and eat the kale due to the meat flavor. This is in accordance with students' stated preference in the focus groups for vegetables with "flavor" or "seasoning" added.

In the Spring, students at Common Ground ate fewer collard greens than they ate kale in the Fall. There are several possible explanations for this. The first is that the curriculum did not encourage students to eat more vegetables; it may have discouraged them. More likely, students may not have eaten the collards because they were not from the school's garden. Nearly all the vegetables served in the Spring at Common Ground are externally sourced; the collards were frozen. In the focus groups, Common Ground students stated a preference for vegetables sourced from their garden versus those externally sourced. The lack of meat cooked with the kale in the Spring may have also played a role. Notably, students at the Comparison Schools either ate more vegetables in the Spring or the same amount as in the Fall, suggesting that they are not influenced by what is in season. In addition, collard greens are a generally familiar vegetable among African-American populations. Given the importance of cultural preferences described in the focus groups, students at these schools may have been more open to eating the collard greens in the Spring than the unfamiliar kale in the Fall.

Salad

The most striking aspect of the salad results was that students at the Comparison Schools ate significantly more salad in both the Fall and the Spring. The main conclusion

that can be drawn from this result is that students who are not usually served fresh salad will eat it if served. At the Comparison Schools, fresh vegetables are not usually served, so students were eager to try a simple, familiar salad. The students at Common Ground are required to take one vegetable option every day, and salad is usually included as one of the options. Even on observation days students had the option to choose between two vegetable options, which may have artificially decreased the amount of vegetables that students ate on those days, since only salad was counted.

Additionally, the salads served at the Comparison Schools were of a different quality and appearance (romaine lettuce instead of green leaf lettuce), which may have affected the results. Sometimes students are hesitant to try vegetables from the garden because they appear different from those to which they are accustomed. For example, a teacher at Common Ground stated, “Some kids, they’re just never going to try anything different.”

It is important to consider that the requirement to take a vegetable may have the adverse effect of discouraging students to eat it. Data from the focus groups support that some students at Common Ground are against the rule requiring them to take a vegetable, as one student says, “It feels like they’re trying to force us.” Knowing they were being observed, students may have actively decided not to eat the salad in part to protest the rule. This idea is supported by the fact that teachers and kitchen staff notice that many students do in fact eat salad when they are not being observed. A Common Ground teacher described how students have eaten more salad over time, “Once they would start trying it, they would really like it, and we would go from being able to serve a tiny bowl

of salad each lunch period to being able to serve one of those giant bowls and go through the whole thing.”

There was little change at any of the schools in terms of salad consumption between the Fall and the Spring. At Comparison School #2, there were no cucumbers in the salad in the Spring, as there were in the Fall, which may account for the slight dip in salads tasted or eaten. When available, some students ate cucumbers and left the rest of the salad. At Common Ground and Comparison School #1, students seemed unaffected by seasonality, curriculum, or exposure to vegetables over the course of the year. Perhaps salad was familiar enough to the high school students in the Fall that they were not influenced to eat more over the course of the school year. Their preferences seem to have been set. Additionally, salad was the last of the three Fall observations, occurring at the end of October, such that students may have already been influenced by the school environment and curriculum. Thus, less change was observed over the course of the school year.

In summary, students at the Comparison Schools were observed to eat more of the familiar vegetables (carrots and salad) than at Common Ground, though less of the unfamiliar vegetable (kale). This shows that many students who are not usually served fresh vegetables will eat them if served, especially if familiar. Students at Common Ground however, are presented daily with choices of vegetables, and seem to be influenced by the appearance of the vegetable, and seasonality. Uncontrollable variability in the lunch menus and quality of vegetables served makes direct comparison among schools and between Fall and Spring difficult. However, the following

recommendations are drawn from the experience of conducting the observations and the data collected.

Body mass index outcome

The BMI data collected at Common Ground and at Comparison School #2 represents a snapshot in time of students' height and weight. Since many factors contribute to BMI, including behavior (diet, exercise), environment, culture and genetics [20], it is difficult to attribute any differences in BMI outcomes between the schools exclusively to the food curriculum at Common Ground. However, given the lower socioeconomic status of the students at Common Ground, evidenced by higher proportion of students eligible for free or reduced lunch, Common Ground students should be at higher risk for obesity. [21] Instead, average BMI as well as percentage of students in overweight and obese categories for age were lower in the study versus comparison group, though these results were not statistically significant.

Even more significantly, Common Ground students did not follow the pattern seen in the comparison school as well as in national trends of increasing BMI from 9th to 12th grade. While 9th grade students in both schools had similar BMIs, the 12th grade students at Common Ground had significantly lower BMI than the 12th grade students at the comparison school. Since the characteristics of the students enrolled at each school have likely not changed in four years, much of this gain could be attributed to the Common Ground curriculum. In order to confirm this observation, it would be useful to follow BMI in this cohort of students over time.

The result that students at Common Ground have a healthier BMI than students at the comparison school has large implications. It shows that school nutrition and a garden-based curriculum can have important effects on population health. As described in the introduction, the childhood obesity epidemic has expensive and life-shortening consequences in US society. The impact on BMI of the garden-based curriculum and lunch program at Common Ground is evidence that similar interventions should be adopted widely in school systems.

Limitations and future research needs

The major limitation to this study was that the schools studied were all small, approximately two hundred students each. Thus, even though there was a good response rate to the surveys, there were only a small number of students that completed surveys in both the Fall and the Spring. Also, no freshmen at Comparison School #2 completed surveys in the Spring, and the sophomore class at Comparison School #1 completed surveys in the Fall only. Many of the survey results were not significant because of these small numbers. However, since only the students who completed the surveys in the Fall and the Spring were included, there was no need to adjust for differences between the two groups. It is possible that the time lapse from Fall to Spring was not long enough to see changes in the students. It would be useful to survey the same students in the future, and look for changes over a longer period of time.

A key result is that students seem to be impacted differentially by the curriculum at Common Ground. While some students internalize the messages about food and nutrition and make large changes to their behavior, the attitudes and habits of other students are a lot more difficult to change. One observation mentioned in a staff

interview is that students who spend more optional time in the garden may internalize the environmental and health messages more deeply than students who only participate in the required courses. Additional research should look specifically at the impact of participating in the Youth Crew, to see if these students are impacted differentially.

The focus group data provided very useful insight into the attitudes, knowledge and behaviors of students. New themes emerged in the groups that were not initially surveyed. Future surveys could try to gather quantitative data about focus group themes such as the importance of control, skipping meals, and sources of nutrition knowledge.

Implications and recommendations

In New Haven, CT, in particular, school nutrition has become a prominent topic in the public discourse. In Spring 2008, employees of the public school food service contractor went on strike, protesting the poor quality of the food. [22] Since then, the Board of Education, along with other key stakeholders, has been discussing solutions for how to offer fresh, healthy food in the public schools. When the food service contractor decided to leave in the Summer of 2008, New Haven decided to run the food service internally, as it has done in the past. Though preparing for the 2008-2009 academic year was clearly a challenge, the City viewed it as an opportunity to commit to serving fresh and healthy school food. The first step was to hire a new food director who is committed to bringing fresh, local food to New Haven public schools. [23] The discussion that has ensued about how to implement this goal will likely continue for years into the future. Common Ground High School has the potential to serve as a model for the rest of the city, as well as for schools around the country, in terms of its garden and lunch program.

The curriculum at Common Ground is a natural “experiment” in serving fresh, local and organic food to students, with students participating directly in food production. The Common Ground project will likely grow and develop, since Connecticut Health and Educational Facility Authority recently granted the school \$100,000 for renovations and equipment for a community kitchen. [24] Hopefully, the results of this study will serve to strengthen the educational program at Common Ground. In addition, lessons learned will be shared with the Board of Education, thus informing the changes underway throughout the city. The recommendations below attempt to summarize the key results of this study in a way that is applicable to schools and school systems that are attempting to improve the nutrition of their students through school food.

1. *Serve fresh vegetables.* Perhaps one of the most striking results from this study was that a large proportion of students unaccustomed to eating fresh vegetables in school ate vegetables when served as part of regular school lunches. This refutes the commonly-held belief that inner-city students will refuse vegetables if offered. It perhaps reflects the trend that messages of eating healthy food are pervading society as a whole, even reaching traditionally marginalized populations such as low-income and minority youth. It also is perhaps a statement on the paucity of fresh vegetables and poor quality of school lunches commonly served in public schools; when students are served fresh vegetables, they eat them.

2. *Appearance, preparation and quality matter.* Students are influenced by the appearance of vegetables. For example, they prefer peeled carrots to unpeeled. Freshness, and, for Common Ground students, seasonality, also play a role. In the focus

groups, students at all schools described the importance of knowing where their food comes from, and the importance of preparing food well.

3. *Offer healthy choices.* It is clear from the focus groups that students value choice. Common Ground's practice of offering multiple vegetable options seems to have gained acceptance among the students. Students complained about the rule requiring them to take a vegetable, and it is unclear based on this research if this rule results in higher vegetable consumption.

4. *Invest in healthy school food.* Cost is important both for students deciding what to eat and for school systems planning their cafeteria menus. Many of the improvements in school food that students and staff desire – better quality, fresh ingredients and better preparation – would require increased spending. This would require a shift in spending priorities at the societal scale. Especially given Common Ground students' healthier BMI outcomes, the public health benefits of providing better nutrition and nutrition education in schools would likely recover societal costs in the long term.

5. *Start young.* Though Common Ground is able to positively impact some students' eating attitudes and behaviors, it is clear that some students' preferences are formed before they arrive in high school. Students cite the importance of family, media, culture and peers in defining their tastes and behaviors. Therefore, interventions should begin before high school.

6. *Involve students and staff in decision-making.* A strong message heard in the focus groups and staff interviews was that the lack of control over what was served in the cafeteria is frustrating for students and staff. In addition, any changes made in school

food service would likely be more widely accepted if students and staff are involved in the process of change.

7. *Involve students in food production.* Though further research is necessary, the Common Ground curriculum of involving students in food production seems to have improved the knowledge and attitudes of students about food and nutrition. Students seem to be impacted differentially, with some able to make changes in their eating behavior, while others have difficulty applying attitudes and knowledge to behavior change.

8. *Create enabling policies.* Common Ground is able to allocate resources to its school lunch program because it has committed to promoting health at the level of its mission statement. Other schools are constrained because health promotion is not considered a core purpose of the school. Creating wellness policies at the school, district, state or federal level may be necessary to create changes in school lunch programs and nutrition curricula.

9. *Work inside and outside of schools.* School is an effective place to improve the nutrition of children and adolescents, both through educational curricula and serving healthy food in the cafeteria. Many students in the schools studied rely on school food for two of their daily meals. Though school interventions are effective and necessary, outside factors such as family, culture, media, cost, convenience and availability have strong influences on student knowledge, attitudes and behavior. Physicians and educators should become advocates for change in the nutrition environment at a societal scale.

Appendix A. Staff interview guide

- How is food and nutrition taught at your school?
- What are the goals of the programs?
- What is the impact on the students?
- Tell me about your school.
 - o What do you like about it?
 - o What don't you like about it?
- Tell me about the food at your school
 - o What is available?
 - o What do you usually eat?
 - o What do you like about the food?
 - o What would you change?
 - o Does it taste good?
 - o Is it healthy?
 - o How common is it for students bring food from outside or home?
- Tell me about what you learn in class about food and nutrition
 - o Which classes?
 - o Have they changed the way you eat?
 - o Tell me about physical education at your school.
 - o How active are you?
- What do you eat at home?
- What do you eat with your friends?
 - o Do you eat with kids from other schools?
 - o Do you eat the same things as kids from other schools?
- What is good food?
 - o What tastes good?
 - o What is healthy?

Appendix B. Student focus group interview guide

Introduction

Purpose of this study – I am conducting a study to see how a school food program impacts a student’s health and eating behaviors/attitudes. The ultimate goal is to improve the food at your school and help students be healthier.

Purpose of the focus group – The purpose of this group is to hear your honest opinions about the food at your school and the classes that have to do with food and nutrition. I also want to get a sense of what you like to eat and why. What you tell me will help improve the food and food curriculum at your school.

Confidentiality – Everything you say will be completely anonymous, which means I will never share who said what outside of this room. I won’t tell your teachers, parents, principal, etc. I would like each of you to do the same – what you say in this room stays in this room. I won’t write your names in any paper or report. I may share some of the things you say without your names. I am recording the conversation to help me remember what you say. The tape itself will be destroyed once it is typed anonymously. I encourage you to be as open as possible, and tell me what you really think.

Ground Rules

1. *Confidentiality* – please do not share what is said in this room with others. If you would like to talk about the experience or what people said, do not attach names. I will do the same.
2. *Respect* – Just as in your classrooms, I want everyone to feel respected and comfortable in this group. Please listen respectfully and do not make fun of anything that anyone says.
3. *Give everyone a chance to speak* – We have about an hour to talk, which means that everyone should have about 10 minutes total to talk. Be aware of how much you are talking. Do not interrupt. If you would like to talk but can’t get a word in, raise your hand and I will call on you. You don’t always need to raise your hand. I trust that you can give each other the space to talk.
4. *Say anything* – I am hoping to find out exactly what you think. Please be honest and don’t hold back your opinion.

Interview Questions

1. The first question is just to give you a chance to get used to talking in the group. Please go around and say what grade you're in, and how long you have been at this school. Also tell me one thing that you like about your school, and one thing that you don't like.
2. This question is to get a sense of what you eat and why. Think about the weekend. What do you eat on a typical Saturday or Sunday?
 - a. How do you decide what to eat? (prompts: taste, health, cost, where it comes from, what's available, what others are eating)
 - b. *Who do you eat with?*
 - c. *Where do you eat?*
 - d. *What do you eat at home?*
 - e. *What do you eat with your friends?*
 - f. *Do you eat with kids from other schools?*
 - g. *Do you eat the same things as kids from other schools?*
3. If your school cafeteria served whatever you wanted, what would it be? What would be your ideal school lunch?
 - a. What food tastes good?
 - b. What is a healthy lunch?
 - c. Does it matter where it comes from?
4. Tell me about the food at your school
 - a. What is available?
 - b. What do you usually eat?
 - c. What do you like about the food?
 - d. What would you change?
 - e. Does it taste good?
 - f. Is it healthy?
 - g. Where does it come from?

- h. How common is it for students to bring food from outside or home?
 - i. Is there anywhere you can get food besides in the cafeteria?
- 5. Do you have classes that have to do with food or nutrition? Tell me about them.
 - a. What have you learned in these classes?
 - b. Have they changed the way you eat?
- 6. Is there anything else you would like to tell me about your school, food, health, something you would like to change, etc?

Appendix C. Survey

Student Questionnaire: Food Behavior, Knowledge and Attitudes

ID: _____

Instructions: Please mark your response.

1. Are you female or male?
 Female Male

2. What is your race?
 Caucasian (White)
 African American
 Hispanic
 Asian
 Native American
 Other _____

3. How old are you? _____

4. How tall are you? _____ feet _____ inches

5. How much do you weigh? _____ lbs

6. How many years have you attended this high school?
 This is my first year
 This is my second year
 This is my third year
 This is my fourth year
 This is my fifth year

We now have some questions for you to complete. Remember:

- ☺ This is not a test!
- ☺ Read each question carefully, and think about it before you choose an answer.
- ☺ Choose only one answer for each question unless you are asked to choose more than one.
- ☺ It is OK to mark “Don’t Know” if you really don’t know the answer.
- ☺ Try not to skip any questions.
- ☺ If you have any questions about this questionnaire, ask your teacher.

Thank you for participating!

During the past 7 days, how many times did you eat or drink the following OUTSIDE of school? Think about all the meals and snacks you had from the time you got up until you went to bed for the last week. Be sure to include food you ate at home, at restaurants, or anywhere else EXCEPT school.

FOOD ITEM	I did not eat or drink this outside of school during the past 7 days	1 to 3 times during the past 7 days	4 to 6 times during the past 7 days	1 time per day	2 times per day	3 times per day	4 or more times per day
Fruit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Salad	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Carrots	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vegetables other than salad or carrots	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Yogurt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fried chicken	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chicken (not fried)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fish	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Beef	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pork or ham	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Beans	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Milk	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Soft drinks (soda)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fruit juice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hamburgers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pizza	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Candy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ice cream	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cake, brownies or cookies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
French fries	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chips	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
White bread	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Whole grain bread (whole wheat, multigrain)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Brown rice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
White rice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A snack	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Breakfast at home	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dinner at home	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fast food	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Food from a garden	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Food from a vending machine	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

School _____ Grade _____ Date _____
 ID# _____

During the past 7 days, how many times did you eat or drink the following AT school? Think about all the meals and snacks you had during school time.

FOOD ITEM	I did not eat or drink this at school during the past 7 days	1 to 2 times during the past 7 days	3 to 4 times during the past 7 days	1 time per day	2 times per day	3 times per day	4 or more times per day
Fruit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Salad	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Carrots	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vegetables other than salad or carrots	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Yogurt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fried chicken	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chicken (not fried)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fish	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Beef	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pork or ham	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Beans	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Milk	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Soft drinks (soda)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fruit juice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hamburgers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pizza	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Candy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ice cream	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cake, brownies or cookies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
French fries	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chips	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
White bread	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Whole grain bread (whole wheat, multigrain)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Brown rice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
White rice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A snack	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cafeteria food	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lunch brought from home	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Food from a garden	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Food from a vending machine	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

School _____	ID# _____	Grade _____	Date _____
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Vegetable	Have you tasted the following vegetables at school and/or at home? Check all that apply.		
	I have never tasted this	I have tasted this at school	I have tasted this at home
Carrots	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Celery	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Collard greens	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Potatoes, baked	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Corn	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Peas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Kale	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tomatoes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Broccoli	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Beans (green, string, or snap)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chard	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cauliflower	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cucumber	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spinach	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bean sprouts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Radishes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Peppers (red, green or yellow)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mushrooms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bok choy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Zucchini	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Summer squash (yellow)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Butternut squash	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

How often do you buy food for yourself from the following places? Check your answer.			
FOOD ITEM	Never	Sometimes	Often
A big chain supermarket, like Shaw's or Stop and Shop	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A local supermarket	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A health food store	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A fast food restaurant	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A restaurant (not fast food)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A convenience store	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A farmers' market	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

School _____	Grade _____	Date _____
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During the past 7 days, how many days did you exercise or participate in physical activity for at least 30 minutes that made you sweat and breathe hard? (For example: basketball, soccer, running, swimming laps, fast bicycling, fast dancing, or similar aerobic activities). SELECT your answer.

0 days	<input type="checkbox"/>
1 days	<input type="checkbox"/>
2 days	<input type="checkbox"/>
3 days	<input type="checkbox"/>
4 days	<input type="checkbox"/>
5 days	<input type="checkbox"/>
6 days	<input type="checkbox"/>
7 days	<input type="checkbox"/>

During the past 7 days, how many days did you exercise or participate in physical activity for at least 30 minutes that DID NOT make you sweat and breathe hard? (For example: fast walking, slow bicycling, skating, gardening or mopping floors). SELECT your answer.

0 days	<input type="checkbox"/>
1 days	<input type="checkbox"/>
2 days	<input type="checkbox"/>
3 days	<input type="checkbox"/>
4 days	<input type="checkbox"/>
5 days	<input type="checkbox"/>
6 days	<input type="checkbox"/>
7 days	<input type="checkbox"/>

On an average weekend, how many days do you get physical exercise? SELECT your answer.

0 days	<input type="checkbox"/>
1 days	<input type="checkbox"/>
2 days	<input type="checkbox"/>

On an average weekend, how many hours do you get physical exercise? WRITE your answer.

_____ hours

On an average school day, how many hours do you watch TV? SELECT your answer.

I do not watch TV on an average school day	<input type="checkbox"/>
Less than 1 hour per day	<input type="checkbox"/>
1 hour per day	<input type="checkbox"/>
2 hours per day	<input type="checkbox"/>
3 hours per day	<input type="checkbox"/>
4 hours per day	<input type="checkbox"/>
5 or more hours per day	<input type="checkbox"/>

School _____	Grade _____	Date _____
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How would you describe your weight? SELECT your answer.	
Very underweight	<input type="checkbox"/>
Slightly underweight	<input type="checkbox"/>
About the right weight	<input type="checkbox"/>
Slightly overweight	<input type="checkbox"/>
Very overweight	<input type="checkbox"/>

Which of the following are you trying to do about your weight? SELECT your answer.	
Lose weight	<input type="checkbox"/>
Gain weight	<input type="checkbox"/>
Maintain my current weight	<input type="checkbox"/>
I am not trying to do anything about my weight	<input type="checkbox"/>

Which, if any, of the following activities have you engaged in during the past 30 days in an effort to lose, gain, or maintain weight? SELECT all that apply.	
Exercise	<input type="checkbox"/>
Eat less food, fewer calories, or foods low in fat	<input type="checkbox"/>
Reduce the amount of one type of food that you eat, such as carbohydrates	<input type="checkbox"/>
Go without eating for 24 hours or more (also called fasting)	<input type="checkbox"/>
Take diet pills, powders, or liquids without a doctor's advice (Do not include meal replacement products such as Slim Fast.)	<input type="checkbox"/>
Vomit	<input type="checkbox"/>
Take laxatives	<input type="checkbox"/>
Eat more	<input type="checkbox"/>

School _____	ID# _____	Grade _____	Date _____
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Each food item in the table belongs to a certain food group. SELECT the box that correctly matches the food group with the food item. If you do not know, select the “don’t know” box.

FOOD ITEM	BREAD	VEG.	FRUIT	MEAT	MILK	FAT/ SWEETS	DON'T KNOW
Broccoli	<input type="checkbox"/>						
Strawberries	<input type="checkbox"/>						
English muffin	<input type="checkbox"/>						
Yogurt	<input type="checkbox"/>						
Butter	<input type="checkbox"/>						
Chicken	<input type="checkbox"/>						
Fish	<input type="checkbox"/>						
Milk	<input type="checkbox"/>						
Potatoes	<input type="checkbox"/>						
Eggs	<input type="checkbox"/>						
Candy	<input type="checkbox"/>						
Tomato	<input type="checkbox"/>						
Cake	<input type="checkbox"/>						
Apples	<input type="checkbox"/>						
Cheese	<input type="checkbox"/>						
Cooked cereal	<input type="checkbox"/>						
Corn	<input type="checkbox"/>						
Soft drinks (soda)	<input type="checkbox"/>						
Beans	<input type="checkbox"/>						
Cold cereal	<input type="checkbox"/>						

Mark the number of servings from each food group that you should eat *each day*. If you don’t know, select the “don’t know” box. (For example, circle the number of servings that represent the correct number of servings you should eat each day.)

FOOD GROUP	NUMBER OF SERVINGS YOU SHOULD EAT EACH DAY	DON'T KNOW
a. Fruit group	1-2 2-3 2-4 3-5 6-11	<input type="checkbox"/>
b. Vegetable group	1-2 2-3 2-4 3-5 6-11	<input type="checkbox"/>
c. Milk group	1-2 2-3 2-4 3-5 6-11	<input type="checkbox"/>
e. Meat and beans group	1-2 2-3 2-4 3-5 6-11	<input type="checkbox"/>

School _____ ID# _____ Grade _____ Date _____

Looking at the table below, match each nutrient with the food group that is considered a high source of the nutrient. Circle the number that represents the nutrient in the blank space. (For some food groups, you will circle more than one number.)

FOOD GROUP	RELATED NUTRIENT(S)						NUTRIENTS
Bread	1	2	3	4	5	6	1-Carbohydrate
Vegetable	1	2	3	4	5	6	2-Calcium
Fruit	1	2	3	4	5	6	3-Saturated fatty acids
Milk	1	2	3	4	5	6	4-Fiber
Meat	1	2	3	4	5	6	5-Vitamins and Minerals
Fat and oil	1	2	3	4	5	6	6-Protein

Which of the following health problems are associated with the following dietary behavior? Match the health problem listed below with the associated dietary behavior by circling the number of the health problem in the space provided. Circle the corresponding number, or 6 if you don't know.

DIETARY BEHAVIOR	RELATED HEALTH PROBLEM						HEALTH PROBLEMS
Eating too much sugar	1	2	3	4	5	6	1-Osteoporosis
Not consuming enough calcium	1	2	3	4	5	6	2-Heart disease/stroke
Eating too much cholesterol and saturated fats	1	2	3	4	5	6	3-Obesity
Eating too much salt or sodium	1	2	3	4	5	6	4-High blood pressure
Eating too many calories	1	2	3	4	5	6	5-Tooth problems
							6-Don't know

Which health problems are associated with being overweight?

a. Type 2 diabetes	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Don't know <input type="checkbox"/>
b. Osteoporosis	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Don't know <input type="checkbox"/>
c. Heart disease	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Don't know <input type="checkbox"/>
d. Anemia	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Don't know <input type="checkbox"/>

In each row below, check the food that is healthier for you.

<input type="checkbox"/> White bread	<input type="checkbox"/> Whole wheat bread	<input type="checkbox"/> Don't know
<input type="checkbox"/> Brown rice	<input type="checkbox"/> White rice	<input type="checkbox"/> Don't know
<input type="checkbox"/> Spinach	<input type="checkbox"/> Iceberg lettuce	<input type="checkbox"/> Don't know
<input type="checkbox"/> Saturated fat	<input type="checkbox"/> Unsaturated fat	<input type="checkbox"/> Don't know

What does "organic" mean? WRITE your answer. If you don't know, write "Don't know."

School _____	Grade _____	Date _____
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Vegetable	Mark the answer that best describes your opinion of the following vegetables:			
	I have never tasted this 	I don't like this 	I like this a little 	I like this a lot 
Carrots	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Celery	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Collard greens	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Potatoes, baked	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Corn	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Peas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Kale	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tomatoes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Broccoli	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Beans (green, string, or snap)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chard	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cauliflower	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cucumber	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spinach	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bean sprouts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Radishes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Peppers (red, green or yellow)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mushrooms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bok choy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Zucchini	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Summer squash (yellow)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Butternut squash	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

For each of the following statements, please indicate how much you disagree or agree with the statement.					
STATEMENT	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
It is hard to figure out what to eat in order to be healthy and prevent obesity	<input type="checkbox"/>				
Biology and genetics affect how much people weigh	<input type="checkbox"/>				
Most fast food tastes good	<input type="checkbox"/>				
Seeing other kids eat healthy foods makes me more likely to eat them	<input type="checkbox"/>				
Managing weight and preventing obesity takes a lot of effort	<input type="checkbox"/>				
Buying organic food is better for the environment	<input type="checkbox"/>				
I am concerned about the obesity epidemic in the U.S.	<input type="checkbox"/>				
My school makes it hard to eat healthy foods	<input type="checkbox"/>				
Most of the food I eat at home is nutritious and healthy	<input type="checkbox"/>				
Fast food is mostly unhealthy	<input type="checkbox"/>				
Vegetables grown locally taste better than vegetables that come from farther away	<input type="checkbox"/>				
Healthy eating is a matter of personal responsibility	<input type="checkbox"/>				
It is easier to eat healthy food when there is no junk food around	<input type="checkbox"/>				
I eat what I want without thinking about nutrition	<input type="checkbox"/>				
I make an effort to eat healthy and nutritious foods	<input type="checkbox"/>				
If people are overweight, it is usually because they eat too much or don't exercise	<input type="checkbox"/>				
I like to eat vegetables	<input type="checkbox"/>				
Seeing other kids eat fast food makes me more likely to eat it	<input type="checkbox"/>				
Buying food that is produced locally is better for the environment	<input type="checkbox"/>				
Fresh foods are more nutritious than processed foods	<input type="checkbox"/>				
I like to eat meat	<input type="checkbox"/>				
Advertising contributes to people's preferences for unhealthy foods	<input type="checkbox"/>				
The high cost of healthy foods, compared to unhealthy foods, contributes to obesity	<input type="checkbox"/>				
Child and adolescent obesity is a major problem in the U.S.	<input type="checkbox"/>				

School _____	ID# _____	Grade _____ Date _____
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STATEMENT	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Eating fast food can make a difference in my chances of getting serious illnesses like heart disease or cancer	<input type="checkbox"/>				
I like knowing where my food comes from	<input type="checkbox"/>				
Some people will never become overweight, regardless of their eating or exercise habits	<input type="checkbox"/>				
Vegetables grown locally are healthier than vegetables that come from further away	<input type="checkbox"/>				
Americans are more overweight now than before	<input type="checkbox"/>				
My family eats healthy food	<input type="checkbox"/>				
Taking care of the environment is important to me	<input type="checkbox"/>				
Living in an environment that makes exercise and physical activity easier helps to prevent obesity	<input type="checkbox"/>				
I am likely to buy organic food even if it costs more	<input type="checkbox"/>				
My school offers lots of healthy options	<input type="checkbox"/>				
I like to eat fast food	<input type="checkbox"/>				
I wish my school provided more healthy choices for foods and drinks	<input type="checkbox"/>				
My health depends on the environment	<input type="checkbox"/>				
I generally pay attention to the nutrition facts on the foods I eat	<input type="checkbox"/>				
My friends do not eat healthy food	<input type="checkbox"/>				
Taking care of my body is important to me	<input type="checkbox"/>				
Fast food is a good value for the price	<input type="checkbox"/>				
I am likely to buy food produced locally even if it costs more	<input type="checkbox"/>				
The types of foods that are available plays a role in whether people become overweight	<input type="checkbox"/>				
Restaurants should have nutrition information on the menus	<input type="checkbox"/>				
Organic food is healthier than conventional food	<input type="checkbox"/>				

End of survey. Thank you!

Appendix D. Student focus group coding themes

I. Attitudes

1. Attitudes about food
 - a. Quality
 - b. Appearance
 - c. Familiarity
 - d. Taste/flavor
 - i. Hot sauce
 - ii. Sweet
 - iii. Seasoning
 - e. Preparation
 - f. Variety
 - g. Value/portion size
 - h. Source
 - i. Knowing source/trust
 - ii. Organic/chemicals
 - iii. Fresh
 - iv. Frozen
 - v. processed –
 - vi. killing animals
 - i. Health
 - i. Healthy food
 - ii. Unsafe food
2. Attitudes about nutrition and health
 - a. Body image/weight
 - b. Difficult to be healthy
 - c. Important to be healthy
 - d. Balance
3. Attitudes about school food
 - a. Negative
 - b. Positive
 - c. Other schools
4. Importance of control
 - a. Access to decision-makers
 - b. Activism
 - c. Participation in preparing food
 - d. Choice
 - e. Rules
 - f. Tasting new foods

II. Knowledge

5. Health/nutrition knowledge
 - a. Nutrition labels
 - b. Nutrients

- c. Calories
- d. Food additives
- a. Diseases related to diet
- b. Genetics/biology
- 6. Sources of health/nutrition knowledge
 - a. Family
 - b. Peers
 - c. School/teachers
 - d. Media
 - e. Healthcare provider
- III. Behavior
 - 1. Food Behaviors
 - a. Skipping meals
 - b. Snacking
 - c. Dieting
 - d. Balance/compromise
 - e. Sleep/energy
 - f. Eating out/fast food
 - g. Eating at home with family
 - h. Bringing food from home or outside
 - 7. Physical activity
 - a. At school
 - b. Outside of school
 - 8. Influences on behavior
 - a. Friends
 - b. Family
 - c. Culture
 - d. Mood
 - e. Cost
 - f. Institutional factors
 - i. Equipment
 - ii. Time
 - iii. Money/cost of food
 - iv. Guidelines/regulations
 - v. Organizational

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