

**Beverage Vending Purchasing Patterns and Attitudes in Southwest
Virginia High School Students**

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Thesis submitted to the faculty of the Virginia Polytechnic Institute and State University
in partial fulfillment of the requirements for the degree of

Master of Science

In

Human Nutrition, Foods, and Exercise

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Friday, March 17, 2006

Blacksburg, VA

Keywords: school, adolescents, sweetened beverages, vending machines

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ABSTRACT

This article examines changes in attitude and beverage consumption after a school-wide policy change replacing sweetened beverages in vending machines with 100% juice and bottled water. Written questionnaires were administered three times to high school students ($n = 278$) in an ethnically-diverse, southwest Virginia school district. χ^2 analysis was utilized and test-retest reliability was assessed with intra-class correlation coefficients. Pearson correlation coefficients between test and re-test displayed a range from $r = 0.53$ to $r = 0.73$. There were no significant differences in demographics (gender and ethnicity) between time periods. χ^2 analysis revealed students were significantly more likely to choose healthier beverage vending options after one year compared to baseline ($P < 0.01$). Although beverage vending purchases declined to near significance immediately following the change, there were no significant changes observed between baseline and follow-up ($P < 0.05$). χ^2 analysis revealed no significant ($P < 0.05$) changes in outside purchase patterns. Students also indicated that the top reasons for snack/beverage choices were hunger, taste, and price. This suggests that students purchase what is convenient and available, regardless of choices. Therefore, environmental changes may be beneficial to promote healthier beverage choices among adolescents.

DEDICATION

For my beloved husband, whose unconditional love and support gave me the strength to finish what I started. Thank you for keeping me laughing and being steadfast with your patience, wisdom, and encouragement.

“There is no doubt that obesity is an undesirable state of existence for a child. It is even more undesirable for an adolescent, for whom even mild degrees of overweight may act as a damaging barrier in a society obsessed with slimness.”

Hilde Bruche 1975

ACKNOWLEDGEMENTS

I would like to thank the students who participated in this study and the high school teachers and administrators who generously gave up class time for this endeavor. In addition, much appreciation is due to those Virginia Tech students who assisted with data collection. These precious individuals include Cindy Barden, Erika Murtaugh, Rachel Spencer, Katie Crandall, Amanda Kaster, Jen Hodgson, and Lani Parsley.

Thank you does not begin to express my gratitude for committee members Dr. Kathryn Hosig and Mr. Clark Gaylord. Dr. Hosig provided countless wisdom and support with data collection, analysis, style, and editions. Mr. Gaylord facilitated the significant task of increasing my statistical analysis knowledge base. His aid ensured accuracy in the interpretation and explanation of the results and conclusions.

Michael Jason Spangler developed the Vending Survey Database which ensured consistency of data entry. Thanks for the custom designed user interface that eased my eyes during the data entry process!

Dr. Mary Margaret Weigel and Dr. Jenn Liefermann initially encouraged me to pursue graduate studies. Without their vision I would not be accepting this degree.

Committee chair Dr. Elena Serrano is largely responsible for making my graduate experience so positive. She demonstrated a contagious enthusiasm for the nutrition field and continually cultivated my character both personally and professionally. Her friendship and integrity have shown me the definition of a well-balanced, working mom. Dr. Serrano characterizes what a graduate mentor, major professor, and advisor should be.

Finally, I would like to recognize my family and Jesus Christ my Lord who gave me strength when my will to proceed escaped me.

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Chapter I: INTRODUCTION

Overweight and obesity is a widespread chronic condition and has reached epidemic proportions (1,2). This once later-in-life condition has expanded to include both adolescents and children and shows no signs of decreasing (3). Obesity is a consequence of environmental, behavioral, and genetic factors and can negatively affect individuals, physically and psychologically (4-9). Nearly 16% of US adolescents are classified as “at risk for overweight” or “overweight” and one in three adults is obese (1). Many overweight and at risk for overweight adolescents become overweight and obese adults (10). In addition, high body mass index as a child are strong predictors of obesity in young adulthood (11).

Nationally, overweight and obesity increases health care costs due to emotional and physical repercussions of the disease (12-14). Health consequences of overweight in adolescence include but are not limited to high blood pressure, insulin resistance, type 2 diabetes, menstrual irregularities, depression, and poor body image (4,9,15). Although these are most frequent among severely overweight children the increasing prevalence of overweight is resulting in consequences in younger and less severe cases as well (15). Since overweight and its related conditions and diseases frequently continue into adulthood and have been shown to be genetically and behaviorally manifested, it can be reasoned that overweight and obesity can be passed through generations of families (5,10,11). Therefore, large-scale interventions to stop the epidemic are critical. Schools reach greater than 95% of children between the ages of 5 and 17 and are a great arena for reaching the American adolescent population (16). Since eating behaviors are developed during adolescence and between 35% and 40% of children’s daily nutritional needs are met at school, a healthy school food environment is crucial for developing healthy eating habits in children (17-19). To make changes in adolescent overweight, ideals of health and wellness must exist along with a support system of health professionals, families, and friends.

The wide accessibility and availability of highly palatable, yet unhealthy, foods in the school environment provides a challenging atmosphere for making nutritious food

choices (20). Foods on the school campus such as, à la carte items, fundraising candy sales, vending machines, and school stores compete with the United States Department of Agriculture (USDA) school lunch and breakfast programs (21-23). Competitive foods are sometimes healthful, but they are usually in small quantities and in poorly accessible areas (24). Little research is known about beverage vending machines, except that they are prevalent in high schools with 98% of high schools offering vending choices (25). Usually the items offered are sweetened beverages, including sodas and imitation fruit drinks instead of healthy options (25,26).

Previous vending studies have focused on pricing and promotion strategies on low-fat vending items and demographic correlations with low-fat vending item selections (27,28). Conflicting research about the consumption of sweetened beverages exists. The Bogalusa Heart study, conducted with 10 year olds between 1973 and 1994, found that overall sweetened-beverage consumption has decreased, although overall milk consumption has also decreased (29). Other studies show that sweetened drinks make up the major source of daily added sugar for children, increasing body mass index, and total energy intake is larger among soft drink consumers than non-consumers among all ages (30-32). This is likely due to regional differences. Researchers observed increased tea consumption with sugar in the Bogalusa area. Additionally, though there was a decrease in the percentage of sweetened beverage consumers, larger quantities among consumers were noted. Finally, research has shown that taste, convenience, and price are usually the highest predictors of a vending choice (28,33).

Based on these data, vending machine access can greatly impact student beverage and snack choices. This study aims to determine if offering healthy items in school vending machines results in positive dietary impacts for youth, both in school and outside of school. In particular, researchers have not addressed whether drinks in schools contribute to the growing rate of adolescent overweight and if access to vending choices with healthy beverage items minimize high fat and high sugar item consumption both in and outside of school day, leading to improvements in students' diets.

Specifically, the study will take place in a southwest Virginia school district due to its decision to offer healthier drink options in the vending machines. In place of high sugar options that contribute to excess calories, the schools replaced machines with 100%

juice and bottled water (34). A machine with various milk options is located in the cafeteria. This study will follow ninth grade students for 12 months continuing into their 10th grade year.

Some potential short-term benefits of this study include determining if a healthier school beverage environment through healthier vending lead to healthier adolescent beverage choices and if the healthier vending choices change overall vending profitability. Possible long-term benefits may include improved health, possibly resulting in higher academic achievement, fewer discipline problems, improved attendance, and lower societal medical costs (4,13,14,35). Research on vending selections on the overall diets of youth has been long needed and represents a novel area of study to develop improved knowledge and interventions in adolescent overweight.

Chapter II: LITERATURE REVIEW

Obesity Epidemic Rationale

The etiology of obesity is complex and involves a combination of genetics, individual or psychological factors, and environment (36). These factors contribute to the energy imbalance of diet or energy input and physical activity habits or energy output, that lead to weight gain. Advances in genetics have shown strong evidence that supports the predisposition to obesity and overweight in certain individuals (37). Psychological contributors are prominent in adolescents because of the developmental phase of their growth and desire to fit in. This can lead to unhealthy consequences that will be discussed in a later section (15).

A major environmental contributor to overweight and obesity in children is our “obesigenic” or “toxic food environment” (38). Technologic advances have decreased the need for physical activity, even for children (20). In addition, television, video games and other sedentary leisure activities reduce energy expenditure through lack of physical exercise (39). Decreased school extracurricular and physical education activities further reduce energy expenditure in children (40,41).

Household food preparation and planning have decreased which increase reliance on away from home foods (42). Ready-made food, convenience snacks, and other out-of-home food portions have increased (42,43). Unfortunately, these increasing portion sizes may encourage increased caloric intake through physiologic or cognitive mechanisms (44).

Child and Adolescent Overweight

For children and adolescents there is no official definition for obesity. In adults, obesity is defined via body mass index, or weight divided by height squared. Since body mass index changes with age and gender in during the time of growth in youth, percentiles are used to determine overweight instead of the cutoff points that are used in adults. These percentiles, adapted by the Center for Disease Control and Prevention

(CDC), compare children of the same age and gender based on a national reference sample. When screening for children with high adiposity, those that are at or above the 95th percentile are considered overweight. Recently another cut-off point was added. Currently, children who are between the 85th and 95th percentiles are considered “at risk for being” overweight (6). It is recommended that overweight and at risk children get further assessment (45).

Prevalence of Overweight and Obesity

The prevalence of overweight and obesity is increasing across age, race, education, smoking status, and sex (46). No state in the union has been immune to the increases. A National Health and Nutrition Examination Survey (NHANES) data sample, from 1999 - 2002 indicated a 16.0% prevalence of overweight in children aged 6 to 19 and 31.0% were at risk for overweight or overweight (1). As Table 1 illustrates, the increasing prevalence of overweight in children in the past shows no sign of easing in the future.

Table 1. Prevalence of overweight among children and adolescents ages 6-19 years, for selected years 1963-65 through 1999-2002 (1)

<i>Age (years)¹</i>	<i>NHANES 1963-65 1966-70²</i>	<i>NHANES 1971-74</i>	<i>NHANES 1976-80</i>	<i>NHANES 1988-94</i>	<i>NHANES 1999-2002</i>
6-11	4	4	7	11	16
12-19	5	6	5	11	16

¹Excludes pregnant women starting with 1971-74. Pregnancy status not available for 1963-65 and 1966-70.

²Data for 1963-65 are for children 6-11 years of age; data for 1966-70 are for adolescents 12-17 years of age, not 12-19 years.

In 2003, 1 in 7 of US children and adolescents was reported as being overweight (8). Many adolescents maintain their extra weight as they transition into adulthood (10). The fact that adolescents are remaining obese is alarming since currently about one in two US adults is overweight or obese (47).

Consequences of Overweight and Obesity

Obesity is currently the most prevalent nutritional health concern for adolescents (48). The physical consequences are numerous, including orthopedic, neurological, pulmonary, endocrine, and gastroenterological manifestations (Table 2). Unfortunately children and adolescents that are overweight are more likely to become overweight and obese adults (10). Therefore, as adults they are more likely to have higher morbidity and mortality from related conditions. These include: cardiovascular disease (CVD), non-insulin dependent diabetes (NIDDM), coronary heart disease (CHD), gall bladder disease, osteoarthritis, stroke, all-cause mortality, and certain cancers (prostate, endometrial, uterine, cervical, ovarian, colon, kidney, gallbladder, and postmenopausal breast).

Table 2. Physical risks and consequences of childhood and adolescent obesity (15)

<i>Orthopedic</i>	<i>Neurological</i>	<i>Pulmonary</i>	<i>Gastroenterologic</i>	<i>Endocrine</i>
Blout's disease	Psudotumor cerebri	Asthma	Cholelithiasis	Insulin resistance
slipped capital epiphysis		sleep apnea	Steatohepatitis	Hyper-androgenemia
		Pickwickian syndrome	Liver fibrosis	Type 2 diabetes (NIDDM)
		Pulmonary embolism	Liver cirrhosis	Polycystic ovary syndrome

The psychosocial consequences, though sometimes overlooked, are not something that is new to this recent epidemic. Sobering results of the pain experienced by overweight children and adolescents were reported in a study that showed quality of life for overweight and obese youngsters to be equal to children with cancer receiving radiation (8). Lazy, lying, cheating, sloppy, dirty, ugly, and stupid are descriptors that are used to describe overweight children (49,50). Therefore, it is no wonder that it has been shown that depression, lower social interaction, disordered eating, low self esteem, distorted body image, negative attitudes toward food, and eating disorders (and any

combination of the above) are related to overweight in youth (4,15,51-53). These overweight children also have higher rates of sadness, loneliness, and nervousness, and are more likely to participate in high risk behaviors such as smoking and alcohol consumption (54). These issues could also be related to weight-based teasing from both peers and family members (55).

Economic Cost

Obesity increases health care costs due to emotional and physical repercussions of the disease (7). In 2004, Raebel and colleagues estimated that the health care costs for obese versus non-obese individuals was higher primarily due to the increased use of prescription drugs. As expected obese individuals also had more hospitalizations, professional claims, and outpatient visits than healthy weight individuals. Health care costs increased by 2.3% for each unit increase in body mass index (13). Researchers continue to estimate the national economic costs of obesity. In 1995 Wolf and Colditz estimated the total cost of obesity to exceed \$99 billion (14). Further direct health care cost related to obesity for chronic diseases were \$51.6 billion, which equated 5.7% of total United States health care expenditures (14). Indirect costs were estimated to be \$47.6 billion (14).

Five obesity related diseases accounted for 85% of the economic burden for obesity (hypertension, hyperlipidemia, type 2 diabetes, coronary artery disease, and stroke). Estimates revealed in 2001 that \$98 billion of the total overweight and obesity costs were related to type 2 diabetes (56). Currently the National Institute of Health (NIH) estimates the total indirect and direct cost of obesity is \$117 billion annually (57). It is debatable if preventative care and other factors like Medicare support medical nutrition therapy. Though costs are high and the childhood overweight epidemic is widely publicized, policy does not support research-based evidence for prevention and intervention within a healthy school eating environment framework (21,58,59).

Adolescent Physical Activity

According to the data from the 2001 National Youth Risk Behavior Surveillance, 38% of adolescent girls and 24% of adolescent boys are below the national

recommendations for moderate or vigorous physical activity (60). Since physical activity could be a successful intervention for the obesity epidemic it is important to realize that physical activity has been shown to decline as students move through high school (60). Additionally, the percentage of adolescent girls that do not report any physical activity the previous week doubles from 9th grade to 12th grade (60). This specifically places adolescent females at an increased risk for weight gain as they progress through high school (61). Changes in female physical activity behaviors are associated with time constraints and support for physical activities from peers, parents, and teachers (62).

Health Behavior Models

Bandura's social cognitive theory regarding development has been used as the basis for many studies of adolescent behavior. The theory is a triadic, dynamic, and reciprocal model in which behavior, personal factors (including cognitions), and environment all interact (63). This theory is widely used to develop and evaluate interventions for health education and health behavior programs because it helps explain and predict behavior (Table 3).

Table 3. Examples in an obesity epidemic triad of the social cognitive theory model

Behavior	Environment	Person
Food preference	Access/Availability	Skills
Knowledge	Parents	Increased soda consumption
Decrease self esteem	School foods available	Disordered eating
Cognitions	Spending power/money	
	Stores Nearby	
	Home	

Adolescent Development Issues

During adolescence peer relationships and sociocultural pressures like the media have a high impact on attitude and behavior formation (64,65). Nutrition in adolescence is important for healthy development and growth (66). The formation of new eating behaviors occurs during this time (17). Eating patterns during this stage of life have been shown to be associated with lasting health consequences as described in Table 2

(15,67,68). Youth have been shown to have diets low in milk, fruits and vegetables and high in palatable foods containing excess fat and sugar (69). Therefore, if unhealthy behaviors can be avoided and reprogrammed to healthy behaviors, overall adolescent health will benefit.

Adolescent Food and Beverage Consumption

Adolescent eating behaviors are influenced by a number of issues. In general, future health is not of primary importance during adolescence (70). This is evident in the increased consumption of fast or processed foods, yo-yo dieting, erratic eating behavior, such as meal skipping, and low intake of nutrient dense foods among this cohort (71). Researchers attribute this behavior to the desire to fit in, including media pressures to look thin (70).

A twelve ounce can of sugar-sweetened soft drink contains approximately 150 kcal (48). Since portion sizes have increased and many teens are drinking more than this, it can be assumed that these contribute to excess calories consumed by American youth. Compared with non-consumers, soft drink consumers have a higher daily energy intake (48, 72). Small increases of body mass index have been shown as a result of consumption of sugar-added beverages (32). Therefore, consumption of soft drinks and other sugar added beverages such as fruit drinks, contribute to total energy intake and may contribute to weight gain as a result of added energy intake (32,73).

Since soft drink consumption has doubled for boys and tripled for girls, it is important to determine the consequences of a diet high in such beverages (73). According to the American Academy of Pediatrics, potential health problems associated with a high intake of sweetened drinks are: overweight or obesity; displaced milk consumption that could lead to calcium deficiency and consequently the risk of osteoporosis and fractures; and dental carries from the excess sugar and possible enamel erosion from the high acidity (48). Another health concern related to sweetened beverages is sleep disturbances due to high amounts of caffeine (74). Beyond these consequences, it has been hypothesized that the body does not compensate fluid carbohydrate energy, as well as carbohydrate energy that is eaten in solid form. As a result, the risk of excess total energy caloric intake may be higher when soft drinks are consumed (75).

Following the national trends, adolescents choose their food based on hunger and food cravings, taste or appeal of food, time considerations, and convenience (28,33). Sadly, foods available at lunch time could be a contributing factor. Older adolescents tend to drink more sweetened beverages and less milk and non-citrus juice (76). Foods of low nutritional quality contributed 30% of the total daily energy with nearly 25% coming from sweeteners and desserts (77). The National School Food Programs contribute about 19% of the daily energy intake of adolescents and the USDA would like 33% of daily energy to come from these programs (22).

Adolescent Environment

It has been hypothesized that adolescents will eat what is in their immediate environment (70). While at home, adolescents that eat with their families and spend more time with their parents on the whole have healthier eating habits (78,79). Since foods at home fulfill two of the highest reported factors in choosing a snack (convenience and cost), what is available impacts their diet greatly. As previously mentioned the “obesogenic” society currently prevalent in the United States and the factors included in the social cognitive theory (Table 3) also influence adolescent food choices.

Societal and Community Environment

Ample opportunities to consume large quantities of food may increase risk for overweight and obesity. Highly palatable and inexpensive food is readily available (20). The increased portion sizes in the United States compound this problem (80). Studies have shown that body fat storage occurs at a higher rate when energy offered ad-libitum comes from fat as opposed to carbohydrate or protein (81). Therefore, convenience or fast food that is high in total and saturated fat not only increase calories but may also increase the rate at which our youth accumulate fat.

Included in environmental effects are the increasingly sedentary lifestyles of our youth. Technological and transportation advances no longer make physical activity necessary in our life. For example elevators, escalators, and automobiles have replaced walking, stairs, and bicycling. Also increasingly sedentary leisure activities like computer and video games and television have replaced more physically active pursuits (39,20).

Finally, students are not obtaining physical education in schools due to budget cuts. Another breakdown of our physical education courses is that they may be taught by untrained individuals (40).

School Food Environment and Competitive Foods

Presently, many food choices are offered to students on a secondary school campus. When referring to school meals, this is usually broken into two categories; school lunch and other, “competitive” foods. According to the United States Department of Agriculture (USDA), the definition of competitive foods are any foods sold in competition with USDA school meal programs such as, school lunch, school breakfast, and after-school snack programs (82). If the school participates in USDA breakfast and lunch programs, the food served from the cafeteria must adhere to certain guidelines. However, if the school does not participate in the National School Lunch Program (NSLP), the school district’s food choices are not restricted. For example, Henrico County, Virginia, does not participate in NSLP, and is not restricted. Therefore, fast food vendors sell their products in the county public school cafeterias. Students also have other competitive food choices including single food items from snack bars, à la carte programs, vending machines, and school stores. Students are also sometimes allowed to leave campus to obtain food which may result in increased fast food consumption (83).

A national study by Wechsler and colleagues found that most high schools offered high fat cookies or cakes (80%), pizza, burgers, and sandwiches (76%), and french fries (62%) in à la carte areas and that 95% had soft drinks, candy, and snacks available throughout campus vending machines (25). This is compared with 90% offering fruits and vegetables and 48% offering low-fat yogurt, low-fat cookies, or low-fat pastry (25). Through the Food Environment in Secondary Schools project in 20 secondary Minnesota schools, French and colleagues found that approximately 36% of foods in à la carte areas and 35% of foods in vending machines met a lower-fat criterion (≤ 5.5 fat grams / serving). Chips and crackers made up the largest share of a la carte foods (84).

Though most parents and teachers agree that the nutritional health of students should be a school priority, few schools have food policies (22,23,83). A recent study by Kubik and colleagues among Minnesota middle-school students found 18% of parents

and 31% of teachers agreed that schools already give enough attention to student nutrition but 90% among both groups agreed that healthier food and beverage choices in à la carte lines and vending machines should be made available (85).

Currently, the most consumed vegetable of the teen population is the fried potato (86). Therefore, most schools offer this daily in a variety of ways (chips, french fries). À la carte programs have shown an inverse association with the daily consumption of fruits and vegetables and total and saturated fat (87). Little is known about beverage vending machines except that they are common in schools and usually offer sweetened beverages (25).

Templeton and colleagues found through a study of sixth graders that energy and essential nutrients were consumed at significantly lower levels than recommended (88). Additionally, one-third of students purchasing school lunch also purchased competitive food items or “foods not included in the school lunch menu, but sold with lunch for an additional price.” Those students that ate a school lunch and purchased competitive foods showed an increase in energy and a decrease in calcium and vitamin A (88).

Foods are also used in schools as fundraisers and as rewards and incentives in the classrooms. Baked goods, candy, and sometimes fruit are sold to raise funds for school activities such as sport camps and band trips (89). Students have a variety of food choices that are not nutrient dense and beneficial to the nutritional needs during their time of accelerated growth and development.

Schools’ Role in Nutrition and Health

Greater than 95% of children between the ages of 5 and 17 are in school (16). Between 35% and 40% of children’s daily nutritional needs are met at school and therefore, a healthy school food environment is crucial to encourage the development of healthy eating habits (17-19).

Nutrition Integrity in Schools

Competitive foods can be further divided into two categories: foods of minimal nutritional value (FMNV) and all other foods offered for individual sale. Examples of FMNV are carbonated beverages, hard candy, and gum. Program regulations currently

prohibit the sale of FMNV during school meal hours (82). Other competitive foods include food and beverages in the á la carte areas, school stores, fundraisers, vending snacks and beverages, and sometimes fast food or other outside vendors, are available to students during meal hours (89). These foods and beverages must meet the USDA regulations or state food competitive policies (82). Some school districts have “pouring rights” contracts that are a source of revenue for the school through carbonated beverage vending. A school may market soft drinks to students and receive free supplies such as binders and folders from the corporation to encourage promotion (89). An Oregon school has recently publicly described the vending industry as exploitative. Their reasoning was that the profit margin for the school is minimal compared to the vending companies making participation unbeneficial (90).

Another way nutrition integrity in schools is compromised is through the mixed messages students receive. The little encouragement and nutrition direction given to students is negated by the choices available to them through competitive foods to the USDA school food programs (40,89). Under the “offer versus serve” provision, high school students are according to law allowed to decline school lunch foods they are not going to eat (91,92). This was originally instituted to save schools money through avoided food purchases and reducing disposal costs. As many of two of the five food items offered may be declined while still qualifying for a reimbursable meal (91). In addition, the USDA meal may have a negative connotation since it is offered to low-income families and therefore be avoided.

The CDC’s School Health Policies and Programs Study (SHPPS) in 2000 revealed that 98.2% of secondary schools have either a vending machine or a school store where students can purchase food or beverages. Furthermore, 93.6% of the students had access to soft drinks, sports drinks, and fruit drinks while only 23.1% had access to 1% or skim milk. Soft drinks, sports drinks, or fruit drinks were sold for fund raising in 36.9% of schools (40).

Current School-based Obesity Interventions

The USDA is responsible for setting the guidelines and policies of the food served in USDA school nutrition programs. Two prongs of this agency - the Food and Nutrition

Service (FNS) and the Center for Nutrition Policy and Promotion (CNPP) - work to provide citizens with food and the knowledge of health in order to make positive food choices that will promote healthy eating and living. FNS handles the nutrition policies within the school system if a school participates in the USDA school breakfast and lunch program. CNPP provides the crucial link between scientific research in nutrition and the specific needs of the public by providing nutrition education (93).

The NSLP began in 1946 through the National School Lunch Act signed by President Harry Truman. Therefore, it federally assists public and non-profit private schools and has the goals to provide nutritionally balanced, low-cost or free lunches to children and young adults every school day. In its initial year it served 7.1 million American children (94). The number of children served multiplied in the years following with 22 million in 1970 and a peak 27 million in 1980 (94). According to the USDA, in 2003, 28.4 million children participated in the NSLP (94). It is estimated that through the NSLP over 187 billion lunches have been served nationwide since the programs initiation (94). NSLP was amended in 1998 through Congress in order to allow reimbursement for after school snacks for children and youth up to 18 years old involved in educational and enrichment programs. State education agencies cooperate with school food authorities or Food Service Directors to ensure the federal monies handed down from FNS at the federal level are handled correctly.

The cooperation between Federal, State, and local groups, includes cash subsidies and donated commodities from the USDA for each meal served. Preliminary data in 2005 reveals that Virginia had 730,970 participants and served 121,281,868 meals. This demonstrated a 1.5% increase in participants from January 2005 to January 2006 (95). In order for the state to get these bonuses they must serve lunches or after school snacks that meet the Federal requirements mentioned above and offer free or reduced price lunches to those children that qualify.

From July 1, 2005 through June 30 2006, 130% of the poverty level is considered \$25,155 for a family of four, and 185% is \$35,798 (94). Families above 185% of the poverty level must pay full price for their school meal which is determined by the food service directors at each local school, though the meals are still subsidized, though at a

lower rate (Table 4). Examples of non-reimbursable meals include USDA school lunch served to adults, second lunches served to students, and á la carte meals (92).

Each school receives funding from the USDA if they participate in the program. A cash reimbursement is made to the school for each meal served. For example, if one free lunch is served, the school will receive \$2.32 for that lunch (Table 4).

Table 4. The reimbursement amount (dollars) for national school food programs (94,96)

	<i>Free</i>	<i>Reduced</i>	<i>Paid</i>
<i>Breakfast</i>	\$1.27	\$0.97	\$0.23
<i>Lunch</i>	\$2.32	\$1.92	\$0.22
<i>Snack</i>	\$0.63	\$0.31	\$0.05

This does not include Alaska, Hawaii, and some schools with high rates of low-income children

Other types of aid include receipt of commodity foods that are available from surplus agriculture. These are provided only upon availability. One aspect of this that has been very successful is the partnership between USDA and the Department of Defense (DOD). Within this project, schools have been provided with fresh produce purchased by the DOD. Additionally, the USDA provides a link between local farmers and schools (94).

The School Breakfast Program (SBP) also makes available monetary assistance to students within a certain income level. The program was piloted in 1966 and became permanent in 1975. Based on 2003 estimates, on average 8.4 million children are served daily through this program (96). It is also a program that provides assistance to public and nonprofit private schools and is handled federally by FNS. Like the NSLP program, the SBP is a cooperative effort among federal, state, and local professionals. Cash subsidies are received from the USDA for each meal served and as a result the school must serve breakfasts that meet the Federal requirements and offer them at a reduced or free price to eligible students. Currently the nutritional requirements for breakfast are same as those for NSLP as are income qualifiers. This is an important issue since eating a nutritionally sound meal before school is such an important way to improve child productivity in school, increase test scores, reducing school absences, and improving student psychological functioning (4,13,14,35).

An additional resource beyond the school food programs is Team Nutrition. Team Nutrition is an “initiative of the USDA Food and Nutrition Service to support the Child Nutrition Programs through training and technical assistance for foodservice, nutrition education for children and their caregivers, and school and community support for healthy eating and physical activity (97).” There is a four point framework that the USDA encourages professionals to adopt. Having healthy vending foods and drink available and only healthy vending items aligns with the first and second point: Eating for Health: Meeting the Dietary Guidelines; and Making Food Choices: Nutrition Education, Training, and Technical Assistance.

The nutrition policies that are set in place by the USDA govern the quality of meals that are provided to students nationwide. All meals are designed to support the US Dietary Guidelines for Americans, which are revised every five years. These guidelines encourage maintaining a healthy weight and being physically active. Schools are required to provide weekly at least 1/3 of the daily Recommended Dietary Allowances for the macronutrient protein, the micronutrients iron, calcium, Vitamin A, and Vitamin C, and total calories (94).

On June 30 2004, President Bush signed into law the Child Nutrition and WIC Reauthorization Act of 2004 (98). This ensured the continuation of the school meal program until 2009 with added improvements. Some relevant improvements to the programs were expanding fresh fruit and vegetable pilots and requiring school district wellness policies to address healthy eating and physical activity.

Vending Machine

Competitive vending foods are typically highly palatable. In a study about secondary school food environment, a median of 12 machines were found per school, with the majority being soft drink machines. Few school policies and few machines (35%) had items that were found to meet the lower-fat criterion established for the study (≤ 5.5 fat grams/serving) (84).

Since the number of vending machines in schools has increased by about 10% in the last decade, the accessibility to foods of low or minimal nutritional value has increased (24). Though secondary school principals have positive attitudes about school

food environment issues such as providing mostly only healthful foods to students and having district- or school-wide food and nutrition policies, 98% have vending machines and 77% have contracts with soft drink companies (21). Additionally, researchers found that 49% of the principals reported that the school foodservice should not be financially supported by the general funds (21).

To promote healthy vending, pricing studies have been conducted by French and colleagues (27,99). Price reductions on lower fat snacks resulted in increased sales for healthy food choices (99). Even when an intervention was absent, sales remained significantly increased (27). Other research suggests that promotional materials may assist in increasing low-fat item sales (100). The promotional research was studied with an adult cohort, however, not adolescents. Very little research has been completed specific to food and beverage vending in schools.

Chapter III:
Beverage Vending Purchasing Patterns and Attitudes in
Southwest Virginia High School Students

Manuscript

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To be submitted to the Journal of the American Dietetic Association

ABSTRACT

A study was conducted to examine changes in attitude and beverage consumption after a school-wide policy change replacing sweetened beverages in vending machines with 100% juice and bottled water. Written questionnaires were administered three times to an arbitrary sample of high school students ($n = 278$) in an ethnically-diverse, southwest Virginia school district. The χ^2 analysis was utilized and test-retest reliability was assessed with intra-class correlation coefficients. Pearson correlation coefficients between test and re-test displayed a range from $r = .53$ to $r = .73$. There were no significant differences in demographics (gender and ethnicity) between time periods. χ^2 analysis revealed students' choice of healthier beverage vending options changed after one year compared to baseline ($P=0.009$). χ^2 analysis revealed no significant ($P>0.05$) changes in outside purchase patterns. Students also indicated that the top reasons for snack/beverage choices were hunger, taste, and price. This suggests that students purchase what is convenient and available, regardless of choices. Therefore, environmental changes may be beneficial to promote healthier beverage choices among adolescents.

INTRODUCTION

Sweetened beverage consumption among adolescents has more than doubled over the past 20 years with several possible health consequences (73). Sweetened drinks have been found to make up the major source of daily added sugar for children with total energy intake higher among soft drink consumers than non-consumers among all ages (30,31). The majority of studies have found a positive association between body mass index and sweetened beverages (32,72). However, a risk analysis completed with four major databases including the Nutrition Examination Survey 1999-2000 (NHANES) found regular carbonated soft drink consumption in adolescents to have no relationship between body mass index and those beverages (101). A weak positive relationship between body mass index and diet carbonated soft drinks has been found (76). The Bogalusa Heart study, conducted with 10 year olds between 1973 and 1994, found that overall sweetened-beverage consumption decreased, while consumption increased with habitual sweetened beverage drinkers (29).

Schools reach greater than 95% of children between the ages of 5 and 17 (16) and therefore are well positioned to play an important role in modeling and reinforcing healthy dietary habits. Since eating behaviors are developed, and nurtured during adolescence (17) and between 35% and 40% of children's daily nutritional needs are met at school (18), a healthy school food environment is crucial for developing healthy eating habits in children. The wide accessibility and availability of highly palatable, yet unhealthy, foods in the school environment provide a challenging atmosphere for making nutritious food choices (20,89). Child and adolescent beverage choices have been shown to be strongly related to age, ethnicity, and gender with consumption of sugary beverages increasing with age and being more prevalent with white males (76). Beverage vending machines are prevalent in high schools, with 98% of high schools offering vending choices, usually sweetened beverages like soft drinks and fruit drinks, instead of healthy options (40,73). Competitive foods, like á la carte items, candy sales, and vending machines are often chosen in place of or in combination with school lunch and policies are minimal (22,23).

Previous research explored vending machine behaviors, including psycho-social determinants of choosing low-fat options and the role of prices and marketing on food purchases and behaviors (27,28,99,102). It has been shown that decreasing prices of low-fat items increased their sales (27,99). Finally, research has shown that taste, convenience, and price are usually the highest predictors of a vending choice (28). Few have investigated the impact of systemic changes in the school environment on overall dietary habits (27,28,83,99,102). Vending machines have the potential of impacting student beverage and snack choices (83). The aim of this study is to determine if offering healthy beverages in school vending machines results in positive dietary impacts for youth, both in school and outside of school.

METHODS

A cross-sectional design with a convenience sample was used to assess student perceptions of a beverage vending change and purchasing habits. The Institutional Review Board for Involving Human Subjects at Virginia Tech approved the research

project. Consent was implied through student participation. Three data collections took place: May 2004 (baseline); November 2004 (post); and May 2005 (follow-up).

Participants were recruited from an urban high school in southwest Virginia. All questionnaires were distributed in English classes. In May 2004, ninth grade students participated and were followed into their tenth grade year. A self-generated student identification code (SIC) provided the means to match participants between time periods.

Test-retest was completed using the same protocol in another high school in the same school district. Students were tested two weeks apart to assess questionnaire reliability.

The survey instrument was designed to ascertain attitudes and purchasing patterns of participants and also included self-reported sociodemographic and anthropometric questions (height, weight). The instrument utilized adapted questions from published research studies (102,28) and questions designed specifically to answer current research questions. The questionnaire took approximately 40 minutes to complete.

All analyses were completed using the Statistical Package for the Social Sciences (SPSS) statistical software (SPSS Inc., Chicago, IL, version 13.0, 2004). "Reasons for Choosing Snack Foods" responses were ranked numerically then recorded by frequency distribution. χ^2 analysis of matched data was used to compare attitudes and purchasing patterns between time periods. Experimental significance of $P < 0.05$ was set and individual research questions were set at a significance of $P < 0.01$ to mitigate multiple comparison problems. Pearson correlation coefficients were utilized to analyze test-retest data ($P < 0.01$). Differences between demographic data for baseline, post, and follow-up were also analyzed ($P < 0.10$).

RESULTS AND DISCUSSION

At baseline, 278 of 555 ninth grade self-selected students completed questionnaires (50.1%). There were 172 matched questionnaires from baseline to post, 136 from baseline to follow-up, 118 from post to follow-up, and 116 from baseline to post to follow-up.

The majority of the baseline student respondents were between the ages of 14 and 16 years with most being 15 years of age (64.5%) and black (73.3%). Males represented 42.4% (n=73) while 57.6% (n=99) were female. Over half were eligible for free and reduced lunch (54.6%). Most students were eligible for free lunch (48.9%).

Test-retest analysis through Pearson correlation revealed a significant relationship between time periods ($P \leq .001$, $r \leq .733$) for all variables (Table 5). There were no significant differences in demographics (gender and ethnicity) between time periods (Table 6)

As displayed in Table 7, χ^2 analysis revealed a significant change ($P < 0.01$) in attitude from baseline to follow-up. The students who disagreed or strongly disagreed with a statement on choosing healthy options at baseline decreased at follow-up (15.9% to 10.4%, 27.3% to 15.6% respectively). The number of students who agreed to choose healthy options increased from 39.4% at baseline to 59.3% at follow-up. No significant changes were observed between time periods for students preferring only healthy beverage items in vending machines (Table 8).

χ^2 analysis showed marginally significant differences ($P = 0.017$) in student school purchasing patterns from baseline to following the change (Table 9). An apparent decrease in student purchasing patterns was displayed in all categorical responses. No students reported purchasing more than seven vending items per week and students purchasing vending items less than once per week almost doubled from baseline to after the change (17.1% to 31.4%). This trend was not significant from baseline to follow-up. No significant trends were observed for student purchasing patterns outside of school (Table 10).

Post to follow-up data revealed significant ($P \leq 0.01$) changes in the attitudes of adolescents regarding choosing healthy beverages if they were available. Data showed an apparent increase in “strongly disagree” and “disagree” responses from post to follow-up (14.4% to 18.6%; 25.4% to 42.4% respectively). A decrease in “agree” and “strongly agree” responses was observed (43.2% to 33.1%; 16.9% to 5.9%).

χ^2 analysis of data matched between all three time periods (n=116) revealed significance ($P \leq 0.01$) from baseline to following the vending change among student weekly in-school purchasing patterns. Weekly in-school purchasing patterns remained

Table 5. Reliability of questions from Food Intake Questionnaire with adolescents			
Questionnaire Variable	N	Pearson Correlation (r)	r²
I would choose healthy beverages (water, 100% juice, low fat milk) from the school vending machines if they were available.	36	.530	.281
I would prefer to have only healthy choices for beverages in the vending machines at school.	36	.570	.325
How many times per week do you buy <i>drinks</i> from the vending machines at school?	36	.733	.537
How many times per week do you buy <i>drinks</i> after school from somewhere besides school?	36	.529	.280
P<0.01 for all variables			

Table 6. Demographic characteristics of gender and ethnicity between time periods						
Demographic Characteristic	Baseline/Post to Baseline/Follow-up^a N = 307		Post/Follow-up to Baseline/Follow-up^b N = 287		Baseline/Post to Baseline/Follow-up^c N = 252	
	n = 171	n = 136	n = 116	n = 136	n = 171	n = 136
Male	42.1% (72)	43.1% (50)	43.1% (50)	44.9% (61)	42.1% (72)	44.9% (61)
Female	57.9% (99)	56.9% (66)	56.9% (66)	55.1% (75)	57.9% (99)	55.1% (75)
Non-black	35.1% (60)	37.9% (44)	37.9% (44)	37.5% (51)	35.1% (60)	37.5% (51)
Black	64.9% (111)	62.1% (72)	62.1% (72)	62.5% (85)	64.9% (111)	62.5% (85)

^{a1} Degrees of freedom=1, $\chi^2=0.028$, $P=0.867$, gender
^{a2} Degrees of freedom=1, $\chi^2=0.242$, $P=0.623$, ethnicity
^{b1} Degrees of freedom=1, $\chi^2=0.078$, $P=0.780$, gender
^{b2} Degrees of freedom=1, $\chi^2=0.005$, $P=0.944$, ethnicity
^{c1} Degrees of freedom=1, $\chi^2=0.233$, $P=0.629$, gender
^{c2} Degrees of freedom=1, $\chi^2=0.191$, $P=0.662$, ethnicity

Table 7. Student attitudes towards choosing healthy beverages if available

I would choose healthy beverages (water, 100% juice, low fat milk) from the school vending machines if they were available.						
Responses	<u>Baseline to Post^a</u> n (%)		<u>Post to Follow-up^b</u> N (%)		<u>Baseline to Follow-Up^c</u> n (%)	
	Strongly Agree	25 (14.9)	25 (14.5)	20 (16.9)	7 (5.9)	23 (17.4)
Agree	71 (42.3)	72 (41.9)	51 (43.2)	39 (33.1)	52 (39.4)	80 (59.3)
Disagree	50 (29.8)	54 (31.4)	30 (25.4)	50 (42.4)	36 (27.3)	21 (15.6)
Strongly Disagree	22 (13.1)	21 (12.2)	17 (14.4)	22 (18.6)	21 (15.9)	14 (10.4)

^a Degrees of freedom=3, $\chi^2=0.137$, $P=0.987$; value for change from baseline to post
^b Degrees of freedom=3, $\chi^2=13.500$, $P=0.004$; value for change from post to follow-up
^c Degrees of freedom=3, $\chi^2=11.464$, $P=0.009$; value for change from baseline to follow-up

Table 8. Student attitudes toward preferring healthy beverages						
	I would prefer to have only healthy choices for beverages in the vending machines at school.					
Responses	<u>Baseline to Post^a</u> N (%)		<u>Post to Follow-Up^b</u> n (%)		<u>Baseline to Follow-Up^c</u> n (%)	
	Strongly Agree	5 (3.0)	9 (5.3)	28 (23.9)*	24 (20.3)*	5 (3.8)
Agree	32 (18.9)	28 (59.3)			27 (20.3)	33 (24.4)
Disagree	87 (51.5)	78 (45.9)	46 (39.3)	61 (51.7)	62 (46.6)	62 (45.9)
Strongly Disagree	45 (26.6)	55 (32.4)	43 (36.8)	33 (28.0)	39 (29.3)	32 (23.7)
* Cell values were too small and thus Strongly Agree and Agree were combined for this time period.						
^a Degrees of freedom=3, $\chi^2=2.898$, $P=0.408$; value for change from baseline to post						
^b Degrees of freedom=2, $\chi^2=3.722$, $P=0.156$; value for change from post to follow-up						
^c Degrees of freedom=3, $\chi^2=1.968$, $P=0.579$; value for change baseline to follow-up						

Table 9. Student purchasing patterns of vending beverages in school						
	How many times <u>per week</u> do you buy <i>drinks</i> from the vending machines at school?					
Responses	<u>Baseline to Post</u>^a n (%)		<u>Post to Follow-Up</u>^b N (%)		<u>Baseline to Follow-Up</u>^c n (%)	
Less than once per week	28 (16.6)	53 (31.0)	43 (36.4)	27 (22.9)	21 (15.7)	28 (20.6)
1-2 times per week	46 (27.2)	42 (24.6)	29 (24.6)	27 (22.9)	37 (27.6)	33 (24.3)
3-4 times per week	44 (26.0)	39 (22.8)	23 (19.5)	38 (32.2)	37 (27.6)	46 (33.8)
5-6 times per week	36 (30.0)	32 (18.7)	23 (19.5)*	26 (22.0)*	30 (22.4)	24 (17.6)
7 or more times per week	15 (8.9)	5 (2.9)			9 (6.7)	5 (3.7)

* Cell values were too small and thus 5-6 times per week and 7 or more times per week were combined for this time period.
^a Degrees of freedom=4, $\chi^2=10.229$, $P=0.017$; value for change from baseline to post
^b Degrees of freedom=3, $\chi^2=7.601$, $P=0.055$; value for change from post to follow-up
^c Degrees of freedom=4, $\chi^2=3.999$, $P=0.406$; value for change from baseline to follow-up

Table 10. Student purchasing patterns of vending beverages after school						
	How many times <u>per week</u> do you buy <i>drinks</i> after school from somewhere besides school?					
Responses	<u>Baseline to Post</u>^a n (%)		<u>Post to Follow-Up</u>^b n (%)		<u>Baseline to Follow-Up</u>^c n (%)	
Less than once per week	60 (35.1)	55 (32.2)	45 (38.1)	44 (37.3)	48 (35.3)	47 (34.6)
1-2 times per week	51 (29.8)	45 (26.3)	31 (26.3)	30 (25.4)	40 (29.4)	34 (25.0)
3-4 times per week	36 (21.1)	38 (22.2)	24 (20.3)	28 (23.7)	29 (21.3)	35 (25.7)
5-6 times per week	11 (6.4)	16 (9.4)	7 (5.9)	8 (6.8)	11 (8.1)	10 (7.4)
7 or more times per week	13 (7.6)	17 (9.9)	11 (9.3)	8 (6.8)	8 (5.9)	10 (7.4)
^a Degrees of freedom=4, $\chi^2=13.423$, $P=0.009$; value for change from baseline to post ^b Degrees of freedom=4, $\chi^2=0.876$, $P=0.928$; value for change from post to follow-up ^c Degrees of freedom=4, $\chi^2=1.329$, $P=0.856$; value for change from baseline to follow-up						

significant ($P \leq 0.01$) immediately following the vending change to one year later. Student responses to choosing healthy drinks if they are available and weekly in-school purchasing patterns were significant ($P = 0.011$) from baseline to one year following the vending change.

Frequency distribution revealed a preference for hunger, taste, and price in “Reason for Choosing Snack” among all time periods. The other options for choosing a snack included value for money, new choice, energy choice, watching weight, attractive packaging, lower fat, habitual choices, popular choice, healthy choices, and fewer calories.

CONCLUSIONS AND APPLICATIONS

The results from this study were encouraging regarding the impact environmental changes may have on adolescent eating perceptions. First, more students reported being receptive to changes in and offering of healthy beverage options from baseline to follow-up. Second, no significant long-term changes in beverage purchasing and money spent were found. So, by replacing with healthier items, we observe that changing beverage items to include more healthful choices does not appear to negatively affect sales. For example, from baseline to follow-up there were no significant changes reported in how many times per week adolescents bought drinks from the vending machines at school. Finally, students did not significantly substitute school vending options with outside sources, further adding to the benefit of making healthful beverage vending choices available.

These findings support other research study patterns to encourage environmental interventions. French and colleagues found that availability and price are the biggest issues in consumption (27,99,102). Price reduction of low-fat vending items and fresh fruit and vegetables in cafeteria lines has been shown to increase customer purchases of these healthier choices (27,99,102). In addition, a positive association between body mass index and sugary beverages has been reported in multiple studies and research teams (32,72). A few sources have contradicted this finding. For example, the study by Forshee and colleagues of the relationship between beverage consumption from school vending machines and risk of adolescent overweight is one of the few studies who have not found a link between beverage consumption and body mass index (101). The study results showed

no improvement on student body mass index through removal of regular carbonated soft drinks from schools suggesting that removal of those vending items from the school environment will not significantly impact body mass index. This may be due to the fact that the study was “supported by an unrestricted gift from the American Beverage Association” and also has ties to the sugar industry (101). In an earlier study by the same research team of Forshee and colleagues, a weak relationship between diet carbonated beverages and body mass index was found (76). In the same study supported by the National Soft Drink Association a strong association between ethnicity, age, and gender was found. This finding would encourage the presence of beverage vending in high schools to market the products and build lifetime consumers (103). The majority of studies indicate that all students can benefit from a healthier environment because lifestyle changes and the formation of new eating behaviors occur in adolescence (17). Adolescents that eat with their families and spend more time with their parents on the whole have healthier eating habits (78,79). Since foods at home fulfill two of the highest reported factors in choosing a snack (convenience and cost) what is available impacts their diet greatly (28). Therefore, having a healthier school environment, where adolescents spend a great deal of time, may encourage healthy eating behaviors.

This study had several limitations. All information was self-reported. No comparison or control school was tested. Findings from the test-retest suggest however that these data are reliable. As a result we cannot be sure if the changes we observed are entirely a result of the beverage vending change. The purchasing pattern questions represent information only within the individual pricing categories and cannot speak to general spending behaviors. Therefore, the scope of the purchasing information that can be generated is limited. A confounding effect could result due to a price increase of \$0.25 on all items in addition to the vending change. Since adolescence is a time of rapid development (17) the students could be more mature, with their increase in age between time periods, and have a higher purchasing power which would result in skewed results. Though an effect was not seen, it is possible that the students increased in their capacity to fill out the survey instrument making them more familiar to the questions. Retention was an issue: as a result a reduced sample size was obtained based on matched data. Finally, this study may not be externally valid and applicable to other geographic areas.

A distinct challenge for practitioners and researchers is obtaining accurate documentation regarding portion sizes. Beverages are served in a variety of sizes and often the United States Department of Agriculture portion size is not well known among youth. Education regarding the increased caloric value and negative consequences, such as dental carries, for high consumption of sweetened beverages are needed among youth. Finally, according to data from the Virginia Department of Education, truancy in this school district was third highest for the 2003-2004 school year (104). This may have decreased sample size and was indicative of why the investigators chose to match across two time periods. It was determined that matching across all three time periods would present a group of students that have different sociodemographic status.

This research represents a novel approach to addressing adolescent nutrition. Hopefully, with continued research in this area, vendors and school officials can make healthful changes with confidence that profitability may not be lost. Finally, thinking with a broader scope, possible student benefits include improved nutrition, higher academic achievement, fewer discipline problems, and improved attendance, and lower societal medical costs (4,13,14,35).

Chapter IV: DISCUSSION AND CONCLUSIONS

Other factors were observed that may influence the validity of the study results. First, the study took place in an urban setting comprised of mostly black students. Second, the researchers observed that students in the majority of the English classes had a very short attention span and little respect for the academic environment in comparison to their peers in advanced English classes. Advanced students finished the survey instrument on average 20 minutes ahead of their peers in regular or remedial English. The demeanor of students was very different in each class. Students in advanced classes seemed eager to learn and asked questions about the research study while their peers treated the study as an inconvenience or a way to get out of coursework.

Additionally, the timing of the research was not optimal because of the daily functions of the school. One data collection took place on the weekday following prom. This was not a usual school day and students reported higher intakes of snack and beverages outside of school than other days. The follow-up data collection took place during the state Standard's of Learning (SOL's) exams. A significantly lower amount of survey instruments were collected during this time period. This could be a result of a higher truancy rate due to the standardized testing for 10th graders.

Ideally, the researchers would have also had greater control of the vending machines and access to records of vending items purchased. Recent technological advances have made tracking vending purchases on an individual basis possible through "smart cards (105)." These cards can act as student identification cards, debit cards and have even been used as a parental monitor for attendance and healthy eating choices through a simple reward points system (106). No record was found that this technology has been utilized in the United States. The system does seem to be beneficial though it has been agreed that the change is very education intensive because of its wide affects on the entire school system. From a research perspective, the cards may be very useful for increasing the validity of the data. Ethically, the cards may pose a challenge due to infringing upon freedom of choice for the students.

Since the majority of students in the participating school clearly had other priorities other than school and nutrition, methods to improve the nutritional health of the students present a challenge to health professionals. Though behavior change on an individual level is very difficult, diet and physical activity are very important. Unfortunately, due to the “obesigenic” or “toxic food environment” of the United States and the preference for convenience over long-term health, “cognitive control of body weight” will always be necessary because making healthful food choices is not convenient or easy (38,107). In addition, physiology is not the primary problem because as Hill and colleagues state “our biology, which evolved in times of frequent famine, is now essentially maladaptive in our environment of food abundance and sedentariness (107).” Currently, our problems with obesity stem from societal and environmental issues rather than biological ones.

In order to impact our youth, health professionals must not only work towards education but focus on their environment. Therefore, all areas of society must be targeted to prevent obesity in children. These environmental target areas include home, school, healthcare, public policy, and public awareness (108). This research study has focused on the beverage vending practices in the school environment. These findings were encouraging because participants showed a significant change in attitude towards healthier beverage options indicating that environmental changes may have a positive influence on adolescent eating perceptions.

Recent legislation, through The Child Nutrition and WIC Reauthorization Act of 2004, requires wellness policies to be adopted and implemented with involvement from parents, teachers, administrators, school food service, school boards, and the public (98). These policies designed and implemented at the local level, can request technical assistance from the USDA in implementing healthy school environments. Thus policy acts as an opportunity for schools to embrace and change the school nutrition and physical activity environment (98). This legislation is only the beginning of how this country must act to improve the school environment for our youth.

Parental involvement is also important since they play a central role in children’s diets plus, they can influence school decision-making. This was evident in the current research study population because the change from fruit drinks to water and fruit juice

came at the request of concerned parents (34). In a study that measured parental attitudes towards soft drink vending machines through focus groups, parents were unaware of the amount and types of machines, hours of operation, location, contracts, and rules and regulations regarding the machines (109). Overall parents thought the machines were an issue of student control and choice. The lack of knowledge and little discussion of health consequences of soda consumption may indicate a low priority with parents in regard to the beverage vending issue (109).

Increased awareness about the school nutrition environment is critical at this time. Though knowledge does not equal behavior change, and may not move students to act on behalf of themselves, it may move parents to pressure school administrators and policy makers to enact policy that supports a healthy eating environment for their children. Since nutrition is important during the period of adolescent growth and habits are being formed in this period that may persist through adulthood, intervention and education are crucial at all possible levels (17,65,66). Understanding how the public perceives the issue of childhood overweight and how they think the issue should be handled will help educators and health professionals accomplish the goal of bridging the “energy gap” or overcoming the excess of energy intake compared with energy expenditure in our youth that continues to cause weight gain (107).

Finally, continuing to understand why adolescents make the food choices they do will also help improve the food environment because it will explain where health professionals should target youth. Students have shown to have a higher intake of fruits and vegetables when they are made available to them regardless of taste preferences (110). Also nutrition projects with peer leaders have been shown to increase campus wide sales of low-fat items and improve nutritional attitudes and behaviors among student advocates (111-113). Therefore, future projects including fresh fruit and vegetable choices in the school system as well as including peer-led projects will greatly assist in improving the school nutrition environment.

Vending machines have benefits such as profits and allowing for students to purchase snacks outside of meal times and are therefore likely here to stay, it is important to educate parents on the negative impacts that the high-fat and high-sugar options have on their children (68,72,74,109). Informed parents and educators will be more likely to

push for regulations and demand assistance through the wellness policies already established through The Child and WIC Reauthorization Act. Further research on the impact healthful choices have on long-term purchasing patterns of the students is needed to encourage administrators nationwide to implement healthier vending options within the machines.

Currently in Virginia competitive foods including beverages served from 6:00 AM until the end of the breakfast period and during the lunch period must be recognized as a component of the food based meal pattern or must contain 5% of the Daily Value, per serving or per 100 calories, of at least one of these eight essential nutrients: iron, calcium, protein, vitamin A, vitamin C, niacin, thiamine, or riboflavin. Iced or hot coffee and tea may not be sold and non-carbonated water may be sold to students. The money from the sale of competitive foods during the protected time periods must accrue to the school nutrition program account (82).

Senator Harkin has recently presented the Child Nutrition Promotion and School Lunch Protection Act of 2006 which is a bill to Congress that would amend the National School Lunch Act and make high nutritional standards to all foods on school campuses not just the currently regulated USDA school lunch. Specifically, it will amend the Child Nutrition Act of 1966 to improve the nutrition and health of children in school by updating the definition of “foods of minimal value” to conform to current nutrition science and to protect the Federal investment in the school meal programs (114). The proponents of this legislation would like to see the nutritional regulation apply to school stores, vending machines, fund-raising events, and snack bars. Though lawmaker supporters remain hopeful, nutrition professionals such as Dr. Kelly Brownell of the Yale Center for Eating and Weight Disorders, remain skeptical thinking that the food industry and soda drink industry will lobby hard to remove this act from Capitol Hill (115). This new legislation has yet to hear a response from organizations such as the American Beverage Association (ABA) who last year created a new vending strategy to meet consumer demand for healthier choices in schools.

The ABA also had recent policy changes which stated; 1) only water and 100 percent fruit juice will be available to students in elementary schools 2) only nutritious and/or lower calorie beverages, such as water 100% fruit juice, sports drinks, no-calorie

soft drinks, and low-calorie juice drinks, in addition no full-calorie juice drinks with five percent or less fruit juice until after school in middle schools, and 3) in high schools no more than 50% of vending selections will be soft drinks a variety of vending choices will be made available including bottled water, 100% juice, sports drinks, and juice drinks (116). This new policy may have come up short in lieu of Senator Harkin's recent bill for even more strict legislation from a federal level.

Implications for Research and Practice

The need for a healthful school environment is great. As this study has shown, one way to approach this may be through replacing unhealthy vending beverage items with more healthful choices. Further research is needed to isolate what vending changes are the most beneficial. Though price decrease has been thoroughly studied with various healthful vending items, little research is available on behavior and attitudes after an actual intervention. More clarity is needed on whether forms of environmental change within the school system that can be beneficial to curb the epidemic of overweight among youth in the United States.

Schools must be creative with their solutions for a healthy environment in order to facilitate an environment for behavior change among youth. Including registered dietitians in the health staff for nutrition education and counseling would greatly benefit the children on an individual and corporate level. As the bill by Senator Harkin proposes, having policies in schools that promote nutritious choices across all food environments in schools including fundraising, celebrations and parties, and using food as rewards would be a positive way to influence children. Schools need to show consistent health practices in order to model sound health and nutrition. In this way, a healthy school environment including healthy vending machine choices will expose children to nutritional and flavorful food and beverage options without sending mixed messages.

Since this study represents the first to measure adolescent attitudes and behavioral changes with respect to a vending change, more research is needed to provide a solid basis for improving school environments. As school districts decide to change to healthier options, investigators may capitalize on that change in order to study if similar results occur. This would add to the confidence among school administrators to make healthful

changes without fear of jeopardizing loss of funding from the vending companies. In addition, a wider knowledge base would encourage corporations to provide more healthful items in vending machines at a reasonable price.

In conclusion, adolescents appear to purchase beverages that are most readily available to them. After being exposed to healthier choices for one year, students' attitudes towards choosing healthy beverages were more positive than before the vending change. This indicates that making healthier vending beverage options available in public schools may improve student attitude and purchasing patterns towards more healthful beverages.

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APPENDICES

APPENDIX A: Survey Instrument

Food Intake Survey General Information

This questionnaire is about the types of foods you eat. Filling out the information is voluntary, and your name will not be recorded. You will be providing valuable information that may be used to decide what foods will be offered at school.

Identification Code: Please fill out the information below to make a special code for yourself

What is the third letter of your last name? _____

What is the first letter of your mother's father's (your grandfather) last name? _____

What is the number (1-12) of the month you were born? _____

What is the number of the day of the month you were born? _____

What is the name of your favorite family pet? _____

Class: What is your English teacher's name? _____

What time does your English class begin? _____

Age: What is your age? _____

Gender: Please circle your gender

Female

Male

Height: How tall are you? _____ feet _____ inches

Weight: How much do you weigh? _____ pounds

Race: What is your race?

_____ White

_____ Asian/ Pacific Islander

_____ Black/African American

_____ Other: _____

_____ Native American

Are you Hispanic or Latino? _____ Yes _____ No

Today's Date: _____



What You Think

Please circle the answer which shows how much you agree with what is said. Please answer all questions, and please choose *only one* answer for each sentence.

1. Eating healthy foods makes me feel better.

Strongly agree Agree Disagree Strongly disagree

2. Eating healthy foods makes me look better.

Strongly agree Agree Disagree Strongly disagree

3. Eating healthy foods will make me healthier.

Strongly agree Agree Disagree Strongly disagree

4. Eating healthy foods will help me lose weight.

Strongly agree Agree Disagree Strongly disagree

5. Eating healthy foods will help me stay at a healthy weight.

Strongly agree Agree Disagree Strongly disagree

6. Eating healthy foods will make me gain weight that I do not want to gain.

Strongly agree Agree Disagree Strongly disagree

7. I know which foods are healthy.

Strongly agree Agree Disagree Strongly disagree

8. I would choose healthy foods (low fat, low salt, whole grain, fruits, etc.) from the school vending machines if they were available.

Strongly agree Agree Disagree Strongly disagree

9. I would choose healthy beverages (water, 100% juice, low fat milk) from the school vending machines if they were available.

Strongly agree Agree Disagree Strongly disagree

10. I would prefer to have only healthy choices for foods in the vending machines at school.

Strongly agree Agree Disagree Strongly disagree

11. I would prefer to have only healthy choices for beverages in the vending machines at school.

Strongly agree Agree Disagree Strongly disagree

Food Choices

1. How often do you choose foods at the grocery store for you or your family?

Almost always Sometimes Rarely Never

2. How often do you tell the person who buys food at the grocery store what to buy?

Almost always Sometimes Rarely Never

3. How often do you choose what you eat for breakfast?

Almost always Sometimes Rarely Never

4. In an average week, how many days do you eat lunch in the school cafeteria? _____ days/week

5. In an average week how many days do you bring your lunch to school? _____ days/week.

6. How many times per week do you buy *snacks to eat* from the vending machines at school? (Check one box.)

- | | |
|--|---|
| <input type="checkbox"/> Less than once per week | <input type="checkbox"/> 5-6 times per week |
| <input type="checkbox"/> 1-2 times per week | <input type="checkbox"/> 7 or more times per week |
| <input type="checkbox"/> 3-4 times per week | |

7. What do you usually buy *to eat* from the vending machine?

8. How many times per week do you buy *drinks* from the vending machines at school? (Check one box.)

- | | |
|--|---|
| <input type="checkbox"/> Less than once per week | <input type="checkbox"/> 5-6 times per week |
| <input type="checkbox"/> 1-2 times per week | <input type="checkbox"/> 7 or more times per week |
| <input type="checkbox"/> 3-4 times per week | |

9. What do you usually buy *to drink* from the vending machine?

10. How much do you usually spend per day on *food* from snack/food school vending machines? (Check one box.)

- | | |
|--|--|
| <input type="checkbox"/> None | <input type="checkbox"/> \$2.05 - \$3.00 |
| <input type="checkbox"/> \$.25 = \$1.00 | <input type="checkbox"/> \$3.05 or more |
| <input type="checkbox"/> \$1.05 - \$2.00 | |

11. How much do you usually spend per day on *drinks* from snack/food school vending machines? (Check one box.)

- | | |
|--|--|
| <input type="checkbox"/> None | <input type="checkbox"/> \$2.05 - \$3.00 |
| <input type="checkbox"/> \$.25 = \$1.00 | <input type="checkbox"/> \$3.05 or more |
| <input type="checkbox"/> \$1.05 - \$2.00 | |

12. How many times per week do you buy *snacks to eat* after school from somewhere besides school?

- | | |
|--|---|
| <input type="checkbox"/> Less than once per week | <input type="checkbox"/> 5-6 times per week |
| <input type="checkbox"/> 1-2 times per week | <input type="checkbox"/> 7 or more times per week |
| <input type="checkbox"/> 3-4 times per week | |

What do you usually buy? _____

Where do you usually buy it? _____

13. How many times per week do you buy *drinks* after school from somewhere besides school?

- | | |
|--|---|
| <input type="checkbox"/> Less than once per week | <input type="checkbox"/> 5-6 times per week |
| <input type="checkbox"/> 1-2 times per week | <input type="checkbox"/> 7 or more times per week |
| <input type="checkbox"/> 3-4 times per week | |

What do you usually buy? _____

Where do you usually buy it? _____

14. How often do you choose what you eat for supper (evening meal)?

Almost always Sometimes Rarely Never

15. How often do you make your own supper (evening meal)?

Almost always Sometimes Rarely Never

16. How often do you choose what you eat for snacks?

Almost always Sometimes Rarely Never

17. In an average week, how many times per week do you eat supper (evening meal) with at least one of your parents?

- | | |
|--|---|
| <input type="checkbox"/> Less than once per week | <input type="checkbox"/> 5-6 times per week |
| <input type="checkbox"/> 1-2 times per week | <input type="checkbox"/> 7 or more times per week |
| <input type="checkbox"/> 3-4 times per week | |

Your Plans

1. Are you currently trying to eat healthier?
_____ Yes _____ No
2. **If you answered yes to the last question, answer this question. If you answered no to the last question, mark an "X" before "not applicable".** On a scale from zero to ten, where 0 means not at all successful, how successful are you at trying to eat healthier?
_____ (write in number)
_____ Not Applicable: I did not answer yes to the last question (mark with "x")
3. Have you been thinking about trying to eat healthier? _____ Yes _____ No
4. Do you actually plan to eat healthier over the next 6 months? _____ Yes _____ No
5. If you are planning to eat healthier, how confident are you that you will eat healthier during the next 6 months? Enter a number from 0 to 10 in the blank provided, with 0 being not at all confident and 10 being totally confident:
_____ (write in number)
_____ Not Applicable: I'm not planning to eat more fruit/vegetables (mark with "x")

Family and Friends

1. On a scale from 0 to 10, where 0 means that they do not encourage you at all and 10 means they encourage you a lot, how much does your family encourage you to eat healthy?

2. On a scale from 0 to 10, where 0 means that they do not encourage you at all and 10 means they encourage you a lot, how much do your friends encourage you to eat healthy?

3. On a scale from 0 to 10, where 0 means that they do not encourage you at all and 10 means they encourage you a lot, how much do the cafeteria employees at school encourage you to eat healthy?

4. On a scale from 0 to 10, where 0 means that they do not encourage you at all and 10 means they encourage you a lot, how much do your teachers at school encourage you to eat healthy?

5. Please indicate how much you agree with each of the following statements. Use a **scale** from 0 to 10, where 0 means you don't agree at all and 10 means you strongly agree: (write in a number, not just an "x").

- _____ My family eats healthy
- _____ My friends eat healthy
- _____ I have made it a habit to eat healthy ever since I was a child
- _____ There is a lot of confusing advice about healthy ways to eat
- _____ I like the taste of healthy foods
- _____ It is easy to find healthy foods to eat for snacks at school
- _____ It is easy to find healthy drinks to drink for snacks at school
- _____ My friends don't think eating healthfully is "cool"

Your Reasons for Choosing Snack Foods

Please rank the following reasons for choosing snacks according to how important they are to you when you choose a snack. There are 13 reasons. Please write a number from 1 to 13 beside each reason, with 1 being least important and 13 being most important. You should use each number from 1 to 13, and only use each number one time.

How important (1 to 13; 1 = least important; 13 most important)	Reason for Choosing Snack
_____	How good the snack tastes
_____	How hungry you are
_____	The price of the snack
_____	Value for the money
_____	The snack is your "usual" snack (habit)
_____	You need energy
_____	The snack has less fat than other choices
_____	The snack is a healthy snack
_____	The snack has fewer calories than other choices
_____	You are trying to watch your weight
_____	You want to try a new snack
_____	The package for the snack is attractive
_____	The snack is one that your friends like

APPENDIX B: Research Proposal Guidelines

Virginia Tech Proposed Study: Impact of Changes in Vending Machine Items on High School Students' Diet and health

Drs. Kathy Hosig and Elena Serrano

May 17, 2004

1. Abstract

Childhood obesity is an epidemic both nationally and in Virginia. In the U.S., childhood overweight has increased two-fold over the past two decades and adolescent three-fold. Schools play a crucial role in addressing this epidemic. Roanoke schools have taken a huge step to ameliorate the proliferation of adolescent overweight by making the commitment to offer healthy food and drink options in high school vending machines, in place of high fat and high sugar options (which can contribute to excessive calories). The aim of this study is to determine if offering healthy items in school vending machines results in positive dietary impacts for youth both in school and outside of school. In order to examine this research question, Virginia Tech researchers will administer written questionnaires to all ninth grade students (n=500) who are interested in participating in May 2004 and 10th grade students in Fall and Spring, 2005. The scheduling of the surveys will ensure that little burden is placed on classroom teachers. Further, all related costs will be encumbered by the Virginia Tech researchers. The survey instrument includes non-invasive questions about: 1) how much control the students have over food choices; 2) student attitudes toward eating healthy foods; 3) the social environment related to eating healthy foods (influence of family, friends, school personnel); 4) reasons for snack choices; and 5) a recall of all foods and beverages consumed during the past 24 hours. All responses will be confidential and anonymous. The data will be collected and analyzed by the Virginia Tech researchers. Results from this study will help provide insight into the direct association between vending machine options and overall diet. The findings may also provide further insight into the role of vending machines in overweight.

2. Relevance of the research topic, questions, and hypotheses to the school setting. The research problem and statistical hypotheses or research questions should be prominent.

In the past few years, there has been growing controversy over the role of vending machines in students' diets and overall health, particularly with the increase in childhood and adolescent overweight. The assumptions have been two fold: 1) foods and drinks in school vending machines are contributing to this growing rate; and 2) if healthy foods replace high fat and high sugar items in school vending machines, students' diets will automatically improve. To date, there are no reported studies that specifically address these two hypotheses. The aim of this study is to determine if offering healthy items in school vending machines results in positive dietary impacts for youth both in school and outside of school.

3. Description of the research design and methodology, including research paradigms, treatments, procedures, and limitations.

In order to examine changes that take place over time as a result of changes in vending machine items, written questionnaires will be administered at three different times: May 2004 (Time 1), Fall 2005 (Time 2), and Spring 2006 (Time 3). All ninth grade students (as of May, 2004) in English class will be recruited to participate in the study. Students will be followed as tenth grade students for Time 2 and Time 3, again in English classes. Questionnaires will be distributed and handled by Virginia Tech researchers in order to ensure consistency in administration, as well as anonymity. English class was chosen since all students are required to be enrolled in that class. The questionnaire will include questions on dietary choices and overall health attitudes (a contributing factor to dietary behaviors). Participation in the study will be voluntary. All data will be anonymous, as students will determine their own unique identification code to be placed on the survey instrument that will be used to match multiple surveys for data analysis. All data will be reported only in aggregate form.

Limitations: This study represents a convenience sample.

4. Samples of instruments, surveys, questionnaires, interview protocols, and other components of the process. Show the relationship between the instruments and the research design. Include reliability estimates, validity estimates, development dates, copyright releases, time requirements, procedures for administration, and any other pertinent information. If

instruments are in the process of development, approval will not be given until final instruments are submitted.

A copy of the survey instrument is included in the Appendix. A majority of the questions were taken from a survey previously tested for reliability in ninth-grade students in North Carolina in 1998. That survey related to fruit and vegetable intake; questions on this survey have been modified to reflect “healthy eating” rather than fruit and vegetable intake. Rank motivation questions for snack choices were taken from a recently published study.¹

Questions on the survey relate to: 1) how much control the students have over food choices; 2) student attitudes toward eating healthy foods; 3) the social environment related to eating healthy foods (influence of family, friends, school personnel); 4) reasons for snack choices; and 5) a recall of all foods and beverages consumed during the past 24 hours. These questions will be used to answer the research questions regarding the effects of vending machine changes on actual dietary intake and attitudes of the students.

5. Description of the target population including number of students, staff, and/or parents; grade levels and background information; special characteristics. Identify selection procedures; describe how rights of subjects will be protected and how permissions will be secured.

All ninth grade students in English class at both high schools (n=500) will be recruited for the study. All students who wish to participate may do so. Anonymity will be protected by using student-generated identification codes (see attached survey for method) rather than name or other personal information and by having the researchers administer and collect the data during the class period. A short statement will be read before all students fill out the questionnaire, indicating that participation is voluntary and that by filling out the questionnaire they give their permission to participate.

6. Specification of the processes/procedures for collecting data, including identification of persons responsible for data collection, dates, times, frequencies, and any other relevant information.

Surveys will be administered on days/times that are convenient for the schools, based on communication with the English teachers. The Virginia Tech researchers will be responsible for data collection, as well as reporting results to schools.

7. Explanation of procedures for analysis of data, including the rationale for the choice of analytical procedures. Indicate the relationships among the hypotheses, the instruments, and the analyses.

Food recalls will be analyzed for nutrient content using the Nutritionist Pro™ computerized nutrient analysis program (First DataBank, San Bruno California). Data will be entered into SPSS™ statistical program. Descriptive statistics will be obtained for demographic information, diet, and overall health habits. Repeated measures t-tests, ANOVA and Chi-square analysis will be used to study changes in diet over time. Primary variables of interest include overall dietary intake (calories, percent of calories from fat, percent of calories from sugar, daily grams of fat and sugar), nutritional quality of snacks purchased at school and away from school, and body mass index (from self-reported height and weight).

8. Description of how results will be reported, including purpose and audience for each type of report.

Reports will be compiled for each school covering the following information: number of students participating in each component of the study; demographic information (gender, age); health habits; dietary status at Times 1, 2, and 3; dietary changes over time; body mass index over time; conclusions and recommendations.

A manuscript will also be submitted to a scholarly journal, so that other schools and researchers can utilize this information to make positive changes in school environments. All data presented will be kept anonymous to protect the schools (unless the schools request their name to be used).

It is possible that press and other media releases are issued as a result of the study. Again, the schools' identity will be protected unless the schools provide permission to report their names.

9. Clarification of all time requirements and timelines, including when each task is to be performed, who is involved, estimated time needed, and any other constraints.

Time requirements: the questionnaires only require one class period to administer for each administration period.

Estimated time needed: one class period for each 9th grade English class in May 2004 and each 10th grade class in Fall 2005 and Spring 2005

Who is involved: 9th grade students (2004) and 10th grade students (2005), n=500, in English class period and VT researchers

Constraints: None anticipated.

10. Description of specific long-range and short-range costs and/or benefits to the participants and to the school division at large. Include a description of how the study contributes to the advancement of knowledge.

The study has many short-term benefits. First, participating schools can determine what type of impact their changes have made on their youth. Second, all data will be collected by trained researchers with little burden placed on the schools. Finally, the study will help determine if any financial costs incurred as a result of changing options in vending machines are offset by improved nutrition.

In the long-range, the changes in the school environment could contribute to improved health, possibly leading to higher academic achievement, fewer discipline problems, improved attendance rate, and lower medical costs for society. The study contributes to the advancement of knowledge, since no reported study has examined the impact of changes in school vending machines on overall diet of youth.

11. Statement of qualifications (professional and technical) of the applicant as well as any consultant(s) to be used. Identify roles and responsibilities of each person and designate the primary researcher.

Primary Researchers –

The following researchers will work closely together to conduct the study, including the following activities: communicate with school faculty to arrange convenient days/times to conduct the study; administer the survey instruments in class; analyze the data; report the findings to the school, as well as Roanoke Research Division.

Kathy Hosig, PhD, MPH, RD, Associate Professor, Dept. of Human Nutrition, Foods, & Exercise, Virginia Tech – Dr. Hosig has had experience working with schools in Arkansas and North Carolina to promote healthy eating habits. She was primary investigator for a USDA-funded cooperative agreement in Arkansas to improve nutrition habits in children in grades K-5. She also served as evaluator for project funded by the National Cancer Institute to increase intake of fruits and vegetables in ninth-graders in Hendersonville, NC. She has served as primary investigator for projects funded by the Nutrition Education and Training (NET) program in North Carolina – these projects were related to fruit and vegetable intake, the importance of breakfast, and promotion of dairy foods for children in elementary school.

Elena Serrano, PhD, Assistant Professor/Extension Specialist, Dept. of Human Nutrition, Foods, & Exercise, Virginia Tech – As an Extension Specialist and Researcher, Dr. Serrano has worked closely with schools over the past 6 years to both promote and study healthy lifestyles among youth. Dr. Serrano is also the Chair of Virginia Action for Healthy Kids, a statewide coalition aimed at improving access to healthy food options and physical activity among youth in Virginia schools.

Secondary Researcher –

Jennifer Spangler, Research Associate, Dept. of Human Nutrition, Foods, & Exercise, Virginia Tech. For the past year and a half, Jennifer has been a Research Associate in the department. Her main job responsibilities have been to help conduct a study looking at the prevalence of childhood overweight in Virginia schools. She also has helped develop several curricula and educational materials for school-aged youth related to nutrition and physical activity.

12. Summary of budget requirements for the study and sources of funding.

The only costs are the photocopying of survey instruments. These charges will be encumbered by the Virginia Tech research faculty through discretionary funds.

13. Letter of recommendation from the major advisor on the applicant's committee (if applicant for the study is a student.) N/A

¹ French, SA, Story, M, Hannan, P, Breitlow, K, Jeffery, R, Baxter, J, Snyder, MP. Cognitive and demographic correlates of low-fat vending snack choices among adolescents and adults. *Journal of the American Dietetic Association*. 1999; 99 (4): 417-475.

APPENDIX C: Research Proposal Application Approval Form

APPLICATION FOR APPROVAL OF RESEARCH PROPOSAL

Contact Names: Elena Serrano & Kathy Hosig

Title of Study: Study of the Impact of Changes in Vending Items

Home Address: 201 Wallace Annex

Home Telephone: 540.552.0732 Business Telephone:
 540.231.3464

Job Title: Assistant Professor/Extension Specialist

Will you be conducting this research as part of your employment? Yes

Will you be conducting this research to fulfill a college or university requirement? No

College or University: Virginia Tech

College Address: 201 Wallace Annex,

Department: Dept. of Human Nutrition, Foods, & Exercise

Major Advisor: N/A

Advisor's Telephone: N/A

I understand that acceptance of this request for approval of a research proposal in no way obligates Roanoke City Public Schools to participate in this research. I understand that approval does not constitute commitment of resources or endorsement of the study or its findings by the school division or the School Board.

I acknowledge that participation in the research studies by students, parents, and school staff is voluntary. I will preserve the anonymity of all participants in all reporting. I will not reveal the identity or include identifiable characteristics of schools or the school division unless authorized to do so by the Superintendent.

If approval is granted, I will abide by all Roanoke City Public Schools policies and regulations and will conduct this research within the stipulations accompanying the letter of approval. At the completion of the study, I will provide Roanoke City Public Schools' Director of Research, Testing and Evaluation with at least two copies of the results.



Signature of Applicant

Date 5/17/04

APPENDIX D: Research Protocol

Teen Beverage Vending Study Protocol

On Blackboard Write:

Current English teacher/9th grade English teacher name, Date, Time Class begins, and 'Stop when finish page 6'

Introductions:

"Hi! Our names are _____. We are from Virginia Tech Department of Human Nutrition, Foods and Exercise. We are here today to ask you some questions that will help us, and your school system find out how to help you eat healthy foods. We would like to fill out the questionnaire we have brought today. It will take about 40 minutes. Your participation is completely voluntary – you do not have to fill it out, but we really need your help."

"It is also completely anonymous. On the survey you will make your own identification code that will not be able to trace back to you. We use the code number to match your survey with the one filled out in the spring of last year, but we will not know who you are. Therefore, do not put your name on the survey."

Note: Thank them for being a part of work that will help people after them and their school.

Pass out questionnaires

"First, take a few minutes to fill out all the identification code information at the top of page one."

Note: Walk students through this section. If have no pets write 'none' and if have multiple pets write the name of only one even though they are all likely favorites or the students would like to put down all pets so as not to be exclusive.

"Now that we have the codes please fill out the information on the surveys. We would appreciate it if you treat this like a test only in that you do not share or converse with your neighbor or friend next to you. The right answer is what you think, how you feel, unlike the SOL's where the test is looking for a specific 'right' answers. Please answer as honestly as possible. Stop when you finish page 6 because we will go through the next section together. We want to help you with that part. If you have any questions raise your hand and one of us will come help you. When you are finished please wait quietly for your colleagues (peers) to finish."

When all have finished through page 6.

"Now, we are going to go through yesterday together and you will write down what you ate. We are going to begin when you woke up and work forwards to the time you went to bed. First, we will go through the day and you will write down what you ate and drank and what time that was. Next. We will go back through everything you wrote down and you will estimate how much of each food you ate and how much of each drink you had. Last, we will go back over the day, and you will write down any other items that may have been missed. For example if you got up early in the morning and had a snack and then went back to bed, if you had gum, etc."

First Pass

Lead through the day anchoring with daily activities/routines. And asking them to write them down.

“Yesterday was _____ (day of week).”

“Think about what time you got up and what you did next. Did you eat or drink anything before school? If so, what was it? Write it down on your sheet and make sure you put down what time that was. Don’t forget drinks and gum etc. Also please tell us where you got this (home, school, convenience store, etc.) for “location.” Did you eat or drink anything in the morning at school? If so, please write it down, including the time.

Did you eat anything at lunch break at school? If so, please write it down, including the time. What was the next thing you ate or drank yesterday? It might help to think about the rest of your day at school and whether you ate or drank anything else while you were at school. Please write it down, including the time. Think about after school yesterday. What was the next thing you ate or drank? Please write it down, including the time. What was the next thing you ate or drank? Please write it down, including the time. Keep thinking about the rest of the day, and write down anything else you ate or drank, including what time it was. Do not forget any drinks, gum, etc., and do not forget anything you ate or drank before going to bed.

Second Pass

Now, please go through the day, looking at each food or drink that you listed, and fill in the amount that you ate or drank for each one. We are here to help you estimate the amounts if you need help. If you need help estimating amounts, raise your hand, and someone will come to help you. If you ate at a restaurant, you can say what restaurant and what size you got. If you only ate part of it, tell us how much (only 1 bite, ½, almost all, all, etc.) Please don’t forget to tell us whether your drink was regular or diet. If you had milk, please tell us if it was whole, 2%, 1%, or skim. If anything was light, fat-free, low-fat, etc. please tell us that. An example for this would be with salad dressing. For chips, crackers, etc., you can say about how many you ate. For sandwiches, we need to know what you put on the bread such as mayo, mustard, ketchup, etc. For pasta, we need to know how many pieces and about how big they were. If you had fruits and vegetables, did you add sugar, salt, or anything else?

Third Pass

“Now, please look over everything you listed one more time. Please make sure that you remembered everything you can. Also make sure that you gave us all of the information we need.”

All the items we need are as follows

- food description
- time
- amount
- location (home, school, restaurant, convenience store, friend’s house, etc.)
- any details you can think of that might be helpful

APPENDIX E: Institutional Review Board Exempt Approval



Institutional Review Board

Dr. David M. Moore
IRB (Human Subjects) Chair
Assistant Vice President for Research Compliance
CVM Phase II- Duckpond Dr., Blacksburg, VA 24061-0442
Office: 540/231-4991; FAX: 540/231-6033
email: moored@vt.edu

DATE: May 31, 2004

MEMORANDUM

TO: Kathy Hosig HNFE 0430
Elena L. Serrano Human Nutrition, Foods, & Exercise 0430

FROM: David Moore 

SUBJECT: **IRB Exempt Approval:** "Does Changing Vending Machine Choices Affect Dietary Intake in High School Students?" IRB # 04-283

I have reviewed your request to the IRB for exemption for the above referenced project. I concur that the research falls within the exempt status. Approval is granted effective as of May 28, 2004.

cc: File
Department Reviewer William G. Herbert HNFE 0351

Jennifer Anne LaBarge Spangler

VITA

EDUCATION

M.S., Human Nutrition, Foods, and Exercise, 2006
Virginia Polytechnic and State University (Virginia Tech), Blacksburg, VA
B.S., Human Nutrition, Foods, and Exercise, Virginia Tech, 2002

RESEARCH

Graduate Research Associate, Virginia Tech
Blacksburg, VA 8/04 – present

- Conduct master’s thesis on school vending machines and adolescent behaviors and attitudes

Research Associate, Virginia Tech
Blacksburg, VA 2/03 -11/03

- Collect and analyze data as part of a Southern Rural Development Center grant to assess prevalence of overweight among Virginia Latino school-children

**PROFESSIONAL
PUBLICATIONS/
PRESENTATIONS**

“Beverage Vending Purchasing Patterns and Attitudes in Southwest Virginia High School Students.”
Research orally presented at the Society for Nutrition Education’s annual meeting (2005)

**EDUCATIONAL
PUBLICATIONS**

Co-author, USDA E-Newsletter
bimonthly e-newsletter on childhood obesity distributed to over 1,000 individuals nationally
<http://www.ext.vt.edu/actionforhealthykids/newsletters.html>

Healthy Weights for Healthy Kids, Smart Choices (Pub 348-231)
Lesson for nutrition educators to conduct with a series for youth to promote healthy weight
Implemented with 10,000 youth

Virginia Tenth Grade Curriculum, Virginia Action for Healthy Kids
Nutrition based curriculum aligned with Virginia 10th grade Standards of Learning (SOL)
<http://www.ext.vt.edu/actionforhealthykids/assistanceguide/assistanceguide.html>

**FOOD
MANAGEMENT**

Foodservice Internship, Montgomery Regional Hospital
Blacksburg, VA 8/03-9/03

- Developed, distributed, and analyzed data that facilitated growth of cafeteria sales

Cook, Heritage Hall Nursing Home
Blacksburg, VA 8/02-2/03

- Train new employees
- Plan and prepare food
- Perform basic bookkeeping and stock ordering duties

Foodservice Aide, Montgomery Regional Hospital
Blacksburg, VA 8/99-10/00

- Cold food preparation
- Trayline assembly
- Clean and sanitize trays, dishes, and cooking items

**GOVERNMENT/
PUBLIC HEALTH**

Asst. Technical Writer, Virginia Cooperative Extension
Blacksburg, VA, 5/04 – 7/04; 2/03-11/03; 9/01-12/01

- Help coordinate trainings to childcare providers on nutrition and physical activity
- Develop nutrition publications for school-aged children and program leaders

**OTHER
EXPERIENCES**

Caregiver, **Senior Support Services LLC**
Radford, VA, 11/03-3/04

- Provide quality individual care for elderly clients of various income and health levels
- Perform light housework and errand running (grocery, doctor's office)

Nutrition Counselor, Refugee and Immigration Services
Roanoke, VA 5/01-7/01

- Assist in acclimating and transitioning refugees into US society and culture
- Assist in obtaining social security number and food stamps
- Facilitate nutritious food planning, purchasing, and preparation

WIC Nutritionist's Aide, Roanoke City Health Department
Roanoke, VA 3/00-12/01

- Assist nutritionists with client counseling and assessment
- Service clientele through assistance with WIC certification paperwork

Dietary Aide, Montgomery Regional Hospital
Blacksburg, VA 7/99-9/01

- **Cooperative meal planning/menu selection**
- **Patient nutrition education**

**PROFESSIONAL
AFFILIATIONS**

Treasurer, Virginia Action for Healthy Kids
Member, Society for Nutrition Education

AWARDS

Virginia Tech Wentworth Service Award, community nutrition (2005)
Society for Nutrition Education (SNE), outstanding graduate student (2005)
SNE travel scholarship (2005)

SKILLS

Research/Technical/Communication Skills

- Oral, written, and visual communication for research and presentational purpose
- Collect, organize, and analyze data
- Multi-line telephone communication
- Public service announcements and news articles

Computer Skills

- Microsoft Office XP Professional 2002
- Microsoft Windows Operating Systems
- Microsoft Office Works
- Macromedia Breeze
- FrontPage™
- Endnote and Reference Manager

Health Screening Skills

- Blood glucose
- Blood cholesterol
- Anthropometric measurements