DETERMINANTS OF ADOLESCENT SNACKING BEHAVIOR

by

KATHERINE A SILVIS

(Under the Direction of Rebecca M. Mullis)

ABSTRACT

Adolescence is an important time both physically and socially. Many adolescents have the opportunity for greater freedom of food selection, particularly snacks. Two schools in the Gwinnett County School System agreed to participate in a study designed to identify and describe factors that impact the snacking behaviors of middle school students. The study was conducted in 2 phases. Phase I consisted of focus groups and survey design, and Phase II consisted of survey implementation and collection of 3-day food diaries. The survey (n=148) and 3-day food diaries (n=60) were used to measure the contribution of snacks to total dietary intake and the factors influencing snack selection. Internal factors such as body image and external factors such as indirect parental influence, media influence, and peer influence were shown to be related to snacking behavior.

INDEX WORDS: Nutrition survey, Adolescents, Food Frequency Questionnaire, Snacking, Behavior, Food Diary

DETERMINANTS OF ADOLESCENT SNACKING BEHAVIOR

by

KATHERINE A SILVIS

A Thesis Submitted to the Graduate Faculty of The University of Georgia in Partial Fulfillment of the Requirements for the Degree

MASTER OF SCIENCE

ATHENS, GEORGIA

2002

DETERMINANTS OF ADOLESCENT SNACKING BEHAVIOR

by

KATHERINE A SILVIS

Approved:

Major Professor: Rebecca M. Mullis

Committee: Stuart Fors
Gail Hanula

Electronic Version Approved:

Maureen Grasso
Dean of the Graduate School
The University of Georgia
December 2002

ACKNOWLEDGEMENTS

This project has helped me grow both personally and professionally. First, I would like to thank my committee chair Dr. Rebecca Mullis for helping me remember that when things don’t go easily, “this too shall pass.” I would also like to thank my committee members Dr. Stuart Fors and Ms. Gail Hanula, as well as the Nutrition Intervention Lab staff for their help and support.

Special thanks to Ms. Beth Mills, the Gwinnett County School Nutrition Program Director, and her staff for their instrumental help getting this project started. My sincere appreciation also to the principals and health teachers in the Gwinnett County School System who made this project possible.

I would like to thank my family for their support and confidence in me throughout school. Finally, I thank my husband, Tim Silvis, for his continual love and patience.

TABLE OF CONTENTS

LIST OF TABLES

Page

Tables:

LIST OF FIGURES

Page

Figures:

CHAPTER 1

Introduction

Adolescence, the developmental stage between the onset of puberty and maturity, is important both biologically and socially. It is during this time that an adolescent's body physically matures and the capacity for independent and abstract thought develops. (Hoelscher, Evans, Parcel & Kelder, 2002) This is also the time when many adolescents have greater freedom to make choices which will affect their health and social well-being. One area of increased opportunity for independence is in food selection.

The nutritional status of adolescents is often described as being rather poor. (Neumark-Sztainer, Story, Resnick & Blum, 1996, McPherson, Montgomery & Nichaman, 1995) Adolescents' diets are often low in nutrients such as calcium, and fiber and in foods such as fruits and vegetables. In addition, eating habits formed in childhood

and adolescence may carry over to adulthood. Poor eating patterns can result in obesity and chronic disease in later life. (Rockett & Colditz, 1997) Adolescence may be an optimal time to target poor eating patterns before the behaviors are too established to be easily changed. But in order to plan an effective intervention, more descriptive data about the eating behaviors of this target group as well as their attitudes and beliefs is needed.

Because understanding total dietary intake is important in understanding how to plan nutrition interventions, all eating occasions including snacks are significant. Research has indicated that the majority of people, both adults and children, snack on a regular if not daily basis. Adolescents snack frequently, and the snacks chosen are often high in fat, salt, sugar, and calories. (Cross, Babicz & Cushman, 1994) Items such as potato chips, cookies, and candy bars often provide a significant source of calories with few nutrients for this age group. According to several studies, the prevalence of snacking among adolescents ranges from 60-98 percent. (Dauch, Story, Dresser, Gilbert, Portnoy & Kahle, 1995, Cross et al, 1994) Adolescence may be a window of opportunity to

intervene before these eating patterns are too firmly established. The factors affecting meal and snack choices are unique for adolescents, as they may have less control over food at home but greater control over food eaten away from home. In intervening with adolescents, snacks and meals need to be addressed separately, as the determinants of the behaviors relative to meals and snacks may be different. This study was designed to address one aspect of eating behavior, snacking, and to investigate some of the determinants of snacking behavior. Presently little research is available to describe this aspect of adolescent lifestyles.

CHAPTER 2

Review of Literature

The nutritional status of adolescents is significant for many reasons including the lasting effects of early behavioral patterns. Unfortunately, in addition to deficiencies in key nutrients, adolescents are exhibiting symptoms of caloric over-nutrition. According to the Centers for Disease Control in Atlanta, both the childhood and total obesity rates have been increasing in recent years. (CDC, 1999) The National Health and Nutrition Examination Survey (NHANES) of 1999-2000 indicates that approximately 15% of adolescents ages 12-19 are overweight, a 4 percent increase from NHANES III completed in 1994. Among children 6-11 years of age, the highest obesity rate was among Mexican American boys, at 37.3%. Among students aged 12-19, the highest rate was for Mexican American boys again, at 27.5% with African American girls a close second at 26.6%. Overweight is defined as BMI-for-age greater than

or equal to the 95th percentile. (CDC, 2000) This is of particular concern because overweight adolescents are at increased risk for becoming overweight adults. African American adults have higher rates of obesity, diabetes, and coronary heart disease than other population groups. (CDC, 1999) These data suggest health disparities start early, with a generation of overweight adolescents becoming overweight adults who most likely will have an increased prevalence of obesity-related disorders such as hypertension and other cardiovascular diseases, diabetes, and dyslipidemia.

Ironically, the same students who are at risk for these health problems are also at risk for undernutrition related to some key nutrients. Many of the popular adolescent snack foods such as soda, chips, and fast foods are calorie dense but nutrient poor. This may be problematic because adolescence is developmentally a time of active growth and adequate nutrition is vital for bone development and physical maturation. For example, calcium, which is found in dairy products and dark leafy greens, is important for attaining linear height and peak bone density. The RDA for calcium for children over age nine is

1300 mg/day. (USDA, 1998) The General Mills Intake Study of 1992 reported 95% of 11-18 year old girls and 79% of boys the same age had inadequate intakes of calcium (under 1300 mg per day). (McPherson, 1995)

Restricted fruit and vegetable intake will also automatically limit many dietary components such as vitamin C, carotenoids, and fiber. The National Health and Nutrition Examination Survey (NHANES) III reported average fiber consumption of 12-16 grams per day for children age 12-19. (McPherson et al, 1995) This is below the level of 20 grams per day recommended by the National Cancer Institute, based on 10g per 1000 kcal.

Eating patterns determine what a person eats and when, and include all eating occasions such as meals and snacks. Meal patterns for families have changed as more people eat in their cars and fewer meals are eaten at home. (Kraak and Pelletier, 1998) This trend is unfortunate because of the relative nutritional content of meals vs. snacks. Adolescents who eat at least two meals at home consume a more nutrient dense diet with respect to calcium, iron, vitamin E, and fiber. (Siega-Ritz, Carson & Popkin, 1998)

Skipping meals, especially breakfast, is common among adolescents and “grazing” has become more popular. Grazing is not in itself the problem, it is the choice of foods that students eat as snacks that often puts them at risk for nutrient deficiencies and obesity. According to the Continuing Surveys of Food Intake by Individuals there has been an overall energy intake increase by adolescents from 1977-1996 predominantly from an increase in snack consumption. While home is still the main source of snacks, home snacking has decreased while store and fast food as sources of food has increased. (Nielson, Siega-Riz & Popkin, 2002) For both meals and snacks, home seems to be the best source of healthy food, and the only source that is not on the rise.

Snack consumption has been described in terms of items eaten. An investigation of snack data from the USDA’s Nation-wide Food Consumption Survey and Continuing Survey of Food Intake by Individuals shows an increase from 20 to 23% in total daily calorie intake from snacks from 1977-78 to 1994-96. Soda/juice beverage and salty snack consumption increased, while high-fat dessert consumption decreased. Milk consumption decreased during this time as well. The

shift from meal consumption to “grazing” was also noted. A more recent survey of soft drink consumption among children has also found that it has been increasing as milk and juice consumption have been decreasing. (Harnack, Stang & Story, 1999) In that study, increased calorie intake correlated positively with soft drink consumption in ounces. Sweet snacks, which are popular with children, continue to be popular with adult women. One survey reported that women ate more sweet snacks than men and felt more guilt about snacking. (Grogan, Bell, and Conner, 1997) This guilt may be associated with the dieting behavior that starts in adolescence.

A recent survey reported 2% of school age respondents never snacked, while approximately 29% said they snacked four times a day. (Cross et al. 1994) Sweet snacks were overall the most popular type of snack for this group, followed by meal-type foods and crunchy/salty foods. Most of the children reported eating their snacks in the afternoon and at home. The quality most desired in a snack was taste, followed by cleanliness, and nutrition. Even the nutrition-conscious students responded they still prefer candy.

Although we know young people snack and that common snack foods are low in nutrients, it is still unclear how much of young adolescents' diets are comprised of "junk food", food contributing little more than calories, and "snack food". It is also unclear exactly what factors influence these eating patterns. Several theoretical models have been proposed to explain the factors that may influence general eating patterns. These models are based on Bandura's Social Cognitive Theory, which proposes that behavior, environment, and personal factors constantly interact to determine individual behavior. (Cullen et al, 2000, Croll, Neumark-Sztainer, Story & Ireland, 2002, Story, Neumark-Sztainer & French, 2002, Cusatis and Shannon, 1996)

Based on that model, many of the same factors may influence snack choice. Within the environment of the individual are external and internal factors that are unique to the individual. External factors are those that may or may not be under the control of the individual, but they exist outside that person. Examples of external factors are culture, family, peers, and media influence. Internal factors are those that exist within a person. Although the individual may be unaware of the influence

that these factors are wielding, these factors are ultimately under the control of the individual. Examples of internal factors are body image, and personal values and beliefs. These external and internal factors will influence each other and, in turn, influence the lifestyle of the individual, which will determine individual behavior. (Rees, 1992) The interaction of these factors is depicted in figure 1. A description of this model and these factors follows.

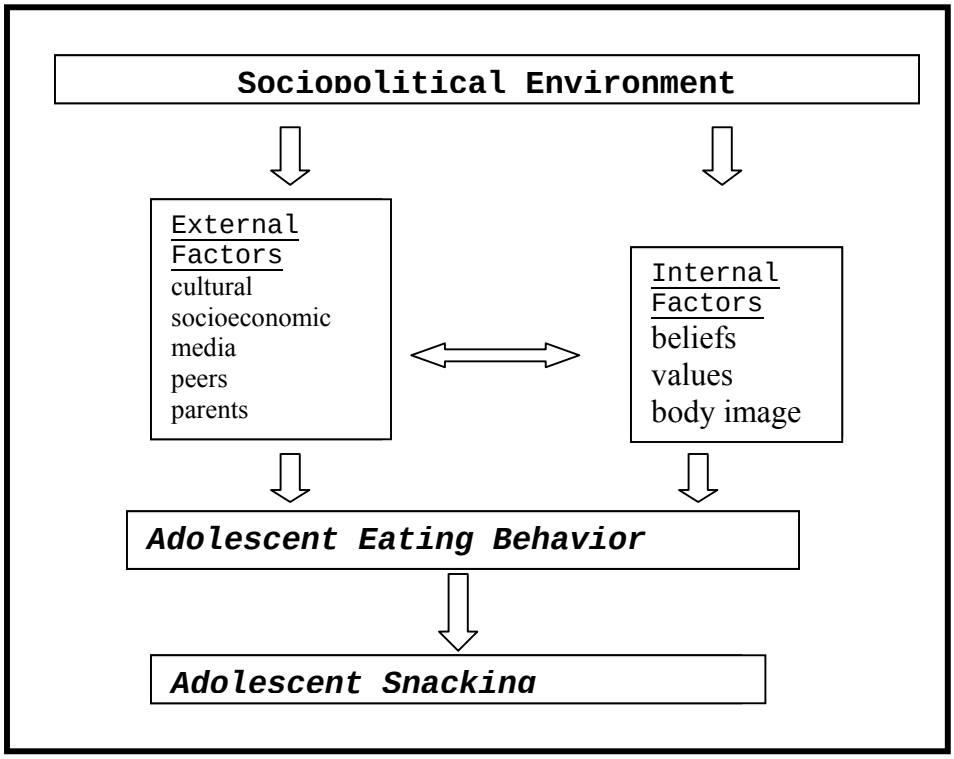

Figure 1. The Internal/External Factors Model

Sociopolitical Environment

The socio-political environment is the geographic and political system in which an individual lives. This will include government, social norms, and other issues such as money and availability of goods. In the area of eating behavior, this overarching system will determine what foods are available to be incorporated into an individual's dietary patterns.

External Factors

Cultural Factors

Culture, defined as socially transmitted behavior patterns, arts, beliefs, institutions, and other products of human behavior and thought, (Neufeldt, 1988) is an external behavioral factor that is difficult to describe and measure. Race is one component of culture, but so is region, religion, and general belief structure. Some research has provided insight into patterns among ethnic groups, which explores one major component of cultural influence on eating behaviors. The 1993 Youth Risk Behavior Survey reported 66% of Hispanic students, 60% of African American students, and 51% of white students ate no cooked vegetables on the day preceding the survey. Asian

Americans were the most likely to consume adequate servings of vegetables daily. (Neumark-Sztainer, Story, Resnick & Blum, 1998) These data indicate that a little over half of students surveyed eat the recommended five servings of fruits and vegetables a day. Some of the differences among the ethnic groups may be due to traditional foods served at home.

Despite these data, few ethnic differences in eating behaviors have been found (Cullen et al. 2002), but it must still be assumed that culture influences intake, as it is one of the defining qualities of who we are.

There are cultural differences in other health-related behaviors. Croll et al.(2002) reported Hispanic and American Indian high-school students at higher risk for disordered eating with risk factors being cigarette smoking, appearance concerns, and alcohol use. Another cultural difference that may influence snack intake is the decreased preoccupation with weight among African American girls. (Story, Neumark-Sztainer, Sherwood, Stang & Murray, 1998) This could be reflected in overall body image, and possibly less concern about healthy snacks.

Socioeconomic factors

Socioeconomic factors are those that reflect resources available to the individual or family. In the

United States, this mainly includes income, but also overlaps with education and perceived social status. According to the Minnesota Adolescent Health Survey, 40% of students from a low SES background reported a less than daily consumption of fruits and vegetables. (Neumark-Sztainer et al, 1998) Low SES can affect daily intake by affecting ability to purchase more expensive items such as fresh fruits and vegetables, fresh meats, and low-fat dairy products.

Parents and Family factors

Availability and family are closely related factors for young adolescents because they cannot drive and usually eat food provided in the home by parents or guardians. Parents will often buy items children request, and television, packaging, and their peers influence the items they crave. (Kraak & Pelletier, 1998; Stratton & Bromley, 1999) Parents do significantly influence the amount of fruits and vegetables that adolescents eat, probably because of their role as providers of food and as role models. A study of high-school students suggested a protective effect of family involvement in regards to adequate fruit and vegetable consumption as well as healthy breakfast and lunch consumption. (Young & Fors, 2001) These

data suggest that family is still influential to a significant degree over fruit, vegetable, and healthy meal consumption, and possibly snack consumption as well. Part of parental influence on adolescents is the level of personal achievement of the parent. This may be associated with self-efficacy, or believing in the ability to help one's self. Roos, Hirvinen, Mikkila & Rimpela (2001) reported a clear positive relationship between household educational level and reported daily consumption of raw vegetables. On the other hand, it can be inferred that low educational levels on the part of the care-giver would correspond to low levels of healthy foods like raw vegetables. (Roos et al, 2001)

Peer influence

An adolescent's peers are the students with whom they have daily contact. The influence of peers is a major factor in determining the behavior of a middle school child, much more so than in earlier years. (Rees, 1992) Adolescents spend more time with their peers during adolescence than they did as younger children, and peer influence on many behaviors seems to increase as children are beginning to develop a sense of separateness and

autonomy from their parents.(Story et al 2002) If students receive negative feedback from their peers for eating low-fat foods and vegetables, this will be a significant barrier to any health-promotion strategy.

Media influence

Media influence in the form of television advertisements targeting children have been very successful at increasing consumption of “fast food”, food from restaurants which prepare and serve food quickly that is generally high in fat and calories. Advertisements for other calorie dense snacks are equally abundant during the hours children usually watch television. (Rees, 1992) In a focus group study of social-environmental influences on children’s diets, both the children and the parents mentioned television commercials promoting “junk-foods” and sports drinks as being influential. (Cullen et al, 2000)

Internal factors

Beliefs and Values

Beliefs are ideas accepted to be true, and values are principals or standards held to be worthwhile or desirable. (Neufeldt, 1988) These are generally ideas that are influenced by external factors such as culture, parents,

and other outside influences but are a factor unto themselves, unique to each individual, and under that individual's control and are thus internal factors. Beliefs and values affect food behaviors by influencing selection and preference through such mechanisms as affecting self-efficacy. Psychosocial factors such as beliefs and values can also influence biological factors such as hunger. (Story et al, 2002)

Body Image

Body image is the picture a person has in their head of their body, which may or may not reflect reality, and includes a value judgment of that picture. Body image is affected by external factors, but is ultimately under the individual's control. Body image as a factor influencing food choice is more important for adolescents than it is for younger children. One survey found 62% of adolescent girls and 28% of boys reported dieting in the previous year. (Story et al, 1998) While dieting and other methods of weight control can be harmful to growing bodies, not all students who report dieting are engaging in unhealthy weight control practices. Moderate methods of weight loss correlate with increased consumption of fruits and

vegetables compared with extreme dieters and non-dieters. Body image may also cause restriction of snacks and meals.

Gender may also play a role in body image. Dieting or some form of weight control is common among adolescents, and awareness of weight is heightened even in young adolescent girls. (Story et al, 1998) This will have an impact on the types of snacks they choose. Both male and female adolescents do report attempting weight loss. In a study of US adolescents, 57.6% of girls and 24.9% of boys attempted weight loss during the previous 7 days. (Story, Neumark-Sztainer, Sherwood, Stang, & Murry, 1998) Because males tend to have an overall higher food consumption, they may score higher than girls on nutrient analyses (Cusatis & Shannon, 1996) but they consume proportionally more fat, sugar, and salt as well. This is a problem because without the protective effects of estrogen, males suffer from cardiovascular disease earlier in life than do women, and so definitely need to develop healthy habits. (American Heart Association, 2002) Thus our understanding of these factors and their interrelationships is important prior to developing interventions designed to promote healthy snacking behavior in adolescents.

The preceding factors have been suggested to be important in determining the eating patterns of adolescents. Unfortunately, there is little research about the snacking patterns of adolescents. Work to date suggests that an optimal intervention strategy would incorporate snacks, as adolescents tend to be “grazers.” In addition, snacking patterns may be an ideal area to target in nutrition interventions with adolescents because they are often purchased away from home and eaten away from home, out of the influence of parents or guardians. Because students have more autonomy with snacks, it makes sense to investigate snacks separately and tailor interventions accordingly. Encouraging young adolescents to use their new freedom to make good choices for their health when it comes to snacks may help modify the internal influences of eating behavior and increase positive decisions about food later in life. This study was designed to determine adolescent snacking behaviors and factors that influence this behavior.

Hypotheses and Specific Aims

Hypotheses:

1. Snacks contribute significant nutrients to the diets of middle school children.
2. Snacking behavior is related to external factors including television viewing, peer influence, and availability, and internal factors such as body image and food beliefs.
3. Snacking is gender and culture specific.

Specific Aims

Specific Aim 1 – This research will describe the snacking patterns of adolescents;

Specific Aim 2 – This research will determine the factors that influence adolescent snacking patterns in Gwinnett County Middle School students;

Specific Aim 3 – This research will summarize these findings to provide recommendations for interventions aimed at influencing the snacking patterns of adolescents.

CHAPTER 3

Methods

Overview

This project involved two phases. Phase I consisted of conducting focus groups with middle school students, designing a pencil/paper survey based on focus group results, and piloting the survey. Phase II included survey administration and collection of dietary records followed by a follow-up visit with each classroom to discuss nutrition related topics outlined in the Quality Core Curriculum for Gwinnett County.

Setting and Study Participants

The population surveyed was middle school students in the Gwinnett County Public School System (GCPSS), a suburban system east of Atlanta, Georgia. The Gwinnett County School Nutrition Program Director identified principals who would consent to an interview regarding the proposed study. Interviews were conducted and two schools were selected, one in a high-income area of Gwinnett County, and one in a lower-income area which is more

ethnically diverse. These schools were recruited so that the sample population could be as representative as possible of the cultural diversity of Gwinnett County middle schools. Table 1 describes the racial diversity in Gwinnett County.

Table 1. Gwinnett County Demographics

Race	Gwinnett Co.
White	72.7%
African-American	13.3%
Hispanic	10.9%
Asian	7.2%
Mixed	2.2%

- numbers total greater than 100 because individuals may report more than one race

The students surveyed were in health class. Placement in health class in the fall is random, as half of the middle school students take health in the fall, and half take health in the spring, according to the principals of the schools. This selection yielded approximately 300 potential participants for the survey and focus groups. Focus group and survey questions(appendices 1&7), parental consent forms(appendix 4), and student assent forms (appendices 5&6) were approved by IRB along with the format of the study.

Phase I

Focus Group Study

Focus groups are open-ended guided discussions intended to elicit information about specific topics from groups of target individuals. This approach is especially useful when there is little data about a target group, or when collaboration between a research team and a target group is the goal. Focus groups were important in this study because the factors influencing adolescent snacking behaviors have not been previously well defined. The focus groups were designed to acquire information from the target audience in order to design a survey tool. The students generated a list of foods they classified as snacks, and provided basic information about snacking patterns. The list of snacks was used to produce a Food Frequency Questionnaire (FFQ). The response pattern for the FFQ was based on the Block Food Frequency Questionnaire (Potischman et al, 1999). Other information about snacking patterns was used in the survey instrument designed to address factors affecting snacking behavior. The focus group questions included where students got snacks, when they ate them, television influence, and other topics surrounding selection and acquisition of snacks. A brief recruiting visit was made to all of the classrooms, and the focus

group format was explained to all of the students. They were provided with information to take home to their guardians, as well as a parental consent form that covered both the focus group and the survey. All students were asked to bring the consent forms back to school, either signed or unsigned.

Four focus groups were scheduled and conducted with the students which were held on Saturday mornings in a public library close to the school. A trained moderator conducted all of the focus groups. All focus groups were recorded by audiocassette and note-takers recorded responses. Each student attending the focus groups completed an anonymous demographic questionnaire and received an incentive worth $20 and a snack during the session. Attendance at the focus group was good for the 6th and 7th grade group; 9 out of 12 students attended the two sessions. Attendance was limited for the eighth grade group; only three students out of the 10 invited took part in the two scheduled sessions. Other Saturday activities could have influenced involvement in this activity, as well as lack of interest in out-of-school participation by the older students.

Results of the Focus Groups

The most overwhelmingly mentioned snack food was chips, either corn chips like Doritos or potato chips. Other items mentioned included fruit and cookies. The most common setting for snacking was at home, while doing homework or watching television. It was also notable that the food commercials most often noted as being influential or memorable were the soda commercials and the salty-snack commercials like Doritos. Some students noted that they decided their snacks based on whether it could be prepared during a commercial. The most common feeling associated with snacking was boredom.

The younger students mainly acquired snacks at home after making requests to whoever went to the grocery store, but older students cited convenience store purchases as a significant source of snack food. At home, whatever “looks good” guided selection, while price was a major consideration at the convenience store.

Table 2 summarizes the most common responses to the focus group questions. Answers were listed in order of relative agreement among the students. These responses combined with the factors in the theoretical model were then used to guide the preparation of the survey. For example, because students reported television commercials

influencing their snack selection, questions were included in the survey about television viewing.

Table 2. Focus Group Summary

	6th and 7th graders	8th graders
Foods mentioned as favorites	*Chips- Sweets like ice cream, candy Fruit	*Chips candy cookies
When and where	*Home, bus stop, *while doing homework, varies from 2 times a week to everyday After school most common	*Home, *While doing homework, everyday, when bored, while watching TV
How they decide what to eat	*Taste-all agree Whatever is good in the fridge Cost-some buy their own Can be done during commercial	*Taste Convenience Cost
Where do they get snacks	*From home/parents Store	*Parents Convenience store
Feeling associated with snacking	*Bored-all agree Tired Refreshed	*Bored Hungry
TV influence recognized by students	Soda Commercials Chips commercials mentioned Doritos, Taco Bell, Coke, Pringles	Wendy's Doritos Twix Other fast food

* indicates clear consensus among participants

Quantitative information about snacks was not collected in the focus groups, because that data was collected in Phase II. The focus group time was kept short with the sixth grade students in mind. A survey instrument was developed with the information from the students using two adapted validated surveys including the Youth Risk

Behavior Surveillance System (YRBSS), an ongoing survey conducted by the CDC concerning risky behaviors such as alcohol use, smoking, and poor nutritional habits, and a survey of influences on students' fruit and vegetable intake by Young and Fors (2001). The questions selected for inclusion in the survey designed for this project were based on relevance to eating behavior and snacking behavior. The Flesch Reading Ease score for the survey was 94.8 out of 100, and the Flesch-Kincaid Grade Level was 2.4 rated by U.S. grade-school level. Once the survey was constructed, it was piloted with a small group of students in a different community to determine if it was clear and easy for the students to understand and complete. Feedback from this group lead to the addition of two FFQ items, and the clarification of a question about exercise on the survey.

Phase II

Phase II consisted of collecting anonymous survey and 3-day food diary data. The survey was administered during health class. Following the administration of the survey the students received verbal instruction on food diary completion by a University of Georgia graduate student in Nutrition. (appendix 2) The students were then given a food diary to take home, along with written instructions and a

sample diary. (appendix 3) The Health teachers collected the surveys in class, which were then returned to the investigator. The challenge of having young students estimate portion sizes was approached in a novel fashion. Students were instructed to list the numerical quantity on labels if it was available, along with the quantity consumed. In the cases where this was not available, like a hand-full of potato chips, students were instructed to compare the size of the portion to something familiar, like a cassette tape, or a tennis ball.

Data Analysis

The survey was designed to determine and differentiate between the internal and external factors influencing snacking behavior. Analysis of the survey data was performed using Excel and EpiInfo. EpiInfo is a program developed by the Centers for Disease Control specifically for descriptive data. Diet records were analyzed using Esha Food Processor for the caloric, fat, and micronutrient content of the snacks as compared with meals. A student was trained to assist in data entry, which was on-going as surveys and food diaries were completed.

Quantitative contribution of snacks to the overall intake of the students was determined with the three-day food diaries. The totals for calories, calories from

snacks, protein, protein from snacks, fat, fat from snacks, vitamin C, vitamin C from snacks, calcium, calcium from snacks, iron, iron from snacks, phosphorus, phosphorus from snacks, vitamin A, and vitamin A from snacks were averaged for the three days and compared to determine the contribution from snacks. These nutrients were chosen to represent the total daily nutrient intake from meals and snacks. Exclusion criteria for food diaries were: lack of parental consent, total calories for the day under 500 or over 5000, and incomplete or illegible survey forms. These criteria were based on IRB compliance and possible unreliability of records with unusual caloric totals. For example, if a student reported consuming 300 kcals per day, the diary is probably incomplete.

Internal and external influences as well as cultural influence were identified through analysis of the survey and Food Frequency Questionnaire (FFQ). The FFQ snack items were split into two groups, calorie dense and nutrient dense, which were then used as outcome variables for the survey analysis. Calorie dense snacks were those snacks containing calories but few other nutrients, such as chips or soda. Nutrient dense snacks were those snacks contributing nutrients as well as calories to the diet such as apples or yogurt. Gender influence was investigated by

comparing calorie and nutrient dense snacks frequently chosen by each gender.

CHAPTER 4

Results

Overview

Study Population

After parental consent forms were returned for the survey and food diaries, 148 subjects were eligible for inclusion in this study. African-American, Hispanic, and Asian students were represented in the study proportional to their representation in the Gwinnett County Public School System with the exception of African Americans which were more prominent in the study. Table 3 compares study participants to the Gwinnett County School System population.

Data Analysis

The original questions in the survey completed by the students were coded and entered into an Excel spreadsheet. Population correlations were run on selected, conceptually related items in the survey to indicate which ones could be grouped together to construct summative measures for independent and dependent variables. The primary outcome

variables were frequency of calorie and nutrient dense snacks, which were measured with the FFQ. The independent

Table 3: Participant Characteristics

	N= 148		
Mean Age	Male Female	12.5 12.3	
Gender	Male: 66 Female: 82	(44.6%) (55.4%)	
Race		Participants	Gwinnett Co.*
White	81	56.2%	54.2%
African-American	29	20.1%	19.5%
Hispanic	15	10.4%	14.1%
Asian	11	7.6%	9.5%
Mixed	4	2.8%	2.6%
Non-answered	2	1.4%	

* numbers total greater than 100% because individuals may report more than one race

variables included: gender, race, media, body image, availability of calorie dense snacks, self-reported exercise, culture, direct parent influence, indirect parent influence, general peer influence, and direct peer influence. The media variable is a self-report of the number of hours of television watched. The two separate questions in the variable are school-day television watching, and weekend television watching. Sources of both nutrient dense snacks such as home and sports, and calorie dense snacks such as convenience stores and vending machines were included in the survey, but the good source variable did not cluster in the primary correlation

analysis and was not included in further analysis. The variable titled “calorie dense snacks availability” (CDSA) is a measure of the frequency of receiving snacks from friends, convenience stores, and vending machines. Direct peer influence is a measure of the frequency of sharing snacks, and general peer influence is a measure of the frequency of talking about food or snacks. The direct parent influence variable is a measure of the frequency that parents ask students what they would like to have for meals or snacks, and the indirect parent influence is a measure of the frequency that students report parents eating fruits and vegetables for snacks around them, or talking with them about healthy eating habits. The variable measuring culture was a self-reported measure of whether students perceived their own culture to influence the meals and snacks they eat. The body image variable was comprised of a question about perceived weight status, and whether or not action was being taken to try to change weight status.

The dependent variables were calorie dense and nutrient dense snacks. The list of snacks was divided into calorie and nutrient dense choices, and summed for each student to produce a numerical value.

Student non-responses were handled by finding the median response for each variable and using that value for the non-response. This procedure was only employed when there were several components of a summative variable and not all were missing. This decreased false reductions of numerical values by eliminating blanks in the data set being read by the software as zeros.

Multiple regression analysis was used to estimate the relationships between the independent variables and the outcome measures for nutrient and calorie dense snacks. Statistical significance levels for these analyses were set at p=.05 using one-tailed t-tests. Because preliminary regression results for calorie dense snacks suggested that availability of calorie dense snacks played a mediating role, the regression model for calorie dense snacks was expanded to include calorie dense snacks availability, CDSA, as an intervening variable. In this formulation, some independent variables may exhibit direct associations with the frequency of calorie dense snacks, and others may exhibit indirect associations with calorie dense snacks via their association with CDSA.

Hypothesis 1

The contribution of snacks to overall intake was taken from 3-day food diary data (n=60). Table 4 illustrates the

contribution of snacks to total daily nutrient intake. The only nutrient with significant contribution from snacks was calcium. Snacks contributed 39% of total calcium intake. Significance was measured by FDA's definition of a good source for nutrients other than carbohydrate. In this study, snacks were not a good source, or contribute 10-19% of the Daily Value to total intakes of calories, protein, fat, carbohydrate, vitamin C, Iron, vitamin A, and phosphorus. Thus hypothesis 1 was rejected for all nutrients except calcium.

Table 4: Contribution of Snacks to Daily Intake of Adolescents

	Contribution from total diet	**Contribution from snacks**	**Contribution from Snacks**
Kilocalories	1769.29	153.71	8.4%
Protein (g)	66.88	3.52	5.4%
Carbohydrate (g)	226.97	21.05	9.3%
Fat (g)	65.99	6.16	8.9%
Vitamin C (mg)	70.48	2.79	4.5%
Vitamin A (RE)	766.3	56.7	7.4%
Phosphorus (mg)	969.9	72.2	7.4%
Calcium (mg)	711.35	269.93	39.2%
Iron (mg)	13.04	0.94	7.4%

N=60

Hypothesis 2

Hypothesis 2 was accepted for some of the internal and external factors affecting both nutrient and calorie dense

snacking behavior. Results indicated that a combination of internal and external variables affect these behaviors.

Internal factors that affect the consumption of nutrient dense snacks include culture and exercise. The external factor that seems to have an effect on nutrient dense snacking behavior is indirect parental involvement, including positive modeling and discussion about healthy foods. (Table 5) All of these relationships have positive correlation coefficients, which indicates that as the influence of these variables increases, the frequency of consumption of nutrient dense snacks increases. Nutrient dense snack choices were positively correlated with exercise frequency, culture, and indirect parent effect.

The exercise frequency result would suggest that the more often the students say they exercise, the more often they report eating nutrient dense snacks, in other words healthy behaviors in one area may increase self-efficacy for other healthy behaviors. The indirect parental effect on nutrient dense snack choices indicates that when students see their parents eat fruits and vegetables as snacks and talk about healthy foods, they model their behavior after their parents, and make good choices.

Table 5: Factors Affecting Nutrient Dense Snack Choices

Variable	**Coefficient**
Availability of Calorie Dense Snacks	0.19
Self-reported exercise	0.257*
Body Image	-0.001
Culture	0.48*
Asian	-0.375
Hispanic	0.322
African American	-0.172
Media	0.049
Indirect Parent Effect	0.520*
Direct parent Effect	-0.030
Direct Peer Effect	0.072
General Peer Effect	0.033
Gender	-0.01
N=148	R^2=0.21

* t-test statistically significant at p=.05

The results for calorie dense snack choices indicated a more complicated relationship. Some of the internal and external factors of the individual directly influence snack selection(table 6), and some that influence availability which in turn influences selection (table 7). The survey suggested a more detailed relationship between the independent variables and the frequency of consumption of calorie dense snacks. There were both direct and indirect predictors of calorie dense snacks. Factors that affect availability of calorie dense snacks and therefore indirectly affect calorie dense snack choices include Hispanic race, and both direct and general peer influence.

Table 6: Factors Directly Affecting Calorie Dense Snack Choices

Variable	**Coefficient**
Availability of Bad snacks	0.884*
Self-reported exercise	0.165
Body Image	-0.175*
Culture	-0.016
Asian	-0.232
Hispanic	0.618*
African American	-0.382
Media	0.126*
Indirect Parent Effect	0.109
Direct parent Effect	0.125
Direct Peer Effect	0.009
General Peer Effect	-0.005
Gender	-0.144

N= 148 R^2=.34

t-test stat. Sig. at p=.05

Table 7: Predictors of Availability of Calorie Dense Snack Choices

Variable	**Coefficient**
Self-reported exercise	0.061
Body Image	-0.075
Culture	-0.065
Asian	0.160
Hispanic	0.477*
African American	0.162
Media	0.018
Indirect Parent Effect	-0.090
Direct parent Effect	0.073
Direct Peer Effect	0.163*
General Peer Effect	0.237*
Gender	-0.060

N= 148 R^2=.30

* t-test statistically significant at p=.05

The variables with a direct affect were availability, body image, Hispanic ethnicity, and the media influence. Body image was negatively correlated with calorie dense snacks (table 6). This indicates that increased frequency

of calorie dense snack choices is related to dissatisfaction with body image. Increased television viewing time also was related to increased calorie dense snack consumption.

Hypothesis 3

Hypothesis 3 was rejected, because gender did not significantly affect the determinants of snacking behavior. Although there was no gender influence on snack selection and consumption found in the survey, a comparative description can still be made. Figures 3&4 were produced by computing the snacks most commonly consumed at least once a week by gender. One interesting comparison is dairy product intake. Girls reported eating more cheese and yogurt, and boys consumed more ice cream. Both genders reported consuming milk. Both genders also reported consuming sodas, sweet tea, fruit drinks and sports drinks. This data indicates a possible weight control intervention strategy may be to educate adolescents on the contribution of liquid calories to overall intake. There was also an interesting frequency of cereal intake, which may also lead to increased milk consumption. The high levels of snack contribution to over-all calcium intake may be partially explained by this frequency of calcium containing foods illustrated in the food diaries. While this is positive,

the over-all calcium levels were still low (711 mg) compared to the RDA of 1300 mg per day. Encouraging habits already evident in the population may help to bring these intakes up to recommended levels.

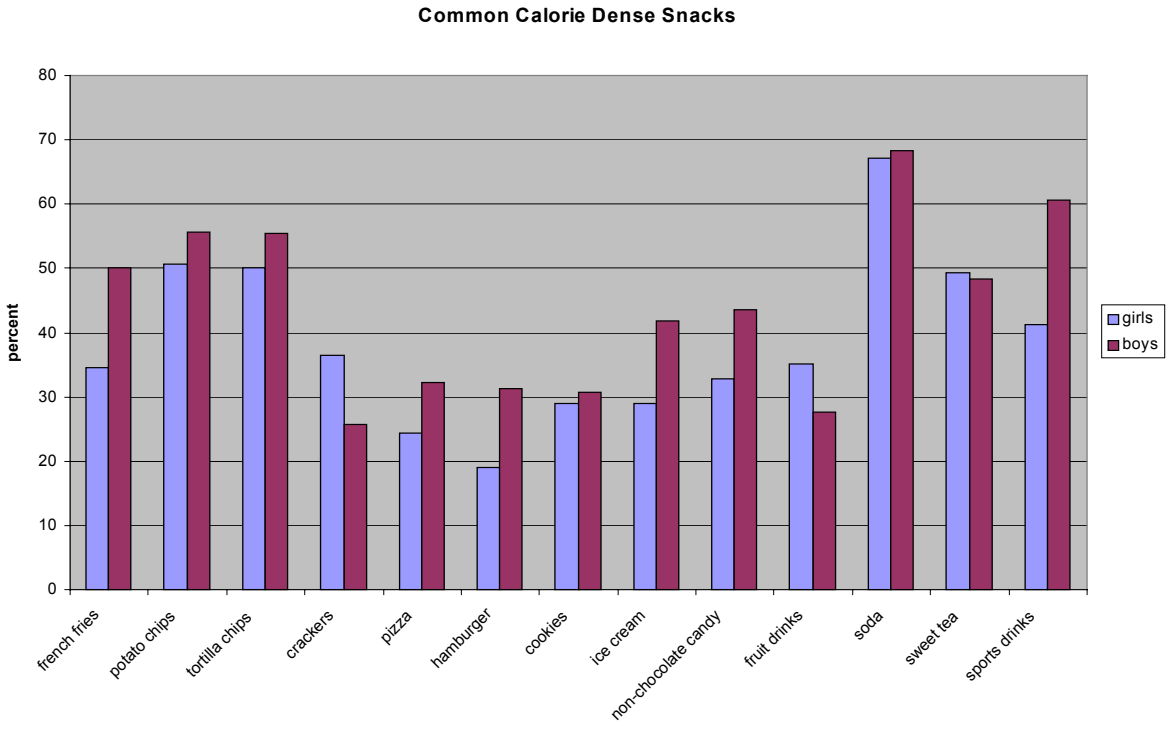

Figure 2: At Least Once Weekly Consumption of Calorie Dense Snacks by Gender

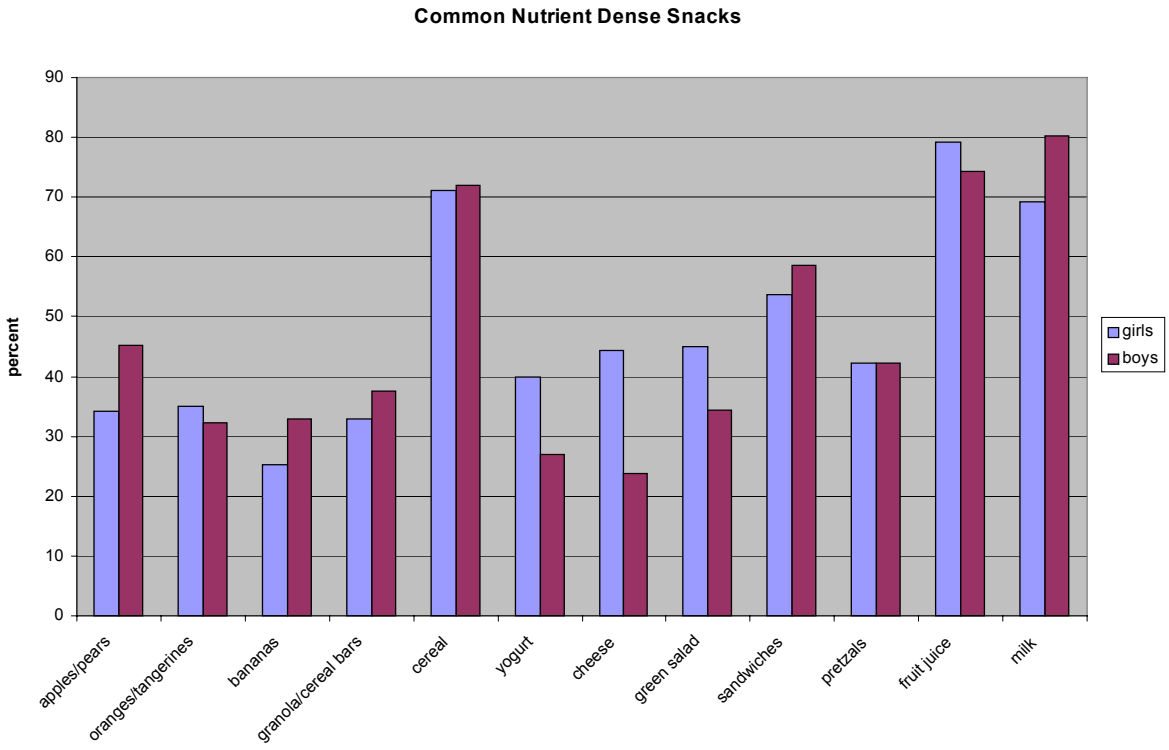

Figure 3: At Least Once Weekly Consumption of Nutrient Dense Snacks by Gender

CHAPTER 5

Discussion and Conclusions

Discussion

These relationships indicate potential for positive intervention in adolescent snacking behavior. This study also highlights a specific societal issue i.e. television viewing. Television viewing is not an active pastime thus decreasing the opportunity for exercise. Also students who watch a lot of television are bombarded with commercials advertising high calorie, high fat food as well as unrealistic images of teens and young adults. (Story et al, 2002) This study concurs with the data already available indicating that relationships between teens, television, and weight are not always health promoting.

Hispanic ethnicity was also a direct predictor of calorie dense snack choices, which may indicate that the nutrition messages are not reaching this audience, or the result may be complicated by the fact that almost all of the Hispanic students in the study were from the lower SES school. Free and Reduced Lunch percentage for the

ethnically diverse school was 39% compared to 9% in the less diverse school. Economic factors have been shown to impact food selection. Parents of varied SES participating in focus groups concerning children's fruit and vegetable intake reported different levels of availability by low, middle, and high SES.(Kirby, Baranowski, Reynolds, Taylor & Binkley, 1995) The current study suggests that Hispanic teens may need health messages tailored for them, both for language and cultural reasons. Nutrition interventions need to be customized to the group they are intended to reach, and the Hispanic community of Gwinnett County may not be adequately served.

Predictors of availability of calorie dense snacks again include Hispanic ethnicity, which would strengthen the argument for tailored nutrition messages. Other predictors include both general and direct peer influence. Figure 2 illustrates the relationship between direct and indirect influence on calorie dense snack choices. Peer influence is most likely reflecting the practice of giving friends snacks, and trading snacks after school. Starting in elementary school and continuing on into older grades, students have the opportunity to trade food. This practice would be acceptable if students all had a variety of healthy foods with which to barter, but the students whose

snacks are nutrient dense may have access to calorie dense snacks through the extensive trading system in school cafeterias and after school hang-outs

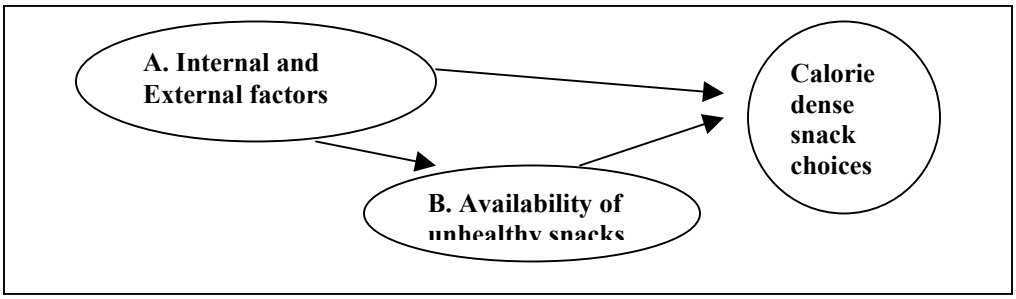

Figure 4: Model of Indirect Influence on Calorie Dense Snack Choices

Availability of calorie dense snacks is one of the most difficult factors to change. Middle school students increasingly have money to spend, and have some mobility to get to convenience stores and vending machines.

One of the positive behaviors that may begin to explain the high snack contribution of calcium is the reported popularity of high calcium snack foods such as cheese and yogurt among girls, ice cream among boys, and milk and cereal among both genders. Because the average daily calcium intake was so low, encouraging popular high calcium snacks may become an important strategy when discussing healthy snacking behaviors with adolescents. The popularity of many drinks such as milk, soda, and juice as snacks may be important when addressing childhood obesity,

as they were the most popular snacks and tend to be less satisfying than solid food.

Future nutrition intervention efforts should also be focused on increasing the demand for healthy snacks. By better understanding the possible protective effects of culture, physical activity, and positive parent modeling we can develop programs that have great potential for success in the adolescent population. We also need to work with private industry to ensure that nutrient dense snacks are available in venues where adolescents are more likely to have snack choices.

Limitations

One of the limitations of this study was the number of students who did not return parent permission forms to school, and whose data could not be used. This may have introduced non-responder bias as it cannot be assumed that the characteristics of the students who brought back the form would be the same as students who did not bring back the form. The internal validity of this study is somewhat compromised by this possible bias. This problem was unavoidable in the situation of this study, as parental permission is necessary for any University affiliated study. Another limitation of this study is the lack of socio-economic data, which would be a useful addition to

the race and culture variables, as well as the availability of fruits and vegetables. Most of the diverse population in this study came from a school that draws students from a low-income area of Gwinnett County, but no economic data was included on the survey as it was doubtful as to the validity of the responses by the younger students.

The low number of food diaries (n=60) collected and analyzed compared to the number of surveys (n=148) is related to the inability to perform follow-up interviews with each student to clarify incomplete food diaries. This limitation increased the number of diaries that did not fit inclusion criteria, and reinforced the necessity of individual follow-up interviews.

Culture is a difficult variable to measure, as it is a difficult word to define. Culture varies from person to person, family to family, and country to country. That being said, the validity of this measure relies on the fact that culture was not defined for the students; they were asked about their perception of whether or not their culture affected their food choices. This approach does take into account all of the variations of culture, but does not quantify culture, nor can it describe how culture affects adolescent snacking behavior. This study indicates that further investigation into the role culture plays in

adolescent and family eating behavior may be warranted to explore the rich relationship between culture and food. This relationship is more obvious when viewed from the perspective of the United States as compared to other countries, however we need to be aware of the cultural diversity that exists in Georgia, and how that affects health status. There may be protective affects of culture on dietary patterns that could be celebrated and encouraged in order to be preserved.

Conclusions

Snacks need to be specifically addressed when designing interventions for adolescents. They have specific behavioral determinants. Because adolescents have a certain level of autonomy, learning to chose healthy snacks at this life stage may lead to lifelong healthy habits.

Snacks contribute significant amounts of calcium to the diets of adolescents in the Gwinnett County School System. Although they are not reaching targeted nutrient consumption levels, there is a dietary pattern established in many of the students that can be encouraged.

In this survey, both internal and external factors influenced the self-reported intake of nutrient and calorie dense snacks. Race and culture had some effect, but gender

showed no effect. This is contrary to the study by Neumark-Sztainer et al. (1996) which indicated a significant gender difference in the types and quantities of snacks chosen by adolescents. The current study included students younger than those in the former survey, and so the gender differences may not develop in early adolescence. The current study is much smaller, which also may effect this outcome. The responses from Hispanic adolescents indicate that more culturally appropriate nutrition interventions may be needed in the Hispanic community.

The amount of television watched was related to calorie dense snack intake. Many advertisements target children and adolescents, and continued media literacy may be needed to counteract these messages, as well as decrease television viewing. Conversely, frequency of exercise was linked to nutrient dense snack choices. Exercise programs may become part of successful nutrition intervention programs, because these factors seem to be linked. Dissatisfaction with body image is another factor linked to calorie dense snack choices, and needs to be addressed along with the television viewing and exercise.

Parents do influence snacking behaviors, but directly telling adolescents what to eat is not as effective as positive role modeling. This idea needs to be incorporated

into family level interventions, as well as interventions for adolescents. Finally, peers also significantly influenced availability of calorie dense snacks, thereby influencing snacking behavior. This would suggest that interventions would be most successful if it included peers as well. These conclusions must be drawn with caution, keeping in mind the limited scope of this study, but it does suggest possibilities for further study.

These factors affecting adolescent snacking behavior are incorporated into the environment of the adolescent, and interact with each other as well as the individual. Environmental changes can increase or decrease health risk, but positively affecting the internal and external determinants of adolescent snacking behavior may decrease risk of chronic disease and increase quality of life.

APPENDIX 1

Survey

1. How old are you? 11 12 13 14 15

2. What is your sex? Male Female

3. What grade are you? 6th 7th 8th

4. How do you describe yourself?
   American Indian or Alaska Native
   Asian
   Black or African American
   Hispanic or Latino
   Native Hawaiian or Other Pacific Islander
   White

5. How tall are you without your shoes on?

_____ft _____in

6. How much do you weigh without your shoes on?

_____ lbs

7. Do you think you are:
a. very underweight
b. slightly underweight
c. about the right weight
d. slightly overweight
e. very overweight
f. don't know

8. Are you trying to do anything about your weight?

a. I am trying to lose weight
b. I am trying to gain weight
c. I am trying to stay the same weight
d. I am not trying to do anything about my weight
e. don't know

9. During the past month, did you exercise?
a. never
b. once a week
c. more than once a week
d. every day
e. don't know

10. During the past month, did you exercise to lose weight or to keep from gaining weight?
a. never
b. once a week
c. more than once a week
d. every day
e. don't know

11. During the past month, did you eat less food to lose weight to keep from gaining weight?

a. never
b. once a week
c. more than once a week
d. every day
e. don't know

12. During the past month, did you eat fewer calories to lose weight to keep from gaining weight?

a. never
b. once a week
c. more than once a week
d. every day
e. don't know

13. During the past month, did you eat foods low in fat to lose weight to keep from gaining weight?

a. never
b. once a week
c. more than once a week
d. every day
e. don't know

14. During the past month, did you eat less snack foods to lose weight or keep from gaining weight?

a. never
b. once a week
c. more than once a week
d. every day
e. don't know

15. During the past month, did you change the types of snacks you ate to lose weight or keep from gaining weight?

a. never
b. once a week
c. more than once a week
d. every day
e. don't know

16. During the past month, did you take and diet pills, powders, or liquids without a doctor's advice to lose weight or keep from gaining weight?

a. never
b. once a week
c. more than once a week
d. every day
e. don't know

17. During the past month, did you vomit to lose weight or to keep from gaining weight?

a. never
b. once a week
c. more than once a week
d. every day
e. don't know

18.During the past month, did you take laxatives lose weight or to keep from gaining weight?

a. never
b. once a week
c. more than once a week
d. every day
e. don't know

19. The people I grew up with snack.

a. never
b. sometimes
c. often
d. always
e. don't know

20. There are snacks that I eat that my friends don't eat.

a. never
b. sometimes
c. often
d. always
e. don't know

21. My religion forbids some foods. yes no
don't know

22. My religion encourages some foods. yes no
don't know

23. My culture influences the foods I eat.
For example, I eat fish on Friday because I am Catholic.

yes no don't know

24. My culture influences the snacks I eat.

yes no don't know

25. The snacks I eat at home are different from the snacks I eat away from home.

yes no don't know

26. How many hours of TV do you watch per day on a school day? 0 1 2 3 4 5

27. How many hours of TV do you watch on a weekend day?
0 1 2 3 4 5 6 7 8

28. What is your favorite type of TV show?

cartoons
sitcoms (like Full House)
comedy shows
news
documentary (like animal shows)
real-life TV (like Real World)
sports

During the past month.....

29. How often did you eat snacks that you saw on TV?

a. never
b. once a week
c. more than once a week
d. every day
e. don't know

30. My friends and I talked about food.

a. never
b. once a week
c. more than once a week
d. every day
e. don't know

31. My friends and I talked about snacks.

a. never
b. once a week
c. more than once a week
d. every day
e. don't know

32. My friends told me what they like to eat.

a. never
b. once a week
c. more than once a week
d. every day
e. don't know

During the past month.....

33. I shared snacks with my friends.

a. never
b. once a week
c. more than once a week
d. every day
e. don't know

34. My friends told me what I should eat for snacks.

a. never
b. once a week
c. more than once a week
d. every day
e. don't know

35. My parents asked me what food I would like for meals.

a. never
b. once a week
c. more than once a week
d. every day
e. don't know

36. My parents asked me what food I would like for snacks.

a. never
b. once a week
c. more than once a week
d. every day
e. don't know

37. My parents ate vegetables for snacks when I am with them.

a. never
b. once a week
c. more than once a week
d. every day
e. don't know

During the past month....

38. My parents ate fruit for snacks when I am with them.

a. never
b. once a week
c. more than once a week
d. every day
e. don't know

39. My parents told me to eat healthy snacks.

a. never
b. once a week
c. more than once a week
d. every day
e. don't know

40. My parents talked about my eating habits with me.

a. never
b. once a week
c. more than once a week
d. every day
e. don't know

41. My parents decided what I ate for my meals.

a. never
b. once a week
c. more than once a week
d. every day
e. don't know

42. My parents decided what I ate for my snacks.

a. never
b. once a week
c. more than once a week
d. every day
e. don't know

During the past month.....

43. My parents made me snacks at home.

a. never
b. once a week
c. more than once a week
d. every day
e. don't know

44. My parents made me healthy snacks at home.

a. never
b. once a week
c. more than once a week
d. every day
e. don't know

45. I made my own snacks at home.

a. never
b. once a week
c. more than once a week
d. every day
e. don't know

46. I bought snacks from a vending machine.

a. never
b. once a week
c. more than once a week
d. every day
e. don't know

47. I bought snacks from a convenience store.

a. never
b. once a week
c. more than once a week
d. every day
e. don't know

During the past month.....

48. I got snacks from my friends.

a. never
b. once a week
c. more than once a week
d. every day
e. don't know

49. I got snacks in after-school activities such as sports.

a. never
b. once a week
c. more than once a week
d. every day
e. don't know

50. I got snacks at after-school care.

a. never
b. once a week
c. more than once a week
d. every day
e. don't know

Food Frequency Questionnaire

How often do you eat these as snack?	**never**	**a few times per year**	**once per month**	**2-3 times per week**	**once per week**	**2 times per week**	**3-4 times per week**	**5-6 times per week**	**every day**
bananas									
apples or pears									
oranges or tangerines									
canned fruit like applesauce or fruit cocktail									
dried fruit like raisins									
breakfast bars, granola, or power bars									
yogurt or frozen yogurt									
cheese, slices or cubes									
Carrots									
Celery									
French fries									
green salad									
hamburgers									
hot dogs									
sandwiches, like ham or veggie									
potato chips									
pretzels									
chips like Doritos									

How often do you eat these as snack?	**never**	**a few times per year**	**once per month**	**2-3 times per week**	**once per week**	**2 times per week**	**3-4 times per week**	**5-6 times per week**	**every day**
other chips like sun chips or Funyuns									
Popcorn									
peanuts, or other nuts									
Crackers									
Doughnut									
Cake									
Cookies									
ice cream									
chocolat candy									
other candy like Gushers or fruit roll-ups									
Fruit juice, like OJ or apple juice									
Soda, like Coke or Sprite									
milk, plain or chocolat									
Sports drinks, like Gatorade									

APPENDIX 2

Three Day Diet Record Instructions

A. Inform students that one part of the Snacking Behavior study is for them to keep a diary of everything they eat for two school days and one weekend day. Pass out the three-day diary sheets that they will be using. Have students look at sheets as you read these directions.

- One part of your participation in this study is for you to keep a diary of everything you eat for three days.
- Put your name on the top sheet, and today's date.
- Now, look at the first column marked "food". Do you remember what you ate when you got up this morning? You would write that down in the first column.
- Can anyone tell me what they had to eat this morning? (pick someone) OK, _____ had (cereal) and (milk) cereal would be written down first, and under it, milk, either skim, 2% or whole, if you know that.
- In the next column, next to the food, you would write down how much. You may have to estimate, but do the best you can, using the hints on the back page of your diary.
- Did you eat anything else this morning?
- In the last column, fill in if this was breakfast, lunch, dinner, another meal, or a snack.
- Everyone fill out the table with what they ate this morning, and raise your hand if you have any questions.

(Give them a couple minutes)

B. (Use this section if it is before lunch, go on the C if it is after lunch)

- Your lunch and any food you eat after school will go under what you did here, then dinner.
- Remember to write down everything, including butter on toast, or mayo and mustard on a sandwich.
- Remember to include how much you ate. For example, if you had a hamburger, but you only ate half, you would write: hamburger on bun with cheese, ketchup, and mustard in the first column, and ½ in the next column. If you ate a whole burger, you would put a 1 in the second column.
- Remember to write down any drinks, like Gatorade or Coke.

- At the end of the day, look at your food diary and think back, and if you forgot something, add it at the end, but be sure to include what meal or snack it was. Drinks and snacks after school are just as important as meals, so don't forget those.

C.

- Now think back to what you ate for lunch. If you ate a sandwich, remember to write down what was on it, including mayo and mustard.
- Did you it all? Remember to include how much of each food you ate. For example, if you had a hamburger, but you only ate half, you would write: hamburger on bun with cheese, ketchup, and mustard in the first column, and ½ in the next column. If you ate a whole burger, you would put a 1 in the second column.
- Remember to write down any drinks, like Gatorade or Coke.
- Any food you eat after school will go under what you did here, then dinner.
- At the end of the day, look at your food diary and think back, and if you forgot something, add it at the end, but be sure to include what meal or snack it was.

- Now, fill out the table with what you ate for lunch, and raise your hand if you have any questions.

(Walk around and look over shoulders to make sure that students understood what to do, and help them if they have problems.)

D.

- You need to complete this one for today, and fill it out tomorrow and the next day. After all three days are complete, bring it back to school.

APPENDIX 3

Sample Food Diary Table

Food	**Amount**	**What Meal**
Frosted Flakes	2 cups	breakfast
Orange Juice	1 cup	breakfast
toast	1 piece	breakfast
butter	1 teaspoon	breakfast
sandwich with white bread, turkey, cheese, and mustard	1	lunch
Lay’s potato chips	1 4oz. bag	lunch
apple	1	lunch
Coke	1 can (12 oz.)	lunch
Pretzels	1 4 oz. bag	snack
baby carrots	12	snack
Ham and cheese sub with mayo, mustard, lettuce, and pickles	6 in.	dinner
gatorade	24. oz bottle	dinner
vanilla ice cream	1 cup	snack

APPENDIX 4

Parent Consent Form

I agree to allow my child_____ to take part in a study titled "Determinants of Adolescent Snacking Behavior", which is being conducted by Ms. Kate Silvis, from the Department of Foods and Nutrition and UGA. I do not have to allow my child to be in this study if I do not want to. My child can stop taking part at any time without giving any reason, and without penalty. I can ask to have the information related to my child returned to me, removed from the research records, or destroyed.

☐ I allow my child to take part in a focus group, which will be held outside school and will be audio-taped for transcription purposes. If my child decides to participate, my child will be asked to take part in a discussion about snacking habits. In return, my child will receive a $20 gift certificate to Blockbuster. _____(contact number)

☐ I allow my child to take part in a survey of snacking behaviors. If my child decides to participate, my child will be asked to fill out a survey in school about snacking habits. My child will also be asked to complete a three-day diet record at home, to the best of his or her ability.

- The reason for this study is to better understand the snacking habits of middle school children.
- The research is not expected to cause any harm or discomfort. My child can quit at any time. My child's grade will not be effected if my child decided to stop taking part.
- Any information collected about my child will be held confidential unless otherwise required by law. My child's identity will be coded, and all data will be kept in a secured location. Cassette tapes will be destroyed within 24 hours of transcription.
- Ms. Silvis will answer any questions about the research and can be reached at 706-542-3371. I may also contact the professor supervising the research, Dr Rebecca Mullis, Department of Foods and Nutrition, at 706-542-4869.
- I understand the study and procedures described above. My questions have been answered to my satisfaction, and I agree to allow my child to take part in this study. I have been given a copy of this form to keep.

_____ _____

Signature of Researcher Date Signature of Parent or Guardian Date

Questions or problems regarding your child's rights as a participant should be address to the Human Subjects Office, Institutional Review Board, Office of the Vice President for Research, University of Georgia, 606A Boyd Graduate Studies Research Center, Athens, Georgia 30602-7411; Telephone (706) 542-6514; E-mail address IRB@uga.edu

Please sign both copies of this form. Keep one, and return the other to the investigator

APPENDIX 5

Student Assent Form: Survey

I _____ agree to take part in a study called "Determinants of Snacking Behavior in Middle School Students"" which is being conducted by Ms. Kate Silvis, from the Department of Foods and Nutrition at UGA (542-3371). I do not have to take part in this study if I do not want to. I can stop at any time without giving reason, and without penalty. I can ask to have the information about me returned to me, removed from the research records, or destroyed.

- The reason for this study is to better understand the snacking patterns of middle school students.
- If I take part, I will be asked to fill out a survey at school, and write down everything I eat for three days.
- The study is not expected to cause any harm or discomfort. I can quit at any time. My grade will not be effected if I decide to quit.
- The information collected about me will be kept secret unless required by law. My identity will be coded by number, and all data will be kept in a secured place.
- Ms. Silvis will answer any questions, now or later and can be reached by telephone at (706) 542-3371. I may also contact her professor, Dr. Rebecca Mullis, Department of Foods and Nutrition, at (706) 542-0000.
- I understand the study described above. My questions have been answered to my satisfaction, and I agree to take part in this study. I have been given a copy of this form to keep.

_____

Signature of Researcher Date

_____

Signature of Student Date

Questions or problems regarding your rights as a participant should be addressed to the Human Subjects Office, Institutional Review Board, Office of the Vice President for Research, University of Georgia, 606A Boyd Graduate Studies Research Center, Athens, Georgia 30602-7411; Telephone (706) 542-6514; Email Address IRB@uga.edu.

Please sign both copies of this form. Keep one, and return the other to the investigator.

APPENDIX 6

Student Assent Form: Focus Group

I _____ agree to take part in a study called "Determinants of Snacking Behavior in Middle School Students"" which is being conducted by Ms. Kate Silvis, from the Department of Foods and Nutrition at UGA (542-3371). I do not have to take part in this study if I do not want to. I can stop at any time without giving reason, and without penalty. I can ask to have the information about me returned to me, removed from the research records, or destroyed.

- The reason for this study is to better understand the snacking patterns of middle school students.

- Students who take part will receive a snack and a $20.00 gift certificate.

- If I take part, I will be asked to take part in a taped discussion about snacking and snack foods.

- The study is not expected to cause any harm or discomfort. I can quit at any time. My grade will not be effected if I decide to quit.

- The information collected about me will be kept secret unless required by law. My identity will be coded by number, and all data will be kept in a secured, locked cabinet. Tapes will be destroyed within 24 hours of transcription.

- Ms. Silvis will answer any questions, now or later and can be reached by telephone at (706) 542-3371. I may also contact her professor, Dr. Rebecca Mullis, Department of Foods and Nutrition, at (706) 542-0000.

- I understand the study described above. My questions have been answered to my satisfaction, and I agree to take part in this study. I have been given a copy of this form to keep.

_____

Signature of Researcher Date

_____

Signature of Student Date

Questions or problems regarding your rights as a participant should be addressed to the Human Subjects Office, Institutional Review Board, Office of the Vice President for Research, University of Georgia, 606A Boyd Graduate Studies Research Center, Athens, Georgia 30602-7411; Telephone (706) 542-6514; Email Address IRB@uga.edu.

Please sign both copies of this form. Keep one, and return the other to the investigator.

APPENDIX 7

Focus Group Questions

1. Please introduce yourself, and then tell me your favorite food.
2. What meals do you normally eat? (brunch, breakfast, lunch, etc.)
3. How often do you and your family eat together? What meals do you normally eat with your family?
4. How often do you snack? What is your favorite snack?
5. What about your friends? What do they eat as snacks?
6. When do you snack? (prompts if needed) During school? After school? Before sports?
7. Where do you snack? At home? In the car?
8. What are you doing while you snack? (studying, watching TV, hanging out, etc.)
9. Where do you get your snacks?
10. How do you decide what to eat for a snack? (money, time, health, taste, convenience)
11. How do you feel when you snack? (angry, bored, lonely, hungry, tired, etc.)
12. What are your favorite 2 TV shows?

Now help me list all the foods you eat as a snack.

Objectives for focus group questions:

1. Generate list of snacks to use in analyzing food diaries
2. Get an idea of food patterns
3. Understand the most important aspects of snacking to focus on in the survey

APPENDIX 8

Focus Group Demographics Questionnaire

Do not put your name on this form!

1. What is your age? (circle one) 10, 11, 12, 13, 14

2. What grade are you in? 6, 7, 8

3. What gender are you? Male Female

4. How do you describe yourself? (circle all that apply)

African American or Black

American Indian or Alaska Native

Asian

Hispanic or Latino

Native Hawaiian or other Pacific Islander

White

References

1. American Heart Association. (2002). *Sex and Survival: in some matters of the heart women have the edge*.
   Retrieved November 12, 2002, from:
   www.americanheart.org
2. Bull N. L.(1992). Dietary habits, food consumption, and nutrient intake during adolescence. *Journal of Adolescent Health*, 13:384-388
3. Centers for Disease Control. (1999). *Prevalence of overweight among children and adolescents: United States*. Retrieved from:www.cdc.gov
4. Croll J., Neumark-Sztainer D., Story M., Ireland M. (2002). Prevalence and Risk and Protective Factors Related to Disordered Eating Behaviors Among Adolescents: Relationship to Gender and Ethnicity. *Journal of Adolescent Health*, 31:166-175.
5. Cross A. T., Babicz D., Cushman L. F. (1994). Snacking Patterns among 1,800 adults and children. *Journal of the American Dietetic Association* , v94n12:1398-1403.
6. Cullen K. W., Baranowski T., Owens E., de Moor C., Rittenberry L., Olvera N., Resnicow, K. (2002)Ethnic Differences in Social Correlates of Diet. *Health Education Research*, 17(1):7-18.
7. Cullen K. W., Baranowski T., Rittenberry L., Olvera N. Social-Environmental Influences on Children's Diets: Results from Focus Groups with African-, Euro- and

Mexican-American Children and Their Parents. *Health Education Research*; 15(5):581-590.

8. Dauch J. G., Story M., Dresser C., Gilbert G. G., Portnoy B., Kahle L. L. (1995)Correlates of high-fat/low-nutrient-dense snack consumption among adolescents: results from two national health surveys. *American Journal of Health Promotion*, v10 issue2:85-88.
9. Domel S. B., Baranowski T., Leonard S. B., Davis H., Riley P., Baranowski J. (1994) Accuracy of Fourth- and Fifth-Grade Students' Food Records Compared With School-Lunch Observations. *American Journal of Clinical Nutrition*, 59:218S-220S.
10. French S. A., Story M., Hannan P., Breitlow K. K. (1999) Cognitive and demographic correlates of low-fat vending snack choices among adolescent and adults. *Journal of the American Dietetic Association*, v99 issue 4:471-475.
11. Gibney M. J., Wolever T. M. S. (1997). Periodicity of eating and human health: present perspective and future directions. *British Journal of Nutrition*, 77:S3-S5.
12. Groff J. L., & Gropper S. S. (2000). *Advanced Nutrition and Metabolism*, third ed. California: Wadsworth,
13. Grogan S. C., Bell R., Conner M. (1997). Eating sweet snacks: gender differences in attitudes and behavior. *Appetite*, 28:19-31.
14. Harnack L., Stang J., Story M. (1999). Soft drink consumption among US children and adolescents: nutritional consequences. *Journal of the American Dietetic Association*, v99 issue4: 436-441.

15. Harris M. B., Koehler K. M., Davis S. A. (1988). Food intake in a multicultural southwestern population; Ethnic, gender, and age differences. *Ecology of Food and Nutrition*, 21:287-296.
16. Heald F. P. (1992). Fast food and snack food: beneficial or deleterious. *Journal of Adolescent Health*, 13:380-383.
17. Hoelscher D. M., Evans A., Parcel G. S., Kelder S. H. (2002). Designing Effective Nutrition Interventions for Adolescents. *Journal of the American Dietetic Association*, Mar: S52-S63.
18. Kirby S. D., Baranowski T., Reynolds K. D., Taylor G., Binkley D. (1995). Children's fruit and vegetable intake: Socieconomic, adult-child, regional, and urban-rural differences. *Journal of Nutrition Education*, 27 n5:261-271.
19. Kraak V., & Pelletier D. L. (1998). The influence of commercialism on the behavior of children and teenage youth. *Family Economics and Nutrition Review*, 11n3:15-24.
20. McPherson R. S., Montgomery D. H., Nichaman M. Z. (1995). Nutritional status of children: what do we know? *Journal of Nutrition Education*, 27n5:225-234.
21. Neufeldt, V. (Ed.). (1988). *Websters New World Dictionary*. New York: Simon & Schuster, Inc.
22. Neumark-Sztainer D., Story M., Resnick M. D., Blum R. W. (1998). Lessons Learned about adolescent nutrition from the Minnesota Adolescent Health Survey. *Journal of the American Dietetic Association*, v98 issue12:1449-1456.
23. Neumark-Sztainer D., Story M., Resnick M. D., Blum R. W. (1996). Correlates of inadequate fruit and vegetable consumption among adolescents. *Preventive Medicine,* 25:497-505.

24. Neumark-Sztainer D., Story M., Perry C., Casey, M. A. (1999). Factors influencing food choices of adolescents: Findings from focus-group discussions with adolescents. *Journal of the American Dietetic Association,* v99 issue 8:929-934.
25. Nielsen S. J., Siega-Riz A. M., Popkin B. (2002). Trends in Food Locations and Sources Among Adolescents and Young Adults. *Preventive Medicine*, 35:107-113
26. O'Dea J. A. (1999). Children and adolescents identify food concerns, forbidden foods, and food related beliefs. *Journal of the American Dietetic Association*, v99 issue8:970-973.
27. Potischman N., Carroll R. J., Iturria S. J., Mitti B., Curtin J., Thompson F. E., Brinton L. A. (1999). Comparison of the 60- and 100-Item NCI-Block Questionnaires With Validation Data. *Nutrition and Cancer*, 34(1):70-75.
28. Rees J. M. (1992). The overall impact of recently developed foods on the dietary habits of adolescents. *Journal of Adolescent Health*,13:389-391.
29. Roos E. B., Hirvonen T., Mikkila V., Rimpela M. (2001). Household Educational Level as a Determinant of Consumption of Raw Vegetables Among Male and Female Adolescents. *Preventive Medicine*, 33:282-291.
30. Siega-Riz A. M., Carson T., Popkin B. (1998). Three squares or mostly snacks-what do teens really eat? *Journal of Adolescent Health,* 22:29-36.
31. Stang J. (2002). Assessment of Nutritional Status and Motivation to Make Behavior Changes Among Adolescents. *Journal of the American Dietetic Association*, Mar:S13-S22.
32. Story M., Neumark-Sztainer D., Sherwood N., Stang J., Murray D. (1998). Dieting status and its relationship to eating and physical activity behaviors in a representative

sample of US adolescents. *Journal of the American Dietetic Association*, v98 issue10: 1127-1135.

33. Story M., Neumark-Sztainer D., French S.(2002). Individual and Environmental Influences on Adolescent Eating Behaviors. *Journal of the American Dietetic Association* Mar.
34. Stratton P. & Bromley K. (1998). Families' accounts of the causal process in food choice. *Appetite*, 33:89-108.
35. United States Census Bureau, (1998). Retrieved November 8, 2002 from: www.census.gov/prod/cen2000/dpi/2khr3.pdf
36. United States Department of Agriculture (2000). *Dietary Reference Intakes (DRI) and Recommended Dietary Allowances (RDA)*.Retrieved November 8, 2002 from: www.nal.usda.gov/fnic/etext/000105.html
37. Young E. M., Fors S. W. (2001). Factors Related to the Eating Habits of Students in Grades 9-12. *Journal of School Health*, 71(10):483-488.
38. Zizza C., Siega-Riz A. M., Popkin B. (2001). Significant Increase in Young Adults' Snacking between 1977-1978 and 1994-1996 a Cause for Concern! *Preventive Medicine,* 32:303-310.