

2006

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NUTRITIONAL QUALITY OF LUNCHESES
AT A SEVENTH-DAY ADVENTIST SCHOOL

by

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Submitted to the School of Health Sciences

Eastern Michigan University

in partial fulfillment

of the requirements for the degree of

MASTER OF SCIENCE

in

Human Nutrition

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November 15th, 2006

Ypsilanti, Michigan

ACKNOWLEDGEMENTS

I would like to acknowledge the work and assistance of Kyunghye Choi, MS, RD,
with the statistical analysis of the data used in this research study.

ABSTRACT

The purpose of this study was to determine if what the 3rd, 4th, and 5th grade children (n=36) at Central Valley Christian Academy (CVCA) were eating for lunch followed the beliefs of the Seventh-day Adventist (SDA) church and if lunches brought from home (LFH) provided more nutritional quality than combination lunches.

This study showed that LFH (n=26) provided more overall nutrients for the students when compared with school-provided entrée lunches (n=1) and combination lunches (n=9). When comparing LFH with combination lunches, LFH met more of the nutritional requirements based on the Recommended Dietary Intake (RDI) and the Dietary Guidelines for Americans 2005.

The health message of the SDA church encourages an increased consumption of fruits and vegetables, adding high fiber foods to the diet, and a moderate consumption of fats, oils, sweets, meat, and dairy products. Students at CVCA fell short of all of these recommendations.

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CHAPTER ONE

INTRODUCTION

The Seventh-day Adventist (SDA) church is highly recognized for its strong health message that is centered on a vegetarian diet. The SDA belief is that a vegetarian lifestyle honors the glory of God and preserves the health of the mind, body, and spirit. They suggest following a lacto-ovo vegetarian diet, which recommends a generous use of whole grain breads, cereals and pastas, liberal consumption of fresh fruits and vegetables, moderate use of legumes, nuts, seeds, and low fat dairy products. Egg yolks should only be used in moderation. They avoid foods high in saturated fat and cholesterol such as beef, lamb, pork, chicken, fish, and seafood. Coffee, tea, and alcoholic beverages provide minimal nutrition and may interfere with the absorption of essential nutrients and therefore should be avoided (1).

Central Valley Christian Academy (CVCA), in Modesto, CA, is an SDA school with approximately 300 students, which houses both elementary and secondary schools. At the time of data collection, the school was named Modesto Adventist Academy but is now known as Central Valley Christian Academy. Within the past couple of years, the state agency in charge of inspecting food service operations in schools shut the kitchen down at CVCA because of the lack of commercial equipment. Prior to this, faculty and parents were cooking vegetarian meals for the lunch program. However, since they are not permitted to cook on campus anymore, they were forced to find other means of providing a lunch meal for their students. The following table outlines the current lunch entrée menu at CVCA, which includes branded foods from local restaurants.

Table 1 Lunch entrée menu at Central Valley Christian Academy

Monday	Nachos: Tortilla chips and nacho cheese
Tuesday	Taco Bell bean burritos
Wednesday	Pizza Hut pizza: Personal size cheese, olive, or veggie
Thursday	Baked potatoes: Choice of butter and sour cream toppings
Friday	Subway sandwiches: Deli style with cheese, lettuce, and mayonnaise

In addition to the lunch entrée menu, the 8th grade class conducts fundraisers that sell snack foods that children can purchase in addition to the lunch menu or what they've brought from home. The items on the snack menu include crackers, cookies, fruit snacks, and fruit drinks. Students also have access to a vending machine that provides bottled water, lemonade, and sports drinks.

Both elementary and high school students at CVCA have four options for lunch: 1) they may bring a sack lunch from home, 2) they may purchase the entrée, 3) they may purchase items from the snack menu, or 4) they may combine items from various sources. From observation, the majority of children who bring their lunch from home eat only the foods that are packed for them. However, there are occasions when they are also given money to buy snacks or beverages in addition to their home-packaged sack lunch. In other cases, the children buy multiple items from the fast food lunch, snack menu, and vending machine to complete their lunches.

Plans are currently in the works for upgrading the kitchen equipment, but until then the current lunch entrée menu will be served. More children are bringing their own lunches now, which may or may not be providing better nutrition than the entrée menu. It is important to determine if the recent change in the lunch program at CVCA to serving branded entrées provides more nutritious meals to CVCA students than what they may bring from home.

Fast food consumption by children increased in the U.S. five-fold from 2% in the late 1970s to 10% in the mid 1990s (2). In addition, obesity in children and adolescents has increased from about 5% in the 1970s to 15% in 2000 (3), and, according to NHANES (1999-2002), it has increased to 16% (4).

Bowman (5) conducted a study to see if fast food consumption adversely affected the dietary factors linked to obesity risk. The data were collected from 6,212 children and adolescents ranging in age from 4 to 19 years. Researchers measured the association between fast food consumption and measures of dietary quality. They found that on a typical day, 30.3% of the subjects ate fast food. On any given day, the subjects who ate fast food consumed more total energy, fat, carbohydrates, added sugar, and sugar-sweetened beverages and consumed less fiber, milk, fruits, and non-starchy vegetables than those who didn't eat fast food (5).

There are several adverse effects on nutrition status that result from this added intake of calories and fat and reduced intake of fiber, milk, and fruits and vegetables. The overall increase of calories, fat, and carbohydrates could lead to a mean weight gain of six pounds per year (5). Fiber promotes satiation and may protect against excessive weight gain.

Because of fruit and vegetables' high fiber content, low energy density, and low glycemic index, a reduced intake of fruits and non-starchy vegetables has been linked to obesity-related morbidities such as cardiovascular disease and diabetes (5). Fast food is also usually served in much larger portions than the recommended serving sizes for children, which caused them to consume more food. In addition, the chances of becoming obese over a 15-year period increased by 86% among young white adults who ate fast food at least twice a week (5).

From the noted negative effects that fast food can have on children and adolescents, the branded entrées served at CVCA may not provide the nutritional quality of foods that students bring from home. This study determined if what the 3rd, 4th, and 5th grade students were eating from combination lunches provided a more nutritious meal than what they brought from home. This study also determined if these meals conformed to the teachings of the SDA church. Last, this study compared the nutrient intake between SDA students and non-SDA students.

CHAPTER TWO

REVIEW OF THE LITERATURE

This chapter will outline and review the articles and studies that are relevant to this topic. The first section will discuss the history of the health message of the SDA Church. The second section will provide an overview of the use of branded foods and pre-packaged food items in schools. The third section will outline the recent studies that have been done comparing the prevention of disease with respect to the vegetarian lifestyle of the SDA and that of a non-vegetarian lifestyle. Finally, the fourth section will provide information regarding vegetarian diets for children.

The purpose of the SDA message is to glorify God and to do so by feeding the body whole grains, fresh fruits and vegetables, nuts, legumes, seeds, and low fat dairy products; to use in moderation egg yolks and foods high in saturated fats and cholesterol; and to avoid caffeine, tea, and alcohol (1).

History of the Health Message of the Seventh-day Adventist Church

The Seventh-day Adventist (SDA) Church is a Christ-centered, worldwide, religious community who dedicates their lives to serving God, sharing the Gospel, and helping others. The term “Seventh-day Adventists” derives from their observation of the Sabbath on Saturday, which is the seventh day of the week, and the second coming (Advent) of Christ. There are several doctrines that SDAs believe must be followed in order to glorify God. These include Biblical teaching; observing the Sabbath; believing in the Trinity, that God is three parts: the Father, the Son, and the Holy Spirit; creation; and their health message. The

basic principle behind their health message is that they demonstrate reason and restraint in their daily lives. This restraint is shown by abstaining from tobacco, alcohol, and illicit drugs and by following both dietary restrictions outlined in the Bible and sound medical advice (7).

According to the Seventh-day Adventist Dietetic Association (7), the health message can be traced back to the Levitical Laws. These were health and hygiene guidelines given to the ancient Israelites while they were in the wilderness. The purpose of these guidelines was to prevent and fight off communicable diseases by practicing proper hygiene and sanitation. These principles were emphasized in order to keep the Israelites healthy in body, mind, and soul while traveling in the desert. Then in the New Testament of the Bible, teachings brought attention to temperance and self-control, both of which stressed the importance of making decisions that would give the follower an upper hand on the development of a strong body, mind, and soul. “The believer who practiced self-control would have more discernment, be able to endure hardships, and be in better position to bring under control totally, the body, mind, and soul” (8).

Up until the 19th century, these principles had been lost and a new understanding of the relationship between health and hygiene was adopted. In the latter half of the 19th century, the increase in awareness of the use of water, air, and exercise in the treatment of disease, the consumption of health foods, and working in gardens and the outdoors provided new insight into health and hygiene. The Adventist Church assessed this explosion and with the Levitical Laws, emphasis on self-control, and new health and hygiene principles, the SDA Church developed their own unique teaching method for the prevention and treatment of diseases (8).

So in the 20th century, the SDA church recognized that the body, mind, and spirit responded favorably to fresh air, sanitation, and hygienic ideals. They saw a balance between work and exercise. They put special concern over self-control issues, such as abstaining from tobacco and alcohol and eating plain and simply-prepared foods. In the last quarter of the 20th century, the SDA church introduced the health principles for reducing fat and adding high fiber to the diet, leading to a light and moderate use of meat and dairy products. This teaching became the basis for all Adventist health beliefs. Abstaining from flesh food, greater daily use of fruits and vegetables, and moderate use of dairy products were viewed as the lacto-ovo vegetarian diet. Along with these dietary guidelines, Adventists also recommend abstaining from smoking, alcohol consumption, and the use of natural remedies that produce more harm than good (8).

Although the United States Dietary Guidelines 2005 (9) recommend an increase in the use of soy and legumes for protein, place a greater emphasis on plant-based foods, and recognize that exercise is necessary for proper nutrition, the SDA church developed these same nutrition guidelines many years earlier (8).

Use of Branded Foods and Pre-packaged Foods in Schools

A 2003 survey of 447 Indiana school food authorities (10) examined the current status of the use of brand-name fast foods and the factors associated with their use in schools participating in the National School Lunch Program (NSLP). They found that the use of fast food and pre-packaged foods has increased in Indiana schools from 3% to 24% between the 1990-91 and 1998-99 school years. This use of food from outside sources is known as branding. Branding is defined as “the use of nationally or locally labeled [branded] products

for sale in an existing food service operation.” The specific type of branding involving fast food restaurants is known as restaurant branding. This refers to the serving of menu items from well-known restaurants in existing foodservice operations. It is also important to note that schools can offer brand-name fast foods as part of a reimbursable school lunch, as a la carte items, or both. The use of fast food restaurant branding in schools has been the center of much debate due to the potential negative effects on children’s nutrition and education (10).

A study conducted by Rainville (11) in elementary schools in two Southeastern Michigan districts investigated the nutritional quality of reimbursable school lunches and compared it to lunches brought from home. Rainville found that the reimbursable school lunches provided better nutrition compared to lunches brought from home due primarily to the strict nutrient regulations of the NSLP (11). Ten percent of the children in the study brought a pre-packaged (cheese, meat, and crackers) lunch from home.

Health Benefits of a Vegetarian Diet in the Prevention of Disease

The first large prospective study (12) of SDA started in 1958, known as the Adventist Mortality Study, which included 22,940 California Adventists. It included an intensive five-year follow-up and a more informal 25-year follow-up. The American Cancer Society was conducting a similar study at the same time, and the two populations compared results. In general, Adventists were found to have a lower percentage of death from all major diseases including, cancer, coronary heart disease, and stroke (12).

Following the Mortality Study was the Adventist Health Study (13), which began in 1974. Initially, it started as a cancer investigation, but in 1981 the cardiovascular component

was added. There are several differences between the Health Study and the Mortality Study. First, the Health Study was designed to find out which aspects of Adventist lifestyle were responsible for the protection against disease. It was not designed to study the rates of disease or mortality between Adventists and non-Adventists. Also, the data reported not only fatal but nonfatal disease events. It also included a more detailed description of diet (13).

Initial mailings of 63,530 questionnaires were sent out to every Adventist household in California, in order to recruit and enroll all adults over the age of 25 (12). Two years later, a second questionnaire was sent to those who responded to the first questionnaire. The second questionnaire asked questions involving previous medical history, drug therapy, dietary questions, psychosocial questions, and questions about physical activity. For the next six years, researchers from Loma Linda University followed the group closely, looking for any fatal or nonfatal causes of cancer or heart disease. In addition, a short questionnaire was sent every year to all participants to assess if any hospitalizations had occurred. Staff researchers also contacted the medical records departments at hospitals that were mentioned by subjects in order to find any missing information regarding cancer or coronary heart disease diagnoses. When data collection was finally concluded, researchers had data from 32,000 hospitalizations, 28,000 hospital charts on 18,053 subjects, 698 California hospitals, and 960 out-of-state hospitals (13).

According to the study, subjects who followed a vegetarian diet showed a reduced risk of developing cancer. Unlike previous studies, the Adventist Health Study took a look at individual food groups, not just nutrients linked to disease development. The researchers found that a higher weekly consumption of fruit showed a lower incidence of cancer of the

lung, stomach, and prostate. They also found that increasing the amount of legumes decreased the risk of developing pancreatic and colon cancer. Finally, researchers found that consumption of meat caused a higher incidence of colon and bladder cancer. However, there was a suggestion that it was not only the vegetarian diet but also the overall vegetarian lifestyle that contributed to the lower incidence of most cancers. Vegetarians tended to be less obese, drink less coffee, eat more legumes and vegetarian protein products, and be more physically active (14).

Dr. Gary Fraser is the current Director of the Adventist Health Study and has written several articles analyzing results from the study in regards to cancer, ischemic heart disease (IHD), and other causes of mortality with respect to diet (15). Fraser reported that meat consumption had a negative effect on the incidence of obesity, hypertension, diabetes, rheumatoid arthritis, and fatal IHD. Obesity, which was measured by body mass index, increased as the consumption of meat increased. The prevalence of hypertension, diabetes, and rheumatoid arthritis were also greater among non-vegetarians compared to vegetarians. Finally, men who consumed beef more than 3 times per week had a 2.31-fold greater risk of a fatal IHD than vegetarian men. However, no associations were found among women and beef consumption (15). The most outstanding finding showed that the consumption of nuts reduced the risk of both fatal and nonfatal IHD (16). Fraser found that individuals who ate nuts 4 to 5 times per week had only a 50% risk of those who ate nuts only one time per week (15). Nuts are known to have properties that aid in the lowering of cholesterol and help to reduce the incidence of atherosclerosis, including high content of

poly- and mono-unsaturated fats and the antioxidant properties of Vitamin E and arginine (16).

Based on these studies, it was shown that in general, vegetarians had a lower risk of obesity, hypertension, diabetes, arthritis, colon cancer, prostate cancer, fatal IHD in males, and death from all causes. The consumption of nuts and whole-grain breads protected against fatal IHD in males, whereas beef consumption increased the prevalence. An increased consumption of fruit and legumes appears to be protective against a number of cancers, whereas beef consumption increased the risk of colon and bladder cancer (15).

Vegetarian Diets for Children

The American Dietetic Association (ADA) stated that, “vegetarian diets can be consistent with the Dietary Guidelines for Americans, and meet Recommended Dietary Allowances (RDA) for nutrients” (17). And in 1995, the United States Department of Agriculture and United States Department of Health and Human Services made a similar statement that; “vegetarian diets are consistent with the Dietary Guidelines for Americans and can meet the RDA for nutrients” (9). There are four different categories of vegetarian diets. A vegetarian does not eat meat, fish, or poultry, or any food product from animals. The lacto-ovo-vegetarian eating pattern focuses on grains, vegetables, fruits, legumes, seeds, nuts, dairy products, and eggs, but excludes meat, fish, and poultry. The lacto-vegetarian includes dairy products but excludes eggs as well as meat, fish, and poultry. Finally the vegan pattern does not include any dairy or animal products (17).

The ADA position paper (17) outlined various nutrition considerations for vegetarians and discussed these throughout the life cycle. All essential amino acids and sufficient

nitrogen retention can be achieved if an assortment of plant foods is eaten during the course of a day; therefore, complementary proteins do not need to be eaten at the same meal. Iron in plant foods is not as bioavailable as protein found in animal products. Therefore, the recommended iron intake for a vegetarian is 1.8 times that of a non-vegetarian. Zinc tends to be lower in the vegetarian diet because animal protein is believed to enhance the absorption of zinc. Calcium intake is shown to be comparable in a vegetarian diet to that of non-vegetarian diet. The major vitamin of concern is vitamin B₁₂. Because B₁₂ is primarily found in animal products, vegetarians must increase their consumption of B₁₂ fortified foods such as soymilk and breakfast cereals, take a supplement, or include dairy products or eggs in their diet (17).

With respect to children and adolescents, the vegetarian diet can provide all essential nutrients that are needed for growth during this period (17). It was reported by the ADA that the growth of lacto-ovo-vegetarian children is comparable to that of their non-vegetarian peers (17). The overall protein intake of vegetarian children usually meets or exceeds the recommendation. Nutrients that should be given special attention in vegetarian children are calcium, iron, and zinc. For vegetarian adolescents, it appears that they consume more fiber, iron, folate, vitamin A, and vitamin C than their non-vegetarian counterparts. They also consume more fruits and vegetables and fewer sweets, fast foods, and high salt foods. Important nutrients for vegetarian adolescents to watch are calcium, vitamin D, iron, zinc, and vitamin B₁₂. “With guidance in meal planning, vegetarian diets are appropriate and healthful choices for adolescents” (17).

The vegetarian food guide pyramid (Appendix A) was developed by Messina, Melina, and Mangels (18). Like the United States Department of Agriculture's (USDA) Food Guide Pyramid (FGP), the base of the vegetarian food guide pyramid (VFGP) also recommends 6-11 servings of breads, cereals, and pastas, but the focus is on whole grains. The next food group in the VFGP is legumes, nuts, and seeds, and the recommendation is 5 servings. Fruits and vegetables are the next group, and it is recommended to get at least 2 servings of fruit and 4 servings of vegetables. The last group is the fats. Like the FGP, the VFGP recommends to use these foods sparingly, only 2 servings per day. The VFGP is intended for all age groups, but Messina, Melina, and Mangels also made additional recommendations for children and adolescents (Table 2). They recommend that good sources of calcium, iron, and zinc be the focus for children who follow a vegetarian diet and to follow dietary practices that enhance absorption of zinc and iron from plant foods. In addition, vitamin B₁₂ and vitamin D may also need to be supplemented (18).

Table 2 Recommendations to the vegetarian food guide pyramid for children and adolescents (reference 18)

Age Group	B₁₂ rich foods (servings per day)	Beans/nuts/seeds/egg (servings per day)	Calcium-rich foods (servings per day)
Children (4-8 years)	2	5	6
Adolescents (9-13 years)	2	6	10

CHAPTER THREE

METHODOLOGY

Recruitment of Subjects

A flyer announcing the purpose and procedure of the study was sent home to the parents of all 3rd, 4th, and 5th grade students, giving them an opportunity to decide whether they wanted their child to be included in the research. Accompanying the flyer was a consent form to be signed by each parent who wished his or her child to be included in the study. A space was provided on the consent form for parents to request a copy of the results.

Subjects

The subjects for this study were 3rd, 4th, and 5th grade students (n=36) from Central Valley Christian Academy (CVCA) between the ages of 8 and 12. The researcher visited each class and explained the purpose of the study and handed out packets, which included a letter stating the purpose of the study and the appropriate consent forms for parental signatures for participation in the study. The letter can be found in Appendix B and the consent form in Appendix C. Of the 54 students who received the letter and consent forms, only 36 returned consent forms and were observed by the researcher. Based on observation and reports from school staff, the health status of all subjects was fair to excellent and their religious status varied. Religious affiliation was determined by whether the child was registered as SDA, which is based on the religious affiliation of the custodial parent, and if he or she is an active member of a constituent church in the area.

Instrumentation

The CVCA data collection sheet (Appendix D) was designed by the researcher and was used to record the food items eaten by each student during his or her lunch period. It consisted of a chart that listed the different food items and then identified the amount of the food that the child ate. In addition, the data collection sheet was used to determine whether the child's lunch consisted of food from home, from the school entrée menu, from the snack menu, or from the vending machine. The data collection sheet also included the student's first name, last initial, grade, gender, and religious status. The student's religious status was determined from his or her school records. The information recorded on the data collection sheet was used to analyze the nutritional value of the student's meals, what source the food came from, which meals were more nutritionally balanced, and if they coincided with the health message of the SDA church.

Data Collection

Once all consent forms were accounted for, the researcher observed each participating child one time during his or her lunch hour and recorded on the data collection sheet the food items and quantity of each item that the student ate. This information was entered into a diet analysis program, Diet Analysis Plus Online Version 6.0 (Wadsworth/ESHA Research), in order to evaluate the nutrient content of each child's lunch.

Analysis of Data

All statistical analyses of the nutrient information were computed using SPSS 12.5 for Windows (SPSS, Inc, Chicago, IL). Variables used included the source of the food item, the amount of the food item consumed, and the nutritional content of the food item. The

health message of the SDA church was held constant against the different food items eaten by the children for lunch and whether or not the child was an Adventist.

CHAPTER FOUR

RESULTS AND DISCUSSION

Data Collection

The researcher collected data on seven different days between May 18th and June 6th, 2005. A data collection sheet (see Appendix C) was used by the researcher to record the type and amount of food items in students' lunches, how much of each item was eaten, and the source of the food.

Demographics

Thirty-six students from 3rd, 4th, and 5th grades at CVCA were observed. The students ranged in age from 8 to 12 years old. The religious affiliation of the students was recorded based on their registration as SDA or non-SDA through the school. During the registration process, parents were asked if they were members of a constituent church in the area, and if so, this deems their children as SDA and they pay a reduced tuition rate. Of the 36 students observed, 86% (n=31) were SDA and 14% (n=5) were non-SDA.

Results and Discussion

Lunches consumed by the students were divided into seven categories. The largest group was lunches from home (n=26). The majority of the students brought a variety of sandwiches, snack foods, and fruit drinks as part of their lunches from home (LFH). Table 3 lists lunches of eight students from the LFH category.

Table 3 Lunches that Central Valley Christian Academy students (n=8) brought from home

Lunch 1	Lunch 2	Lunch 3	Lunch 4
Peanut Butter Sandwich Apple Baby Carrots Fruit Snacks Boiled Egg Whole Peanuts	Turkey Sandwich Fruit Snacks Rice Cereal Treat Soft Fruit Snacks	Peanut Butter and Jelly Sandwich Spicy Corn Snacks Sports Drink	Peanut Butter and Jelly Sandwich Red Grapes Fruit Yogurt Milk
Lunch 5	Lunch 6	Lunch 7	Lunch 8
Veggie Pizza Peanut Butter Granola Bar 100% Juice Box	Tuna Sandwich Apple Barbecue Chips Chocolate Cookies Fruit Drink Barbecue Chips Chocolate Cookies Fruit Drink	Cheese Sandwich Cherries Kiwi-Strawberry Juice	Vegetarian Hot Dog and Bun with Condiments Canned Peaches String Cheese Fruit Yogurt Corn Snacks Chocolate Pudding

The next two groups had three students in each group and were the LFH/entrée and entrée/snack category. These students combined food items from home with items from the entrée lunch menu and items from the 8th grade snack menu. One student who ate solely from the school entrée menu bought two personal pizzas and ate only one of them after giving away the other pizza. The student in the entrée/vending category bought the school entrée lunch item and supplemented with a sports drink from the school vending machine. Similarly, the student from the LFH/entrée/snack category combined foods from all three sources. Finally, the student in the LFH/McDonald's category brought a LFH, which contained a chicken sandwich from McDonald's. From these categories, the researcher analyzed the nutritional content based on how much of the food the student ate.

Table 4 Mean nutrients* consumed in Central Valley Christian Academy students' lunches from home compared to school entrée lunch and combination lunches (n=36)

Nutrient*	LFH (n=26)	Entrée (n=1)	LFH/ Entrée (n=3)	Entrée/ Snack (n=3)	Entrée/ Vending (n=1)	LFH/Entrée/ Snack (n=1)	LFH/ McDonald's (n=1)
Energy (667 g)	702.9 ± 319.8	640.0	547.6 ± 39.7	585.3 ± 162.1	675.0	811.5	468.7
Protein (9.3 g)	20.0 ± 8.3	27.0	18.8 ± 7.0	27.2 ± 9.1	27.0	28.0	15.0
Carbohydrate	99.6 ± 42.3	6.0	37.9 ± 55.1	8.0 ± 13.8	6.0	8.7	4.7
Fiber	5.0 ± 2.7	4.0	3.2 ± 1.1	5.1 ± 1.5	4.0	4.0	1.0
Total Fat (≤ 22g)	26.7 ± 18.8	27.0	21.8 ± 3.8	24.8 ± 5.2	27.0	32.2	16.0
Saturated Fat (< 7g)	6.6 ± 4.6	12.0	8.0 ± 3.4	6.4 ± 2.6	12.0	13.3	3.5
Cholesterol	34.6 ± 45.7	60.0	40.1 ± 20.8	6.8 ± 7.6	60.0	60.0	50.0
Vitamin A (233 µg)	124.1 ± 175.1	17.0	12.4 ± 7.7	84.2 ± 135.0	15.0	16.7	3.7
Thiamin (0.33 mg)	.43 ± .33	.00	.05 ± .06	.58 ± .59	.00	.05	.00
Riboflavin (0.4 mg)	.37 ± .22	.00	.06 ± .08	.87 ± .89	.00	.03	.00
Niacin (4.3 mg)	6.2 ± 3.7	.00	.40 ± .61	8.4 ± 8.5	.00	.39	.00
Vitamin B ₆ (0.47 mg)	.35 ± .30	.00	.01 ± .01	.75 ± .79	.00	.00	.00
Vitamin B ₁₂ (0.47 mg)	.70 ± .92	.00	.01 ± .01	3.0 ± 3.0	.00	.00	.00
Vitamin C (15 mg)	40.5 ± 64.7	6.0	37.9 ± 55.1	8.0 ± 13.8	6.0	8.7	4.7
Vitamin D (3.33 µg)	.30 ± .59	.00	.00	.01 ± .02	.00	.00	.00
Folate (33.3 µg)	83.9 ± 74.2	.00	1.1 ± .99	52.2 ± 58.7	.00	.00	.00
Calcium (267 mg)	172.7 ± 142.6	50.0	52.1 ± 22.4	230.3 ± 158.2	45.0	55.9	17.1
Iron (3.3 mg)	3.8 ± 1.9	25.0	16.1 ± 8.1	4.4 ± 2.0	25.0	25.4	15.1
Sodium	1157.5 ± 683.1	1270.0	951.9 ± 168.3	1114.5 ± 319.7	1257.5	1411.0	831.0
Zinc (3.3 mg)	1.4 ± .80	.00	.06 ± .09	1.6 ± 1.7	.00	.00	.00

* Nutrient recommendations are based on one-third of the Dietary Reference Intakes (DRI) (19) The DRIs are actually a set of four reference values: Estimated Average Requirements (EAR), Recommended Dietary Allowances (RDA), Adequate Intakes (AI), and Tolerable Upper Intake Levels (UL), which have replaced the 1989 Recommended Dietary Allowances (RDAs)

As seen in Table 4, students who consumed lunches from home generally consumed more overall nutrients than students who ate school-provided entrée meals and combination lunches. This was most apparent with carbohydrates, vitamin C, vitamin D, and folate intakes. The intake of these nutrients for LFH was higher than those lunches provided by the school and combination lunches. However, the protein and iron intakes were lower in LFH than other lunches. The most interesting results came when comparing LFH with that of the entrée/snack combination. There were three students in this category, and two out of the three had vegetarian hot dogs provided by a special lunch menu for that day. The regularly scheduled entrée for this day was replaced by vegetarian hot dogs. These vegetarian hot dogs plus the bun provided 69.97 g of calcium and 15.77 g of protein. These lunches also provided significantly higher amounts of vitamin A, thiamin, riboflavin, niacin, vitamin B₆, vitamin B₁₂, vitamin D, folate, and zinc when compared to other lunches provided by the school and snacks. It is important to note that these meals had lower sodium content, total fat, and saturated fat than all other meals.

It is also important to note that CVCA did not provide milk to its students, which does have an impact on the amount of calcium and vitamin D that the students consume. In addition, only two students who brought lunches from home packed milk to drink or other dairy products to eat. In all lunches, vitamin D and calcium intakes were below one-third of the DRI.

Table 5 groups all other meals together and compares it to LFH. These results are very similar to those of Table 4, but when grouping all other meals together, some of the

results are more obvious, such as total fat and saturated fat percentage, vitamin A, vitamin C, calcium, thiamin, niacin, and folate.

Table 5 Mean nutrients consumed in Central Valley Christian Academy students' lunches from home compared to combination lunches***

Nutrient**	Lunches from Home (n=26)	Combination Lunches *(n=10)
Energy (667 g)	702.87 ± 319.8	599.4 ± 121.9
Calories from Fat (<30%)	239.7 ± 169.3 (34.1%)	217.3 ± 47.9 (36.3%)
Calories from Sat Fat (<10%)	59.4 ± 41.3 (8.5%)	75.8 ± 33.2 (12.7%)
Protein (9.3 g)	20.0 ± 8.3	23.5 ± 7.4
Carbohydrate	99.6 ± 42.3	71.0 ± 17.3
Fiber	5.0 ± 2.7	3.8 ± 1.5
Total Fat (≤ 22g)	26.7 ± 18.8	24.2 ± 5.2
Saturated Fat (< 7g)	6.6 ± 4.6	8.4 ± 3.7
Cholesterol	34.6 ± 45.7	37.1 ± 24.7
Vitamin A (233 µg)	124.1 ± 175.1	34.2 ± 72.6
Thiamin (0.33 mg)	0.43 ± 0.33	0.19 ± 0.39
Riboflavin (0.4 mg)	0.37 ± 0.22	0.28 ± 0.59
Niacin (4.3 mg)	6.2 ± 3.7	2.7 ± 5.6
Vitamin B ₆ (0.47 mg)	0.35 ± 0.30	0.23 ± 0.52
Vitamin B ₁₂ (0.47 mg)	0.70 ± 0.92	0.90 ± 2.0
Vitamin C (15 mg)	40.5 ± 64.7	16.3 ± 30.7
Vitamin D (3.33 µg)	0.30 ± 0.59	0.004 ± 0.012
Folate (33.3 µg)	83.9 ± 74.2	15.9 ± 37.3
Calcium (267 mg)	172.7 ± 142.6	101.5 ± 117.0
Iron (3.3 mg)	3.8 ± 1.9	15.2 ± 9.3
Sodium	1157.5 ± 683.1	1096.9 ± 247.2
Zinc (3.3 mg)	1.4 ± 0.80	0.50 ± 1.1

* Other Lunches included school, home/school, school/snack, school/vending, home/school/snack, and home/McDonald's

** Nutrient recommendations are based on one-third of the Daily Recommended Intakes (DRI) (19) The DRIs are actually a set of four reference values: Estimated Average Requirements (EAR), Recommended Dietary Allowances (RDA), Adequate Intakes (AI), and Tolerable Upper Intake Levels (UL), which have replaced the 1989 Recommended Dietary Allowances (RDAs)

Lunches that students brought from home met more of the nutritional requirements than combination lunches, but LFH were higher in fat and sodium. One of the main areas of focus in the revised Dietary Guidelines for Americans 2005 (DGA) is calories from fat and

calories from saturated fat. The DGA states that intake of calories from total fat should be <30%, and intake of calories from saturated fat should be <10% (10). In addition, the DGA recommends that grams of saturated fat should be <7 grams per day. For LFH, calories from saturated fat were 8.5% of the total energy intake, and the grams of saturated fat were 6.6. Lunches from home had less saturated fat but more total fat than all other lunches.

Not only did LFH provide less saturated fat, but they also provided more vitamin A, vitamin C, calcium, thiamin, niacin, and folate when compared to combination lunches. With regard to thiamin and niacin, only LFH met the required amounts at 0.43 mg and 6.23 mg, respectively. It is also important to note that the levels of vitamin A from home lunches was 3.63 times higher than those provided by combination lunches.

A final comparison was done between nutrient intakes of SDA students (n=31) with that of non-SDA students (n=5). The following table outlines those results.

Table 6 Mean nutrients* consumed in SDA (n=31) students at CVCA compared to non-SDA (n=5) students

Nutrient	SDA Total	SDA Mean	Non-SDA Total	Non-SDA Mean
Energy (667 g)	21183.18	683.33	3095.35	619.07
Calories from Fat (<30%)	7311.57	235.8 (34.5%)	1094.77	218.96 (35.3%)
Calories from Sat Fat (<10%)	1988.17	64.13 (9.38%)	314.75	281.90 (45.5%)
Protein (9.3 g)	685.61	22.12	70.30	14.06
Carbohydrate	4697.46	151.53	808.24	161.65
Fiber	3362.86	108.48	207.38	41.48
Total Fat (\leq 22g)	1089.58	35.15	126.93	25.39
Saturated Fat (< 7g)	225.61	7.28	24.39	4.88
Cholesterol	2860.38	92.27	439.19	87.84
Vitamin A (233 μ g)	149.35	4.82	19.50	3.90
Thiamin (0.33 mg)	813.86	26.25	121.64	24.33
Riboflavin (0.4 mg)	220.91	7.13	34.97	6.99
Niacin (4.3 mg)	1190.67	38.41	79.63	15.93
Vitamin B ₆ (0.47 mg)	11.22	0.36	1.87	0.37
Vitamin B ₁₂ (0.47 mg)	10.91	0.35	1.55	0.31
Vitamin C (15 mg)	165.61	5.34	23.05	4.61
Vitamin D (3.33 μ g)	9.62	0.31	1.72	0.34
Folate (33.3 μ g)	23.90	0.77	3.36	0.67
Calcium (267 mg)	7.39	0.24	0.55	0.11
Iron (3.3 mg)	2033.09	65.58	309.94	61.99
Sodium	36378.07	1173.49	4686.39	937.28
Zinc (3.3 mg)	30.36	0.98	5.77	1.15

* Nutrient recommendations are based on one-third of the Dietary Reference Intakes (DRI) (19) The DRIs are actually a set of four reference values: Estimated Average Requirements (EAR), Recommended Dietary Allowances (RDA), Adequate Intakes (AI), and Tolerable Upper Intake Levels (UL), which have replaced the 1989 Recommended Dietary Allowances (RDAs)

SDA students, on average, consumed more calories and calories from fat than the non-SDA students. However, they consumed considerably fewer calories from saturated fat. Percentage of calories from saturated fat for SDA students met the DGA (<10%) at 9.38%, whereas non-SDA students consumed more than four times the DGA. On the other hand, SDA students did consume more total fat, total saturated fat, and cholesterol. All students

met the recommended amounts for protein, thiamin, riboflavin, niacin, and iron. In addition, SDA students consumed more vitamin A, thiamin, riboflavin, niacin, vitamin B₁₂, vitamin C, folate, and iron than non-SDA students. Finally, SDA students consumed more than two times the amount of fiber than non-SDA students.

Meeting the Health Message of the Seventh-day Adventist Church

The general focus of the SDA health message is consuming more fruits and vegetables, moderately consuming dairy products, and abstaining from smoking and alcohol consumption (8). CVCA's lunch program was based on this teaching; therefore, vegetarian entrées were provided to its students. The ADA published a position statement on the vegetarian diet in 2003, which stated that a vegetarian diet is appropriate and provides a healthful diet for adolescents (17).

The following table outlines the average number of servings of food groups that the subjects of this research consumed in order to compare it to the teachings of the SDA church.

Table 7 Observed consumption of the six food groups for all Central Valley Christian Academy students

Food Group	Recommended Servings per day*	One-third of Recommended Servings	Total Servings	# of Students who consumed food group	Average Servings	Avg. servings fell below, fell above, or met the recommended servings
Breads, cereal, rice, and pasta	6-11	2-3.7	110.2	36 (100%)	3.06	Met
Vegetables	3-5	1-1.7	11.91	8 (22%)	1.49	Met
Fruits	2-4	0.7-1.3	24.59	16 (44%)	1.54	Fell above
Meat, poultry, fish, dry beans, eggs, and nuts	2-3	0.7-1	20.24	25 (69%)	0.81	Met
Milk, yogurt, and cheese	2-3	0.7-1	11.28	17 (47%)	0.66	Fell below
Fats, oils, and sweets	Use sparingly	Use sparingly	223.17	34 (94%)	6.56	Fell above

* Taken from the Food Guide Pyramid on the Diet Analysis Plus program (20)

As Table 7 shows, only 8 out of the 36 students ate vegetables and only 16 consumed fruits. This is not consistent with the SDA health message. All students should have eaten a serving of fruits and vegetables in their lunches to better follow the teachings of the SDA church. However, 14% of the students are non-SDA, which could have an effect on the results. In addition, 94% of the students ate food items from the fats, oils, and sweets group, and this is not a recommendation of the SDA church; it recommends eating sparingly from this food group. The largest number of servings consumed came from the fats, oils, and sweets group. However, the only food group to fall short of one-third of the DRI was milk, yogurt, and cheese. About half of the students ate items from the milk, yogurt, and cheese group, but CVCA does not provide milk to its students, which would impact these numbers.

The health message of the SDA church puts an emphasis on the increased consumption of fruits and vegetables, and although the average intake met the recommendation, it did not exceed it. In addition, adding high fiber foods to the diet is also part of the health message, and as Table 7 shows, the intake of breads, cereal, rice, and pasta was within the recommended range but not exceeding it. However, the average servings of meat, poultry, fish, dry beans, eggs, and nuts is 0.81, which does reflect the health message, which encourages a moderate use of meat and dairy products (8).

In conclusion, the lunches of the CVCA students did not strictly follow the health message of the SDA church. All students ate servings from the breads, cereal, rice, and pasta group, but only 8 and 16 students ate fruits and vegetables, respectively. If students were following the health message of the SDA church, you would have seen servings of fruits and vegetables exceed the daily recommendation and the servings of fats, oils, and sweets eaten to be minimal.

Comparison of Results to Past Research

There have been a few studies conducted on determining the nutritional quality of lunches brought from home versus school-provided lunches; however, none has been conducted at a Seventh-day Adventist school. This study is the first of its kind to analyze the nutritional quality of student lunches at a SDA school and to compare it to the teachings of the SDA church.

The study conducted by Rainville (11) in 1998 compared the nutritional quality of lunches brought from home to school lunches (n=570), which followed the nutrition guidelines of the National School Lunch Program (NSLP). In this study (11), reimbursable

school lunches (RSL) followed the guidelines and regulations of the NSLP and, therefore, provided more food variety and better nutrition than lunches brought from home. The NSLP required that RSLs comply with the Dietary Guidelines for Americans and met one-third of the Recommended Daily Allowances (RDA). With these guidelines, the RSLs in Rainville's study provided more nutritional quality to students than the students at CVCA received. Students who consumed RSLs had significantly higher intakes of protein, fiber, cholesterol, vitamin A, vitamin B₆, vitamin B₁₂, vitamin D, thiamin, riboflavin, niacin, folate, calcium, iron, sodium, and zinc than students who consumed lunches brought from home. On the contrary, in this study of CVCA lunches, students who brought lunch from home consumed more vitamin A, vitamin C, calcium, thiamin, niacin, and folate than students who consumed the school entrées.

One of the main differences between these two studies was that Rainville's schools provided milk to their students, whereas CVCA did not. Table 7 reported that only 17 out of 36 students consumed servings from the milk, yogurt, and cheese group. However, only one student actually drank milk. The other 16 students had either a yogurt or a serving of cheese. CVCA does not provide milk to their students as part of their lunch program. In Rainville's study, 93.6% of students who ate a RSL had one or more servings of milk and dairy products. This is much higher than the students at CVCA.

Another difference to note is the sample sizes. This study had only 36 students, whereas Rainville's study (11) had 570. This difference in sample size greatly affected the quality of the results and limits this study's ability to make generalizations for the whole student body at CVCA. In order to provide better results in the future, the sample size would

have to increase greatly or the researcher would have to collect data on each student on more than one occasion.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The findings of this research project cannot be generalized due to the small sample size and varying numbers of subjects who consumed each of the seven types of lunches. There were only ten students who consumed foods from a combination of sources, compared to 26 students who brought lunch from home. In most cases, lunches that students brought from home provided more nutrients than combination lunches, especially carbohydrates, vitamin C, vitamin D, vitamin A, and folate. However, even though the students who ate LFH had a higher intake of vitamin D, all students fell far below the recommendations. In addition, when compared to combination lunches, LFH provided less than 10% of calories from saturated fat and total saturated fat grams. Whereas combination lunches provided 12.7% calories from saturated fat and a mean of 8.4 grams of saturated fat, LFH provided 8.5% calories from saturated fat and a mean of 6.6 grams of saturated fat. In addition, total fat was higher in both groups. Lunches brought from home also provided more calcium, vitamin A, fiber, thiamin, riboflavin, niacin, vitamin B₆, and zinc. In addition, they provided less cholesterol than combination lunches.

Although it seems as though LFH were more nutritionally balanced, combination lunches did provide more protein, iron, and vitamin B₁₂ than LFH and also provided less sodium, total calories, and fat. Given the low number of students observed, the researcher

cannot determine whether lunches provided by the school are more nutritious for the students than LFH.

However, when looking at home lunches versus school-provided entrées, the student who ate only from the school lunch entrée consumed fewer overall calories than students who ate a lunch brought from home, but they also consumed more total fat and sodium. In addition, when comparing lunches brought from home with combination lunches, the students who ate combination meals consumed fewer total calories, less total fat, and less sodium.

When looking at the total number of servings for each food group, the lunches consumed did not follow the teachings of the SDA church. When looking at the average number of servings for all students, the only food group that fell short was milk, yogurt, and cheese. In addition, even though the breads, cereals, rice, and pasta, fruits, and vegetable groups fell within one-third of the FGP, they did not exceed the recommendation. Also, the servings for fats, oils, and sweets were high at 6.56, with 34 students consuming foods from this category. The SDA health message strongly recommends the increased consumption of fruits and vegetables, moderate use of meat and dairy products, and a decreased intake of sweets and high salt foods (8).

Finally, when the intake of SDA students was compared to the intake of non-SDA students, there were conflicting results. SDA students met the DGA for percentage of calories from saturated fat, but they consumed more total fat, total saturated fat, and cholesterol. SDA students consumed more than two times the amount of fiber of non-SDA

students. In addition, they consumed more vitamin A, thiamin, riboflavin, niacin, vitamin B₁₂, vitamin C, folate, calcium, and iron than non-SDA students. However, all students met the DRI for protein, thiamin, riboflavin, niacin, and iron. From these results, it is clear that the SDA students did not eat more nutritious meals than the non-SDA students.

Based on the comparison of the FGP to the number of servings of each food group the students ate, it is clear that the entrées provided by the school did not conform to the teachings of the SDA church. First of all, most of the entrées provided by the school were from fast food restaurants, and others contained more than the recommended amount of fat, saturated fat, and sodium. However, no comparison can be made between LFH and combination lunches. It is clear that increased education to parents is needed on how to pack a more nutritious lunch. In addition, low fat milk or fortified soymilk could be added to the lunch menu in order to increase the intake of vitamin D, calcium, and vitamin B₁₂. More regulation on what the 8th grade class sells for their fundraiser is needed to help increase the nutritional quality of the foods that CVCA offers. Finally, the CVCA staff could focus on conforming to the teachings of the SDA church to reinforce those teachings and regulate what is offered to its students.

In order to conform to and follow the teachings of the SDA church, CVCA needs to change their lunch entrée menu. If the CVCA kitchen were remodeled, vegetarian meals that conform to SDA teachings could be offered again.

Limitations

This study had the following limitations:

1. The numbers of subjects in each meal type are drastically different. This made it difficult to make a comparison between the seven categories, and the results may not be conclusive or reliable.
2. The sample of students was small (n=36) and the number of students who consumed each of the seven types of lunches ranged from 1 to 26.
3. The sample was made up of voluntary subjects at the discretion of their parents. The eating habits and religious status of those who chose not to participate may have altered the findings.
4. The data were collected over a period of several days in random order, and each child was observed only once. The children's lunch habits could have changed significantly from day to day.
5. The subjects were taken from one SDA school. Because of this very limited sample, the findings cannot be generalized to other SDA schools.
6. The subjects observed were only from 3rd, 4th, and 5th grades. Eating habits of younger and older children could vary greatly.

The sample size of this study was small, which makes the results harder to interpret, and generalizations cannot be made. It would be helpful to observe more students in additional classes or observe participating students on more than one occasion to get a better variety of meals eaten. In addition, observing students from more than one SDA school may

have provided better results based on increased sample size and variety of lunches provided by the school.

Recommendations for Future Research

A diversion from the teachings and beliefs of the SDA church is apparent from the results of this study. Educating the parents and staff about the health message of the church and reevaluating the current lunch entrée menu being provided to their students in order to follow the beliefs more closely would be beneficial. Not only would parents learn from this education, but the nutrient intake of the students would also improve.

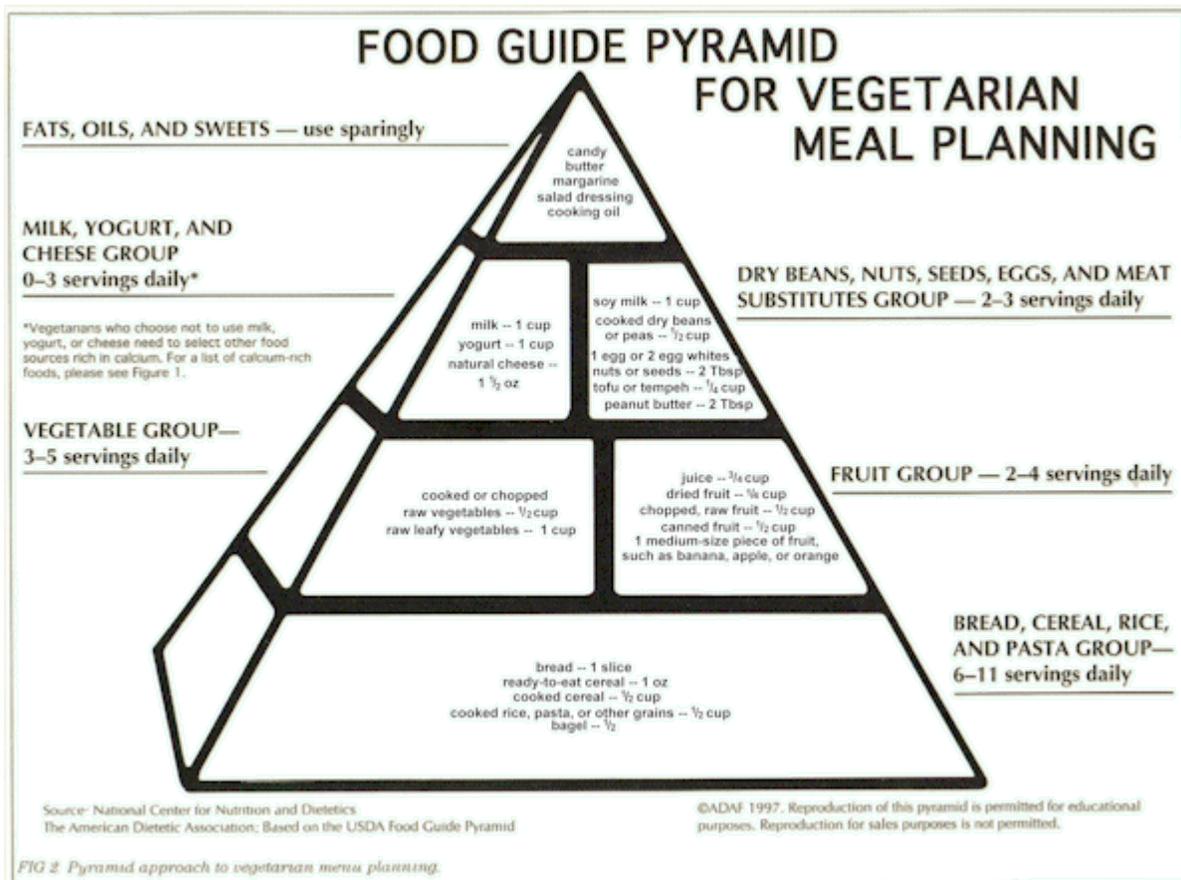
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APPENDICES

Appendix A Vegetarian Food Guide Pyramid



Appendix B Letter Sent Home to Parents

To all parents of 3rd, 4th, and 5th graders:

My name is Justine Markert and my son, Hunter Antonio, is a student at CVCA in the 1st grade. I am currently finishing up my last semester and working on my thesis to complete my graduate studies from Eastern Michigan University. I will be conducting a research study on what the children are eating for lunch. I will be watching and recording what your child eats for lunch on random days during the months of May and June. To ensure privacy, their names and personal information will not be used in my study. However, if you do not want your child to be a part of my research, just send back the consent form with the last box marked and I will not include them in my data collection. The purpose of my study is to record what the children are eating for lunch while attending a Seventh-day Adventist school and compare it to the health message of the church. I will also be recording whether or not the children's lunch came from home, hot lunch, snack menu, or a combination. The religious status of your child will also be recorded. I hope that this small research project will shed some light on the health message of the church and how it influences the choices of our schools and students. In addition, if you would like to receive information as to the results of this study, please fill out the bottom portion of the consent form before you turn it in and I will mail you a copy of the results.

Thank you for your support and consideration,
Justine Markert

Appendix C Consent Form for Participation

CYCA LUNCH DATA COLLECTION STUDY CONSENT FORM

I understand that my child's participation in this study is strictly voluntary and I may remove my child from participating at any time during the study without harm. I understand that the purpose of this study is to determine whether or not what my child eats for lunch coincides with the health message of the Seventh-day Adventist church. I understand that no personal, identifying information will be used in the dissemination of this study. However, my child's religious status will be used. I also understand that data collection will be done by observation by the principal investigator and no other individuals will be allowed to view the information. I understand that there is no health or medical risks associated with my child's participation in this study. I further understand that at the conclusion of this study all records identifying the individual children will be destroyed.

Signature of the

Parent: _____ Date: _____

Name of the Child: _____

If you would like to receive the results of this study, please fill out the following information and include a prepaid envelope.

Name: _____

Address: _____

Appendix D Data Collection Sheet

CVCA LUNCH DATA COLLECTION SHEET

Date: _____

Name: _____

Grade: _____ Seventh-day Adventist (yes/no): _____

Food Item	Home/Hot Lunch/Snack/Vending	Quantity
Sandwich:		
Fruit:		
Vegetable:		
Dairy:		
Crackers:		
Snack Foods:		
Dessert Items:		
Beverage:		
Taco Bell Bean Burrito		
Pizza Hut Pizza (cheese/olive/veggie)		
Subway Sandwich		
Nachos		
Baked Potato		
Additional Items:		

Appendix E Human Subjects Approval Letter



EASTERN MICHIGAN UNIVERSITY

April 19, 2005

M. Justine Markert
c/o Judi Brooks
Campus

Dear Ms. Markert,

The CHHS Human Subject Review Committee finds that your request entitled "Nutritional Quality and Adherence to Health Message of Hot Lunch Meals Compared to Lunches brought from home in Students who attend Seventh-day Adventist School" submitted on April 4, 2005, meets the Minimal Risk Standards and is approved for initiation with the following requirement:

- There should be a line on the consent form for the student to sign his/her assent.

The Committee may request further approval if secondary analysis of the data is conducted.

Sincerely,

Stephen A. Sonstein, PhD
Chair, CHHS Human Subjects Review Committee

