2014

Development of a Food Preference Survey

Amber Bourgeois McGuerty
Louisiana State University and Agricultural and Mechanical College

DEVELOPMENT OF A FOOD PREFERENCE SURVEY

A Thesis

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Master of Science

in

The School of Human Ecology

by
Amber B. McGuerty, RD, LDN
B.S., Nicholls State University, 2010
August 2014

ACKNOWLEDGMENTS

I would like to thank my major professor, Dr. Georgianna Tuuri, for all of her support and patience throughout my research project. Also, I would like to thank my committee members: Dr. Melissa Cater, for all of her support and for her statistical expertise; Dr. Witoon Prinyawiwatkul, for his guidance with the focus group interviews and help with the statistical process; and Dr. Carol Lammi-Keefe, for all of her support and guidance throughout my time at Louisiana State University.

Most importantly, I would like to thank my family and friends for all of their support throughout my entire educational journey. I could not have completed any of this without the love and support of my husband. Last but not least, I would like to thank my friends for understanding my goals and always being there for me when I need them.

TABLE OF CONTENTS

ABSTRACT

This study developed a food preference survey to estimate adolescents' willingness to consume energy-dense foods and sugar-sweetened beverages. Five focus group interviews with 13 to 19 year-old students were conducted, and items representing energy-dense foods, energy-dilute foods, sweetened beverages, and unsweetened beverages were determined (5 per category). The final survey was administered to 234 students. Willingness to consume items was assessed using a 7-point Likert Scale (1, representing "Extremely Unwilling" to 7, indicating "Extremely Willing"). Exploratory Factor Analysis using Principal Axis factoring with a Promax (oblique) rotation revealed two factors. Factor one included French fries, Kool-Aid, glazed donuts, cookies, lemonade, and pizza (23.9% of the variance). Factor 2 included nuts or peanut butter, low-fat or fat-free yogurt, grapes, and bananas (13.8% of the variance). Cronbach's alpha was 0.770 for factor 1 and 0.664 for factor 2.

CHAPTER ONE:
INTRODUCTION

Adolescent obesity is one of the major health challenges of this century. In 2011-2012, the prevalence of obesity in U.S. children 12-19 years of age was 20.5% (Ogden *et al*. 2014). Developing and maintaining healthy dietary habits is critical to the overall health and quality of life for children, yet the current environment, rich in highly marketed, energy-dense foods and sugar-sweetened beverages encourages development of palate preferences for these items. Food preferences are strongly associated with foods eaten (International Food Information Council, 2012). Extra calories from these foods may contribute to the development of overweight and obesity. It is important to determine what foods and beverages adolescents are willing to consume to develop possible interventions to help them practice healthy eating habits. A food and beverage "willingness-to-consume" survey that can illustrate adolescent liking for energy-dense foods and sugary beverages is needed.

Most available food preference questionnaires evaluate adult populations and some are specific to gender (Geiselman *et al* 1998 and Deglaire et al 2012), while others evaluate youth (Cornwell and McAlister 2011). Geiselman et al (1998) created an instrument to identify individuals who have a significant preference for fat. This instrument does not include information specific to preference for sugar-sweetened beverages, which has been associated with an impact on increased caloric intake (Han and Powell 2013). Currently, there is no instrument that measures willingness to consume specific food items that has been developed for use with an adolescent population.

Food preferences are shaped by innate and learned behaviors. Research shows that humans are born with a preference for sweet foods and beverages and a dislike for bitter

items (Ganchrow 1983; Mennella *et al*. 2001). The influence of these preferences appears to extend into early childhood and may continue throughout adolescence and adulthood (Nicklaus *et al.* 2004).

Food preferences may be acquired in different ways. A child's taste preference is influenced by repeated exposure to a particular food (Anzman-Frasca *et al*. 2012; Lakkakula *et al*. 2011), social learning such as seeing an adult eating certain foods (Addessi 2005), and marketing and policy (Cornwell and McAlister 2011). Food preferences and habits established in childhood influence food choice over the lifespan and have both short- and long-term consequences for health (Must and Strauss 1999).

It is important to know what foods and beverages youth are willing to eat. Currently no instrument capable of capturing this information is available. The purpose of the current study was to develop a survey to measure adolescents' willingness to consume energy-dense food items and sugar-sweetened beverages.

Justification

Many behaviors or consumption habits have been developed by the time a child becomes an adolescent, and this is the stage in life where youth have more control over what they eat. If adolescents are educated to make healthy decisions they will be more likely to make changes to their diet and overall lifestyle. Decreasing the amount of energy-dense foods consumed regularly in the diet may reduce the likelihood of obesity in adulthood and reduce the possibility of complications or disease-states associated with obesity (U. S. Department of Agriculture and U. S. Department of Health and Human Services 2010). A validated survey that estimates adolescents' willingness to consume energy-dense foods and sugar-sweetened beverages will assist in the evaluation of dietary

consumption habits. This survey can be used as a tool to measure change in dietary behavior as a result of participating in nutrition intervention programs.

Research Question

Can a survey be developed to explore adolescents' willingness to eat commonly consumed energy-dense and energy-dilute foods and sweetened and unsweetened beverages?

Research Objectives

1. Identify foods and beverages representing high-fat and high-sugar items that most adolescents are willing to consume.
2. Examine if high-fat and high-sugar food items and beverages adolescents are willing to consume will cluster into one or more factors.
3. Determine if adolescents who are willing to eat energy-dense food items also prefer sugar-sweetened beverages.

Assumptions

- The foods identified from focus group interviews and used in the survey will represent foods and beverages adolescents are willing to consume.
- The adolescent will be honest in answering questions during the focus group interview and when completing the food "willingness-to-consume" survey instrument.
- The high school students 13-19 years of age who completed this survey represented the adolescent population.

Limitations

- Students recruited to participate will be a convenience sample of adolescents.
- Information will be dependent upon the truthfulness of subject response.
- The "willingness-to-eat" survey responses may not be generalized to other geographical locations or population groups.

Definitions

- Childhood/Adolescent Overweight and Obesity: Childhood and adolescent obesity is defined from body mass index (Centers for Disease Control and Prevention 2012). Body mass index is a measure of weight in kilograms (kg) relative to height in meters (m) squared. It does not measure body fat directly, but it is a reasonable indicator of body fatness for most children and teens with a BMI greater than the 85th percentile (Centers for Disease Control and Prevention 2012). A child's weight status is determined using an age- and sex-specific percentile for BMI because children's body composition varies as they age and varies between boys and girls. The CDC growth charts are used to determine the corresponding BMI-for-age and sex percentile. The percentile indicates the relative position of the child's BMI among children of the same age and sex (Centers for Disease Control and Prevention 2012).
    - Under weight is defined as a BMI less than the 5th percentile.
    - Healthy weight is defined as a BMI between the 5th percentile to less than the 85th percentile.
    - Overweight is defined as a BMI at or above the 85th percentile and lower than the 95th percentile.

- Obesity is defined as a BMI at or above the 95th percentile.

- Energy dense foods (ED): Energy density refers to the amount of energy in a given weight of food (kcal/g) (Kral and Rolls 2004). Energy-dense foods have high calories per weight of food (Centers for Disease Control and Prevention 2005).
  - Very Low ED: 0-0.6 kcal/g
  - Low ED: 0.6-1.5 kcal/g
  - Medium ED: 1.5-4.0 kcal/g
  - High ED: 4.0-9.0 kcal/g

  (Definitions from: Centers for Disease Control and Prevention 2005)

  Fat (9 kcal/g) increases the energy density of a food more than either carbohydrates or protein (4 kcal/g), while water decreases energy density by adding weight but not energy.
- Sugar-sweetened beverages: Sugar-sweetened beverages are liquids that are sweetened with various forms of sugar that add calories. These beverages include, but are not limited to, soda, fruit ades and fruit drinks, and sport and energy drinks (U. S. Department of Agriculture and U. S. Department of Health and Human Services 2010).
  - Harvard's School of Public Health defines a highly sugared beverage as containing more than 12 grams of sugar in a 12 oz. serving, equivalent to about 10 teaspoons of sugar and 200 or more calories (2013).
- Healthy dietary choices: These choices include nutrient-dense foods that provide vitamins, minerals, and other substances that may have positive health effects,

while providing relatively few calories (U. S. Department of Agriculture and U. S. Department of Health and Human Services 2010).

  - Nutrient-dense foods: a food that has not been "diluted" by the addition of calories from added solid fats, sugars, or refined starches. These foods include vegetables, fruits, whole grains, seafood, eggs, etc, that are prepared without added fats or sugars (U. S. Department of Agriculture and U. S. Department of Health and Human Services 2010).

- Food preference: the selection of one food item over another food item.
- Youth Risk Behavior Survey (YRBS): This survey is conducted by the Louisiana Department of Education (DOE), Division of School and Student Learning Support, Health and Wellness Services Section. National data are collected by the Centers for Disease Control and Prevention (CDC) under the Division of Adolescent and School Health's Youth Risk Behavior Surveillance System (YRBSS) and the CDC coordinates and assists with state-level surveys. The YRBS is administered every other year (odd years) and is designed to assess health-risk behaviors and the prevalence of obesity and asthma among middle and/or high school students. In 2011, the survey was completed by 1,160 students in Louisiana. Survey results are weighted to be representative of all high schools students in Louisiana. National and state level YRBS data can also be found at: http://apps.nccd.cdc.gov/youthonline (Centers for Disease Control and Prevention 2011).

References

ADDESSI, E., GALLOWAY, A., VISALBERGHI, E., and BIRCH, L. 2005. Specific social influences on the acceptance of novel foods in 2-5 year-old children. Appetite 45, 264-271.

ANZMAN-FRASCA, S., SAVAGE, J., MARINI, M., FISHER, J., AND BIRCH, L. 2012. Repeated exposure and associative conditioning promote preschool children's liking of vegetables. Appetite 58(2), 543-553.

CENTERS FOR DISEASE CONTROL AND PREVENTION. 2005. Can eating fruits and vegetables help people to manage their weight? Retrieved from http://www.cdc.gov/nccdphp/dnpa/nutrition/pdf/rtp_practioner_10_07.pdf.

CENTERS FOR DISEASE CONTROL AND PREVENTION (CDC), Louisiana Department of Education, Division of Student and School Learning Support, Health and Wellness Services. 2011 Youth Risk Behavior Survey (YRBS) Retrieved from http://apps.nccd.cdc.gov/youthonline.

CENTERS FOR DISEASE CONTROL AND PREVENTION. 2012. Basics about Childhood Obesity. Retrieved from http://www.cdc.gov/obesity/childhood/basics.html.

CORNWELL, T., and McALISTER, A. 2011. Alternative thinking about starting points of obesity. Development of child taste preferences. Appetite 56(2), 428-439.

DEGLAIRE, A., MEJEAN, C., CASTETBON, K., KESSE-GUYOT, E. URBANO, C., HERCBERG, S., and SCHLICH, P. 2012. Development of a questionnaire to assay recalled liking for salt, sweet and fat. Food Quality and Preference 23, 110-124.

GANCHROW, J., STEINER, J., and DAHER, M. 1983. Neonatal facial expressions in response to different qualities and intensities of gustatory stimuli. Infant Behav. Dev. 6, 473-484.

GEISELMAN, P., ANDERSON, A., DOWDY, M., WEST, D., REDMANN, S., and SMITH, S. 1998. Reliability and validity of a macronutrient self-selection paradigm and a food preference questionnaire. Physiology & Behavior 65(5), 919-928.

HAN, E. and POWELL, L. 2013. Consumption patterns of sugar-sweetened beverages in the United States. Journal of the Academy of Nutrition and Dietetics 113, 43-53.

HARVARD SCHOOL OF PUBLIC HEALTH. 2013. The Nutrition Source: How Sweet Is It? Retrieved from http://www.hsph.harvard.edu/nutritionsource/how-sweet-is-it/.

INTERNATIONAL FOOD INFORMATION COUNCIL. 2012. Food and health survey: consumer attitudes toward food safety, nutrition, and health. Retrieved from: http://www.foodinsight.org/Resources/Detail.aspx?topic=2012_IFIC_Foundation_Food_Health_Survey_Media_Resources. Accessed November 3, 2013.

KRAL, T. and ROLLS, B. 2004. Energy density and portion size: their independent and combined effects on energy intake. Physiology & Behavior 82(1), 131-138.

LAKKAKULA, A., GEAGHAN, J., ZANOVEC, M., PIERCE, S., AND TUURI, G. 2010. Repeated taste exposure increases liking for vegetables by low-income elementary school children. Appetite 55, 226-231.

MENNELLA, J., JAGNOW, C., and BEAUCHAMP, G. 2001. Prenatal and postnatal flavor learning by human infants. Pediatrics 107(6), 1-6.

MUST, A., and STRAUSS, R. 1999. Risks and consequences of childhood and adolescent obesity. International Journal of Obesity 23, suppl 2, S2-S11.

NICKLAUS, S., BOGGIO, V., CHABANET, C., and ISSANCHOU, S. 2004. A prospective study of food preferences in childhood. Food Quality and Preference 15, 805-818.

OGDEN, C., CARROLL, M., KIT, B., and FLEGAL, K. 2014. Prevalence of childhood and adult obesity in the United States, 2011-2012. Journal of the American Medical Association 311(8), 806-814.

U. S. DEPARTMENT OF AGRICULTURE AND U. S. DEPARTMENT OF HEALTH AND HUMAN SERVICES. Dietary Guidelines for Americans, 2010. 7th Edition, Washington, DC: U. S. Government Printing Office.

CHAPTER TWO:
LITERATURE REVIEW

The high prevalence of overweight and obesity in the United States is of great concern. It is not only a major problem for adult populations but significantly affects the child and adolescent populations as well. In 2011-2012 the prevalence of obesity in US children between the ages of 12 and 19 years was 20.5% (Ogden *et al*. 2014). The 2011 Youth Risk Behavior Survey (YRBS) found that 16.1% of Louisiana adolescents in grades 9 to 12 were classified as obese (Centers for Disease Control and Prevention 2011).

Being overweight or obese can cause adverse health, social, and emotional problems and increase adolescents' risks of disability and premature death as adults (Story *et al*. 2009). Obese adolescents today are experiencing diseases, such as Type 2 diabetes (American Diabetes Association 2000), hypertension (Figueroa-Colon *et al*. 1997; Schwiebbe *et al*. 2012), and dyslipidemia (Caprio *et al*. 1996), that were once only seen in adult populations. Without a significant lifestyle change, the risk of disease will likely follow these adolescents into adulthood (Park *et al* 2012).

Energy imbalance resulting from limited physical activity and excess energy intake is considered the most important factor influencing adolescent obesity (Story *et al*. 2009). The United States Department of Health and Human Services (2008) recommends that youth between 6 and 17 years of age participate in at least 60 minutes of moderate-to-vigorous physical activity on most days of the week. However, all youth are not meeting this guideline. According to the 2011 Youth Risk Behavior Survey (2012), 13.8% of high school students had not participated in at least 60 minutes of any kind of physical activity. Adolescents who have increased opportunity for sedentary behavior are

likely to spend this time watching television and using other electronic devices. This same survey discovered that 32.4% of students watched television three or more hours per day on an average school day. The amount of time spent watching television increases the amount of exposure to food advertising. The high rates of advertising for food products during television viewing may influence food choice (Kraak and Pelletier 1998).

The current environment with heavy marketing of foods and beverages low in nutrients and high in fat, sugar, and calories (energy-dense foods) encourages adolescents to make poor dietary choices (Institute of Medicine, Committee on Food Marketing and the Diets of Children and Youth 2006). Few adolescents eat the amounts of fruits, vegetables, whole grains, and calcium-rich foods recommended by the 2010 Dietary Guidelines for Americans (Kimmons *et al* 2009), and many consume excess calories, sugar, total and saturated fats, and sodium. The Academy of Nutrition and Dietetics has consistently recommended a balanced variety of nutrient-dense foods and beverages along with adequate physical activity as the foundation of a health-promoting lifestyle (Freeland-Graves and Nitzke 2013). The 2010 Dietary Guidelines for Americans recommends increasing vegetable and fruit intake to at least 4 servings of fruit per day and at least 3 or more servings of vegetables per day in order to reduce the risk of chronic disease. Although these guidelines are established, research has found that adolescents continue to choose foods and beverages that lack nutritional value. The Louisiana Department of Educations' Youth Risk Behavior Survey (Centers for Disease Control and Prevention 2011) found that only 5.9% of adolescents consumed greater than or

equal to 4 fruit servings per day and 11.7% consumed greater than or equal to three vegetable servings per day.

Food choices of adolescents are greatly influenced by their food environment and by their knowledge of healthy food. If available foods are limited to healthier options, adolescent diets are more likely to be healthy (Larson *et al*. 2009). Velazquez *et al*. (2011) conducted a cross-sectional study to explore the relationship between healthful eating knowledge versus consumption of healthy foods. Their study suggested that nutrition knowledge improves consumption of nutrient-dense foods. Students who reported a "higher perceived healthiness of usual eating habits" consumed more healthy foods overall, such as fruits, vegetables, and whole grains.

Excessive exposure to and availability of unhealthy food items promotes the habit of frequent consumption of foods high in fat and sugar. A habit is characterized by automaticity and is considered an alternate route to behavior, independent of conscious intent (Danner et al 2008 and Verplanken 2006). When people continue to repeat behaviors, habit develops and the behavior will occur automatically in a given habitual circumstance. Health-risk behavior as a spontaneous reaction to circumstances is incorporated by an additional route embedded in a constructed prototype model (Gibbons et al 1998 and Gibbons et al 2004). This model explains the two types of motivations, that is, behavioral intention and behavioral willingness.

Behavioral intention is a conscious deliberation of intention when acting. Behavioral willingness is an unintentional motivation that is a result of impulse or habit. Habit may affect behavioral willingness for unhealthy eating behavior through weakened

internal control and strengthened external control over behavior (Ohtomo 2013). Weak internal control indicates lack of control that promotes an unintentional situational response and can result in vulnerability to unhealthy food environments. External control promotes motivational factors of unhealthy eating in relation to foods' availability. The ease of accessing food strengthens the behavioral willingness to do so (Ohtomo 2013).

The overall environment surrounding children and adolescents affects their diets and health and contributes to the obesity epidemic. The current environment is filled with food and beverage marketing and the majority of marketing is for foods low in nutrients and high in calories, sugars, salt, and fat (Institute of Medicine, Committee on Food Marketing and the Diets of Children and Youth 2006). Exposure to food marketing significantly increases children's preferences for advertised products (Chemin 2008). Adolescents are vulnerable to food marketing messages due to developmental concerns related to appearance, self-identity, belonging, and reduced ability to inhibit impulsive behaviors and delay gratification (Story *et al*. 2009).

A comprehensive review of scientific studies designed to access the influence of marketing on the nutritional beliefs, choices, practices, and outcomes for children and youth was conducted by an independent committee of the Institute of Medicine (Institute of Medicine, Committee on Food Marketing and the Diets of Children and Youth 2006). They found that marketing influences children's and adolescents' food preferences and purchasing requests made to parents, impacts their dietary intake, and contributes to the high rates of overweight and obesity observed in this population group. A study by the Kaiser Family Foundation (Gantz *et al*. 2007) reviewed more than 1600 hours of television programming geared to children and adolescents to examine food marketing

advertisements. The researchers reviewed popular networks including: ABC, CBS, Fox, NBC, WB, UPN, ABC Family, BET, The Cartoon Network, Disney, MTV, Nickelodeon, and PBS. The researchers estimated that annually, teenagers between 13 and 17 years of age were exposed to an average of 28,655 food advertisements. Teens saw an average of 17 food advertisements per day on television alone. The most common appeal was taste (34%), followed by fun (18%), the inclusion of premiums or contests (16%), and the fact that a product was unique or new (10%). Two percent of all food ads targeting children or teens used claims about health or nutrition as a primary or secondary appeal in the ad, while 5% used pep or energy as a primary or secondary appeal (Gantz *et al*. 2007). In this study, a total of 2,613 food ads appeared to be geared to children and/or teenagers. The research coders did not encounter a single ad for fruits, vegetables, meat, fish, poultry, or whole grains that was designed to primarily appeal to children and/or teens.

Other studies have found an association between television viewing and increased kilocalorie intake that was associated with consumption of unhealthy foods and beverages. Phillips and colleagues (2004) estimated that children ages 2-18 years watched at least 2.5 hours of television per day and were exposed to a total of 6.5 hours of media per day. In their 10-year longitudinal study these authors investigated the relationship between energy-dense snack food consumption, weight status, and body fat in girls from pre-adolescence through adolescence and the relationship between energy-dense snack food consumption and television viewing. Although there was no correlation between total energy-dense snack food consumption and body mass index, there was a significant relationship between soda consumption and body mass index. They also

observed a significant relationship between excessive energy-dense food consumption and television viewing.

To reverse the current obesity epidemic, there is a need to further explore and identify specific food properties and other influences that may contribute to excess energy consumption. Energy density is a concept that can help in balancing energy needs to improve weight loss and maintenance. Generally, foods and food patterns that are high in fat have high energy density, and those foods high in water and/or fiber have low energy density. Energy density refers to the amount of energy in a given weight of food (kcal/g). Of the macronutrients in food, fat (9 kcal/g) increases the energy density of a food more than either carbohydrates or protein (both at 4 kcal/g), while water decreases energy density by adding weight but not energy (Kral and Rolls 2004). Replacing foods of high energy density with foods of lower energy density, such as fruits and vegetables, can be an important part of a weight maintenance strategy (Centers for Disease Control and Prevention 2005).

The study of Ledikwe et al (2006) found that adults who consumed a low-energy-dense diet had the lowest total intakes of energy, even though they consumed the greatest amount of food by weight. For the same number of calories, people can eat foods with low-energy-density in greater volume than foods with high-energy-density. This helps people feel full even though they are consuming fewer calories (Centers for Disease Control and Prevention 2005; Ledikwe *et al*. 2006).

People find it difficult to replace high-energy-dense foods with lower-energy-dense foods due to palatability. Educating individuals on how to modify the energy-dense foods in their current diet may increase the likelihood of achieving a lasting change. The

Centers for Disease Control and Prevention (2011) propose that the energy density of frequently consumed foods can be lowered by making slight modifications to the amounts of fat and water-rich foods in the diet without compromising palatability.

Controversy exists regarding the proper way to calculate dietary energy density. The inclusion of drinks in the energy density calculation creates a variable of questionable validity and has a substantive impact on the estimated energy density of the diet (Johnson *et al*. 2009). Based on experimental evidence, calculating the energy density of diets by excluding drinks and including calories from drinks as a covariate in the analysis is the most valid and reliable method of testing the relationship between energy density and weight gain in free-living humans (Johnson *et al*. 2009). When dietary energy density is calculated including drinks, a low dietary energy density is strongly associated with high drink consumption for both energy- and non-energy-containing drinks due to the water content (Johnson *et al*. 2009). Experimental studies have shown that energy-containing beverages have a weaker effect on satiety and energy intake than an equal amount of energy from a solid food (Johnson *et al*. 2009). The energy that people consume from drinks may be important in increasing total kilocalorie intake and promoting obesity (Johnson *et al*. 2009). Total calorie intake is what ultimately influences calorie balance.

In parallel with the growing obesity epidemic, the global consumption of liquid carbohydrates by adults and adolescents has dramatically increased (Pan and Hu 2011). Sugar-sweetened beverages are believed to be one of the major contributors to the increased prevalence of obesity. Although these drinks provide needed water, many beverages add calories to the diet without providing essential nutrients. Regular soda is

one of the most frequently consumed sugar-sweetened beverages (SSBs) with high calorie content. Consumption of SSBs may have an effect on total energy consumption. Mathias *et al* (2012) conducted a study to examine the extent to which sugar-sweetened beverages affect caloric intake overall and to determine if there is a difference between the diets of people who consume sugar-sweetened beverages and people that do not consume sugar-sweetened beverages. In children ages 12-18 years, these researchers found that the intake of food increased for every 100-kcal increase in sugar-sweetened beverages and decreased for every 100-kcal increase in non-sugar-sweetened beverages. For all races and ethnicities, individuals who consumed beverages high in sugar ingested more total calories per day than individuals who did not consume sugar sweetened beverages. Also, the energy density of food consumed increased as SSB intake increased.

Research suggests that liquid carbohydrates are associated with less satiety and increased energy intake compared with the intake of solid food. DellaValle and colleagues (2005) examined the impact of increasing beverage portion size on the type of beverage offered (water, regular cola, and diet cola) and food intake. The study showed that individuals who consumed sugar-sweetened beverages shortly before or with a meal ate the same number of calories as individuals who drank a calorie-free drink, resulting in an increase in total energy intake in those who consumed sugar-sweetened beverages with their meals.

Children and adolescents have been reported to consume an average of 271 kcals/day from SSBs (Han and Powell 2013). Sugar-sweetened beverages, including sodas, fruit drinks, sports drinks, chocolate milk, and vitamin water, are the leading source of added sugar in adolescent diets (Ebbeling *et al*. 2006). A higher intake of SSBs

by children is associated with poor overall dietary choices (Collison *et al*. 2010). Decreasing the consumption of SSBs seems to be a viable strategy to aid in the prevention of overweight and obesity in adolescents. Repetition of exposure to foods high in sugar, fat, and salt (as typified in fast-food and carbonated and sugar-added beverages) is achieved, a generalized preference for these and similar foods is also achieved (Cornwell and McAlister 2011).

Nutrition education and intervention strategies most commonly focus on the nutritional quality of foods and not on the taste or pleasure response (Cornwell and McAlister 2011). However, taste is often the most important factor influencing food choice. Children have a natural taste preference for sweet and salty foods, and typically dislike bitter and sour foods. Usually once a child's taste preference has formed for sugar- and fat-containing foods, their consumption behavior is affected to the extent that less flavorful foods become unacceptable to them (Cornwell and McAlister 2011). Energy-dense foods and sugar-sweetened beverages are a large part of the current food environment making it easy for children and adolescents to be exposed to them and gain a strong preference for them. Repeated exposure and experience to healthy foods early in life may lead to acceptance and increased consumption of these foods later in life (Freeland-Grave and Nitzke 2013). Although taste is regarded as the deciding factor, consumption patterns in adolescents are also influenced by perceived nutrition, product safety, price, convenience, and prestige. Other demographic, socio-cultural, and economic factors also modulate the connection between taste responsiveness and food choice (Drewnowski 1997).

With obesity rising, adolescent populations are increasingly more at-risk for diseases that were once only observed in adult populations. Overexposure to environments that promote the consumption of foods high in fat and sugar are likely contributing to the problem of obesity. There is a need for a method to evaluate dietary habits and willingness to eat particular food and beverage items in the adolescent population.

Most available food preference questionnaires have been developed for use with adults and many are gender-specific (Geiselman *et al* 1998 and Deglaire *et al* 2012), other surveys have been designed for use with young children (Cornwell and McAlister 2011). Geiselman et al (1998) created an instrument to identify people who had significant preferences for fat. This survey did not include information specific to preference for sugar-sweetened beverages, which has been associated with an impact on increased caloric intake (Han and Powell 2013; Johnson *et al* 2009). Currently, there is no instrument to estimate willingness to consume energy-dense foods and sugar-sweetened beverages by the adolescent population. A survey that can identify foods and beverages adolescents are willing to consume will allow researchers to evaluate change in habits and preferences as a result of participating in nutrition and behavioral-change interventions.

References

AMERICAN DIABETES ASSOCIATION. 2000. Type 2 diabetes in children and adolescents. Diabetes Care 23, 381-389.

CAPRIO, S., HYMAN, L., MCCARTHY, S., LANGE, R., BRONSON, M., and TAMBOLANE, W. Fat distribution and cardiovascular risk factors in obese adolescent girls, importance of the intraabdominal fat depot. American Journal of Clinical Nutrition 1996 64, 12-17.

CENTERS FOR DISEASE CONTROL AND PREVENTION. 2005. Can eating fruits and vegetables help people to manage their weight? Retrieved from http://www.cdc.gov/nccdphp/dnpa/nutrition/pdf/rtp_practioner_10_07.pdf.

CENTERS FOR DISEASE CONTROL AND PREVENTION (CDC), Louisiana Department of Education, Division of Student and School Learning Support, Health and Wellness Services. 2011 Youth Risk Behavior Survey (YRBS) Retrieved from http://apps.nccd.cdc.gov/youthonline.

CENTERS FOR DISEASE CONTROL AND PREVENTION (CDC). 2011. Low energy-dense foods and weight management: cutting calories while controlling hunger. Retrieved from http://www.cdc.gov/dnpa/nutrition/pdf/r2p_energy_density.pdf.

CENTERS FOR DISEASE CONTROL AND PREVENTION (CDC). 2012. Youth Risk Behavior Surveillance-United States, 2011. Retrieved from: www.cdc.gov/MMWR/PDF/SS/SS6104.PDF.

CHERNIN, A. 2008. The effects of food marketing on children's preferences: testing the moderating roles of age and gender. The ANNALS of the American Academy of Political and Social Science 615(101), 102-118.

COLLISON, K., ZAIDI, M., SUBHANI, S., AL-RUBEAAN, K., SHOUKRI, M., and AL-MOHANNA, F. 2010. Sugar-sweetened carbonated beverage consumption correlates with BMI, waist circumference, and poor dietary choices in school children. BioMed Central Public Health 10(234), 1-13.

CORNWELL, T., and McALISTER, A. 2011. Alternative thinking about starting points of obesity. Development of child taste preferences. Appetite 56(2), 428-439.

DANNER, U., AARTS, H., and VRIES, D. 2008. Habit vs. intention in the prediction of future behavior. The role of frequency, context stability and mental accessibility of past behavior. British Journal of Social Psychology 47, 245-265.

DEGLAIRE, A., MEJEAN, C., CASTETBON, K., KESSE-GUYOT, E. URBANO, C., HERCBERG, S., and SCHLICH, P. 2012. Development of a questionnaire to assay recalled liking for salt, sweet and fat. Food Quality and Preference 23, 110-124.

DELLAVALLE, D., ROE, L., and ROLLS, B. 2005. Does the consumption of caloric and noncaloric beverages with a meal affect energy intake? Appetite 44, 187-193.

DREWNOWSKI, A. 1997. Taste preferences and food intake. Annual Review of Nutrition 17(1), 237-253.

EBBELING, C., FELDMAN, H., OSGANIAN, S., CHOMITZ, V., ELLENBOGEN, S, and LUDWIG, D. 2006. Effects of decreasing sugar-sweetened beverage consumption on body weight in adolescents: a randomized, controlled pilot study. Pediatrics 117(3), 673-680.

FIGUEROA-COLON, R., FRANKLIN, F., LEE, J., ALDRIDGE, R., and ALEXANDER, L. 1997. Prevalence of obesity with increased blood pressure in elementary school-aged children. Southern Medical Journal 90, 806-813.

FREELAND-GRAVES, J. and NITZKE, S. 2013. Position of the Academy of Nutrition and Dietetics: Total Diet Approach to Healthy Eating. Journal of the Academy of Nutrition and Dietetics 113(2), 307-317.

GANTZ, W., SCHWARTZ, N., ANGELINI, J., and RIDEOUT, V. 2007. Food for thought: television food advertising to children in the United States. Retrieved from http://kff.org/other/food-for-thought-television-food-advertising-to/.

GEISELMAN, P., ANDERSON, A., DOWDY, M., WEST, D., REDMANN, S., and SMITH, S. 1998. Reliability and validity of a macronutrient self-selection paradigm and a food preference questionnaire. Physiology & Behavior 65(5), 919-928.

GIBBONS, F., GERRARD, M., BLANTON, H., and RUSSEL, D. 1998. Reasoned action and social relation. Willingness and intention as independent predictors of health risk. Journal of Personality and Social Psychology 74, 1164-1180.

GIBBONS, F., GERRARD, M., VANDE LUNE, L., WILLS, T., BRODY, G. and CONGER, R. 2004. Context and cognitions. Environmental risk, social influence, and adolescent substance abuse. Personality and Social Psychology Bulletin 30, 1048-1061.

HAN, E. and POWELL, L. 2013. Consumption patterns of sugar-sweetened beverages in the United States. Journal of the Academy of Nutrition and Dietetics 113, 43-53.

INSTITUTE OF MEDICINE, COMMITTEE ON FOOD MARKETING AND THE DIETS OF CHILDREN AND YOUTH. Food marketing to children and youth: Threat or opportunity? Washington, DC: National Academies Press; 2006. Available from: http://www.iom.edu/Reports/2005/Food-marketing-to-Children-and-Youth-Threat-or-Opportunity.aspx. Accessed 1/27/13.

JOHNSON, L., WILKS, D., LINDROOS, A., and JEBB, S. 2009. Reflections from a systematic review of dietary energy density and weight gain: is the inclusion of drinks valid? Obesity Reviews 10, 681-692.

KEMMONS, J., GILLESPIE, C., SEYMOUR, J., SERDULA, M., and BLANCK, H. 2009. Fruit and vegetable intake among adolescents and adults in the United States: percentage meeting individualized recommendations. The Medscape Journal of Medicine 11, 26.

KRAAK, V. and PELLETIER, D. 1998. The influence of commercialism on the food purchasing behavior of children and teenage youth. Family Economics & Nutrition Review 11, 15-23.

KRAL, T. and ROLLS, B. 2004. Energy density and portion size: their independent and combined effects on energy intake. Physiology & Behavior 82, 131-138.

LARSON, N., STORY, M., and NELSON, M. 2009. Neighborhood environments: disparities in access to healthy foods in the U.S. American Journal of Preventative Medicine 36, 74-81.

LEDIKWE, J., BLANCK, H., KHAN, L, SERDULA, M., SEYMOUR, J., TOHILL, B., and ROLLS, B. 2006. Dietary energy density is associated with energy intake and weight status in US adults. American Journal of Clinical Nutrition 83, 1362-1368.

MATHIAS, K., SLINING, M., and POPKIN, B. 2013. Foods and beverages associated with higher intake of sugar-sweetened beverages. American Journal of Preventive Medicine 44, 351-357.

OGDEN, C., CARROLL, M., KIT, B., and FLEGAL, K. 2014. Prevalence of childhood and adult obesity in the United States, 2011-2012. Journal of the American Medical Association 311, 806-814.

OHTOMO, S. 2013. Effects of habit on intentional and reactive motivations for unhealthy eating. Appetite 68, 69-75.

PAN, A and HU, F. 2011. Effects of carbohydrates on satiety: differences between liquid and solid food. Curr Opin Clin Nutr Metab Care 14, 385-390.

PARK, M., FALCONER, C., VINER, R., and KINRA, S. The impact of childhood obesity on morbidity and mortality in adulthood: a systematic review. Obesity Reviews 13, 985-1000.

PHILLIPS, S., BANDINI, L., NAUMOVA, E., CYR, H., COLCLOUGH, S., DIETZ, W., and MUST, A. 2004. Energy-dense snack food intake in adolescence: longitudinal relationship to weight and fatness. Obesity Research 12, 461-472.

SCHWIEBBE, L., TALMA, H., RENDERS, C., VISSER, R., KIST-VAN HOLTHE, J., and HIRASING, R. 2012. High prevalence of hypertension in obese children in the Caribbean. Paediatrics and International Child Health 32, 204-207.

STORY, M, SALLIS, J., and ORLEANS, C. 2009. Adolescent Obesity: Towards Evidence-Based Policy and Environmental Solutions. Journal of Adolescent Health 45, S1-S5.

U. S. DEPARTMENT OF AGRICULTURE AND U. S. DEPARTMENT OF HEALTH AND HUMAN SERVICES. Dietary Guidelines for Americans, 2010. 7th Edition, Washington, DC: U. S. Government Printing Office.

U.S DEPARTMENT OF HEALTH AND HUMAN SERVICES. 2008. Physical Activity Guidelines for Americans. Retrieved from: www.health.gov/PAGuidelines/pdf/paguide.pdf.

VELAZQUEZ, C., PASCH, K., RANJIT, N., MIRCHANDANI, G., and HOELSCHER, D. 2011. Are Adolescents' Perceptions of Dietary Practices Associated with Their Dietary Behaviors? Journal of the American Dietetic *Association* 111, 1735-1740.

VERPLANKEN, B. 2006. Beyond frequency. Habit as mental construct. British Journal of Social Psychology 45, 639-656.

CHAPTER THREE:
DEVELOPMENT OF AN ADOLESCENT FOOD PREFERENCE QUESTIONNAIRE

Introduction

Adolescent obesity is one of the major health challenges of this century and poor dietary habits are thought to contribute to the problem. In 2011-2012 the prevalence of obesity in U.S. children 12-19 years of age was 20.5% (Ogden *et al*. 2014). Developing and maintaining healthy dietary habits is critical to the overall health and quality of life for children, yet the current environment, rich in highly-marketed, energy-dense food items and sugar-sweetened beverages encourages development of palate preferences for these food items (Institute of Medicine, Committee on Food Marketing and the Diets of Children and Youth 2006). Food preferences are strongly associated with foods eaten (International Food Information Council 2012). Extra calories from these foods may contribute to the development of overweight and obesity. It is important to determine what foods adolescents are willing to eat so as to develop possible interventions to help them practice healthy eating habits to achieve appropriate weight status. A food preference questionnaire capable of identifying adolescent liking for energy-dense foods and sugar-sweetened beverages is needed.

Questionnaires have been developed to evaluate adult's (Geiselman *et al* 1998 and Deglaire et al 2012) and young children's food preferences (Cornwell and McAlister 2011). These surveys, however, are not specific for use with adolescents. Geiselman et al (1998) created a questionnaire to identify individuals with preferences for high-fat foods but it did seek information about preference for sugar-sweetened beverages. Currently,

there is no questionnaire capable of estimating adolescents' willingness to consume high-fat foods and sugar-rich beverages.

Food preferences are shaped by innate and learned behaviors. Humans are born with a preference for sweet tastes and a dislike for bitter tastes (Ganchrow 1983; Mennella *et al* 2001). The influence of these preferences appears to extend into early childhood and may continue to change throughout adolescence and adulthood. A child's taste preference is thought to be influenced by repeated exposure to a particular food (Anzman-Frasca *et al*. 2012; Lakkakula *et al*. 2011), social learning such as seeing an adult eating certain foods (Addessi 2005), and marketing (Cornwell and McAlister 2011). Food preferences and habits established in childhood influence food choice over the lifespan and have both short and long-term consequences for health (Must and Strauss 1999).

A survey to evaluate willingness to consume foods associated with obesity is needed yet one does not currently exist for the adolescent population. Survey responses would give an indication of what foods or beverages adolescents prefer and are likely to consume. It could be used with nutrition intervention programs as an evaluation tool. The purpose of this study was to develop a questionnaire to estimate adolescent food preferences for energy dense-food items and sugar-sweetened beverages.

Methods

Participants

Males and females 13-19 years of age (9^{th} - 12^{th} grade) were recruited to participate in focus group interviews (5 focus groups; n=36 students) or to complete the finalized survey (n=234). Youth were selected from southern Louisiana public high schools and after-school programs. Students in focus group interviews provided

information about their preferences for energy-dense foods and sugar-sweetened beverages and this information were used to develop a list of items to be included in the food preference survey. The finalized survey was administered to adolescent high school students who had not participated in focus group interviews.

Parents gave consent for children under the age of 18 years to participate and youth gave personal assent to participate. Students 18-19 years of age consented to participate. This study was approved by the Louisiana State University Agricultural Center Institutional Review Board.

Questionnaire Development

Five focus group interviews were conducted and a preliminary food preference survey was developed. The first (n=5) and second (n=6) focus group interviews established food items for possible inclusion on the food preference survey. The participants were asked about their food preferences from a pre-structured list of questions. The responses were recorded and later reviewed. Following the first two focus group interviews, the researcher compiled a list of 20 food items to be included in a preliminary version of the food preference survey. The list included five items representing each of the following categories: medium-to-high energy-dense foods (energy dense) (≥ 1.5 kcal/g), very-low to low energy-dense foods (energy dilute) (<1.5 kcal/g) (Centers for Disease Control and Prevention 2005), sugar-sweetened beverages, and non-sweetened beverages. A 7-choice and a 9-choice Likert scale survey were formatted to gather participant opinions. The choices ranged from "extremely willing to eat or drink a food item or beverage" to "extremely unwilling to eat or drink a food item or beverage."

Participants in the third (n=7), fourth (n=13) and fifth (n=6) focus group interviews discussed the preliminary survey foods and the 7-choice and 9-choice Likert scales. Before students discussed the survey foods, note cards were distributed and participants were asked to list 5 food items they preferred from each of the following categories: 1) sweet foods, 2) fatty foods, 3) sugar-sweetened beverages, 4) beverages that did not contain sugar, and 5) foods the participants considered to be "healthy." Students filled out the note-cards individually before discussing the responses as a group. If preliminary survey items were not listed or mentioned in the discussion, the students were asked their opinion of the survey items. The participants were also asked to review both the 7-choice and 9-choice Likert scale surveys and to indicate their Likert-scale preference.

The students preferred the 7-choice Likert scale option over the 9-choice option. The 9-point Likert scale included "moderately willing/unwilling" and "slightly willing/unwilling". The students indicated that they thought the choices were too similar and believed that it was easier to use the 7 point scale. They were also asked if they understood the neutral point; "neither willing nor unwilling" and indicated that they would select this category for an item that they did not like or dislike. One student said that this choice could also be used if they never tried the food item and did not have an opinion about it. The food items and the Likert scale choices were adjusted as necessary to make the finalized version of the food preference survey. The finalized survey included the 7-point scale with the neutral point.

Survey Distribution

The finalized survey instrument was distributed to high school students (n=234) in East Baton Rouge and Ascension Parishes, Louisiana. One trained investigator administered the surveys to the students. The students were able to complete the assent form, food preference survey, and an attached demographics section of the survey within 15 minutes.

Data Analysis

Willingness to consume survey items and demographic information about gender, race, grade level, and type of school (public vs. private) were collected. The needed sample size was estimated by assessing the ratio of observations to questions and by calculating the Kaiser-Meyer-Olkin measure of sampling adequacy (KMO). At least 10-15 participants per variable were recruited to complete the survey instrument (Field 2009; MacCallum and Widaman 1999). The food preference survey included 20 questions; therefore, at least 200 responses were sought. The KMO test indicates the proportion of variance in the variables that may be caused by underlying factors. The KMO statistic varies between 0 and 1. A value close to 1 indicated that the patterns of correlations are relatively compact and factor analysis should yield distinct and reliable factors (Field, 2009). Kaiser recommends accepting values between 0.7 and 0.8 as a good representation of reliable factors. Principal Axis factoring with a Promax (oblique) rotation was used to observe how the food items clustered together and to allow for correlated factors. To determine the number of factors to be interpreted eigenvalues over 1 were chosen and the scree plot was considered (Field 2009). Bartlett's Test of Sphericity was used to determine if overall correlations were too small and the correlation matrix was checked

for multicollinearity. Data were examined using SPSS statistical software (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.)

Results

Focus Group Interviews

Five focus group interviews were conducted and included a total of 36 participants between 13 and 19 years of age. Twenty-seven of the participants were female (75%). Twenty of the participants, were Caucasian (56%), 13 were African American (36%), one student chose the classification of "other", and two others did not indicate their race or ethnicity. The focus group interviews established a list of 5 items in each of the following categories: energy-dense foods, energy-dilute foods, sugar-sweetened beverages, and unsweetened beverages. Table 1 presents the food items that were included on the food preference survey instrument.

Table 1: Foods and Beverages Chosen by Adolescents to Represent Categories

Energy-dense foods	**Energy-dilute foods**	**Sugar-sweetened beverages**	**Unsweetened beverages**
French fries	Raw or Steamed broccoli	Kool-Aid (made with sugar)	Water
Nuts or nut butters	Low-fat or Fat-free yogurt	Regular Cola drinks	Unsweetened or artificially sweetened tea
Glazed donut	Carrot sticks (with no more than 2 Tbsp low-fat dressing	Lemonade	Low-fat unflavored milk
Cookies	Grapes	Low-fat chocolate milk	Diet cola drinks
Pizza with meat topping	Banana	Tea sweetened with sugar	Coffee with 1 tsp/1 sugar packet or less

Table 1 continued: Foods and Beverages Chosen by Adolescents to Represent Categories

Footnotes: Energy-dense refers to the amount of energy in a given weight of food (kcal/g). Sugar-sweetened beverages contain added sugar; highly sugared beverages contain more than 12 grams of sugar in a 12 oz. serving. Nutrient values were obtained from the USDA database (U.S. Department of Agriculture, Agricultural Research Service. 2013. USDA National Nutrient Database for Standard Reference, Release 26.

Food Preference Surveys

Surveys were collected from a total of 234 students from three high schools in East Baton Rouge and Ascension Parishes, Louisiana. One hundred twenty-six participants were female (54%). One hundred forty-five participants were Caucasian (62%), 63 were African American (27%), 7 were Hispanic/Latino (3%), and 16 were classified as "Other". For statistical analysis, the participants were classified as either 'white' or 'non-white' subjects.

The KMO statistic for the first food preference survey analysis was 0.719 indicating that the survey was adequate for factor analysis, and the Bartlett's Test proved to be significant ($p < 0.001$). The Bartlett's Test indicated that the correlations between variables were significantly different from zero and that the correlation matrix was not an identity matrix. Multicollinearity was not an issue due to the determinant of 0.004 being greater than .00001. Additionally, the intercorrelation among variables was checked by examining the correlation matrix. With values ranging from -.009 to .510, no issues of extreme multicollinearity (values greater than .9) were observed. This indicated that each food item stood alone within its factor. The items were not highly correlated with any other items so they did not need to be combined or removed.

Principal axis factoring was the extraction method used for the analysis. This method was chosen to see how the food items clustered together. Conclusions were restricted to the sample collected and generalization of the results achieved only if

analyses using different samples revealed the same factor structure. Not all of the factors were retained in this analysis. The two strategies used for retaining factors were eigenvalues greater than 1 and the Catell scree test (Stevens 2002). Retaining eigenvalues greater than 1 is based on the idea that eigenvalues represent the amount of variation explained by a factor and that eigenvalues greater than 1 represent a substantial amount of variation. The point of inflexion in the principal axis factoring graph occurred at the third data point (factor), therefore, only two factors were extracted. The factors to the left of the point of inflexion remain without including the point itself.

Since the items in the survey were all food items, correlated factors were expected. Promax (oblique rotation) was used to allow the factors to correlate and improved the factor interpretation. The initial analysis returned 6 factors with eigenvalues ranging from .630 to 3.248. Three factors had eigenvalues greater than 1: Factor 1 = 3.248, Factor 2 = 2.544, and Factor 3 = 1.058. The remaining 3 factors had eigenvalues less than 1: Factor 4 = .922, Factor 5 = .889, and Factor 6 = .630. This analysis explained 46.461% of the variance (Tables 2 and 3). An a priori determination was made to dismiss any items with factor loadings on the pattern matrix less than .4 (Guadagnoli and Velicer 1988). Two items in the pattern matrix had loadings less than .4 (coffee = .205, water = .366) (Table 2).

A second analysis, after coffee and water had been removed, returned 6 factors with eigenvalues ranging from .615 to 3.222. Three factors had eigenvalues greater than 1: Factor 1 = 3.222, Factor 2 = 2.355, and Factor 3 = 1.035. The remaining 3 factors had eigenvalues less than 1: Factor 4 = .923, Factor 5 = .883, and Factor 6 = .615. This analysis explained 50.181% of the variance (Tables 4 and 5). Factors having eigenvalues

less than 1, items with loadings less than .4, and factors that were uninterpretable because they carried only 2 items were removed. Factors 4, 5, and 6 had eigenvalues less than 1 and Factors 3 and 4 were composed of only 2 items with loadings greater than .4 deeming them uninterpretable **(**Velicer and Fara 1998**).** Items deleted following the second analysis included: broccoli, carrots, unflavored milk, chocolate milk, regular cola, diet cola, unsweetened tea, and sweetened tea.

Table 2: Pattern Matrix and Communalities for Foods and Beverages included in the First Analysis

	Pattern Matrix						
Items	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	**h^2**
Fries	**.786**	-.009	.019	.104	-.048	-.006	.580
Pizza	**.678**	.057	-.209	.060	-.021	-.172	.373
Cookies	**.668**	.154	-.226	.038	.026	.174	.486
Donuts	**.579**	-.069	.043	-.045	.070	.128	.454
Kool Aid	**.546**	-.061	.216	-.115	.141	-.107	.465
Lemonade	**.509**	.073	.149	.096	-.106	-.108	.282
Banana	.073	**.785**	.031	-.077	-.044	-.022	.572
Yogurt	-.163	**.510**	.138	.031	-.007	.172	.377
Grapes	.128	**.502**	.158	.047	-.029	-.010	.348
Nuts	.114	**.470**	-.019	-.055	.040	-.052	.222
Water	-.117	**.366**	-.142	-.032	.108	.068	.167
Sugared Tea	.041	.086	**.840**	-.052	-.075	-.058	.722
No Sugar Tea	-.082	-.024	**.676**	.127	.084	.093	.526
Coffee	-.083	.101	**.205**	.125	.094	.107	.143
Broccoli	.067	-.162	.115	**.894**	-.022	-.056	.684
Carrots	.069	.144	-.062	**.665**	.068	.069	.550
Chocolate Milk	.099	.036	.081	-.099	**.819**	-.131	.704
Unflavored Milk	-.090	-.004	-.067	.145	**.664**	.091	.508
Diet Cola	-.070	.082	.012	.024	-.026	**.677**	.448
Regular Cola	.391	-.173	.097	-.132	-.034	**.526**	.683

Footnotes: Extraction method used principle axis factoring with a Promax rotation. Table entries are item factor loadings. Factor 1-eigenvalue for the summed squared factor loading = 3.248, percent of variance =16.2%, rotated model = 2.958; Factor 2-eigenvalue for the summed squared factor loading = 2.544, percent of variance = 12.7%, rotated model = 2.106; Factor 3-eigenvalue for the summed squared factor loading = 1.058, percent of variance = 5.3%, rotated model = 2.029; Factor 4-eigenvalue for the summed squared factor loading = 0.922, percent of variance = 4.6%, rotated model = 1.821; Factor 5-eigenvalue for the summed squared factor loading = 0.889, percent of variance = 4.4%, rotated model = 1.551; Factor 6-eigenvalue for the summed squared factor loading = 0.630, percent of variance = 3.2%, rotated mode l= 1.373; Total Variance Explained by the Model = 46.5%

Table 3: Structure Matrix for Foods and Beverages included in the First Analysis

	Structure Matrix					
Items	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
Fries	**.755**	.003	.246	-.129	.064	.231
Pizza	**.543**	.002	-.041	-.135	.016	-.027
Cookies	**.641**	.107	.067	-.085	.150	.321
Donuts	**.653**	-.069	.244	-.215	.146	.322
Kool Aid	**.630**	-.030	.353	-.266	.190	.134
Lemonade	**.479**	.102	.275	-.033	-.001	.072
Banana	.071	**.745**	.229	.222	.185	.011
Yogurt	-.095	**.563**	.264	.308	.187	.173
Grapes	.141	**.548**	.315	.224	.169	.079
Nuts	.100	**.450**	.121	.110	.170	-.010
Water	-.127	**.354**	-.049	.167	.183	.020
Sugared Tea	.277	.248	**.840**	.008	.091	.172
No Sugar Tea	.122	.225	**.695**	.201	.231	.281
Coffee	-.016	.237	**.261**	.225	.193	.168
Broccoli	-.166	.229	.130	**.807**	.094	.047
Carrots	-.113	.424	.066	**.717**	.228	.132
Chocolate Milk	.211	.251	.229	.017	**.815**	.074
Unflavored Milk	-.043	.240	.062	.278	**.680**	.184
Diet Cola	.123	.104	.197	.119	.128	**.658**
Regular Cola	.614	-.214	.302	-.280	.061	**.650**

Footnotes: Extraction method used principle axis factoring with a Promax rotation. Table entries are item factor loadings. Factor 1-eigenvalue for the summed squared factor loading = 3.248, percent of variance =16.2%, rotated model = 2.958; Factor 2-eigenvalue for the summed squared factor loading = 2.544, percent of variance = 12.7%, rotated model = 2.106; Factor 3-eigenvalue for the summed squared factor loading = 1.058, percent of variance = 5.3%,rotated mode l= 2.029; Factor 4-eigenvalue for the summed squared factor loading = 0.922, percent of variance = 4.6%,rotated model = 1.821; Factor 5-eigenvalue for the summed squared factor loading = 0.889, percent of variance = 4.4%,rotated model = 1.551; Factor 6-eigenvalue for the summed squared factor loading = 0.630, percent of variance = 3.2%, rotated mode l= 1.373; Total Variance Explained by the Model = 46.5%

The third and final factor analysis retained two factors that explained 37.7% of the variance. The KMO of 0.755 indicated sampling adequacy, and the Bartlett's Test was significant ($p < 0.001$). The determinant of .108 indicated that multicollinearity was not an issue. The items in the two factors are displayed in Table 6. A two-factor solution was the best representation of the underlying constructs of foods and beverages high in added fat and/or sugar (Factor 1) and a group of less processed foods without added fats and

sugars (Factor 2). Factor 1 explained 23.9% of the variance, and Factor 2 explained 13.8% of the variance.

Table 4: Pattern Matrix and Communalities for Foods and Beverages included in the Second Analysis

	Pattern Matrix						
Items	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	$\mathbf{h^2}$
Fries	**.786**	-.002	.026	.101	-.052	-.010	.579
Cookies	**.671**	.103	-.196	.062	.023	.141	.470
Pizza	**.668**	.048	-.189	.062	-.022	-.176	.361
Donuts	**.579**	-.093	.081	-.026	.071	.119	.463
Kool Aid	**.544**	.009	.155	-.156	.127	-.090	.444
Lemonade	**.522**	.075	.145	.095	-.114	-.123	.286
Banana	.025	**.834**	-.034	-.082	-.024	.022	.630
Grapes	.100	**.546**	.099	.038	-.013	.019	.370
Yogurt	-.176	**.481**	.112	.061	.018	.172	.352
Nuts	.096	**.431**	-.025	-.029	.054	-.049	.199
Sugared Tea	.041	.100	**.858**	-.048	-.076	-.069	.760
No Sugar Tea	-.075	-.039	**.703**	.149	.090	.076	.557
Broccoli	.067	-.131	.130	**.857**	-.022	-.056	.646
Carrots	.066	.148	-.069	**.672**	.074	.072	.557
Chocolate Milk	.083	.047	.058	-.107	**.824**	-.114	.712
Unflavored Milk	-.098	-.026	-.056	.162	**.665**	.092	.503
Diet Cola	-.090	.091	-.017	.027	-.015	**.722**	.492
Regular Cola	.398	-.139	.075	-.143	-.034	**.504**	.652

Footnotes: Extraction method used principle axis factoring with a Promax rotation. Table entries are item factor loadings. Factor 1-eigenvalue for the summed squared factor loading=3.222, percent of variance=17.9%, rotated model=2.940; Factor 2-eigenvalue for the summed squared factor loading=2.355, percent of variance=13.1%, rotated model=1.967; Factor 3-eigenvalue for the summed squared factor loading=1.035, percent of variance=5.8%,rotated model=1.948; Factor 4-eigenvalue for the summed squared factor loading=0.923, percent of variance=5.1%,rotated model=1.719; Factor 5-eigenvalue for the summed squared factor loading=0.883, percent of variance=4.9%,rotated model=1.506; Factor 6-eigenvalue for the summed squared factor loading=0.615, percent of variance=3.4%,rotated model=1.376; Total Variance Explained by the Model=50.2%

The adolescent group's willingness to consume each of the items in Factor 1 is displayed in Table 7. Youth were most willing to eat fries and pizza and least likely to drink lemonade. The group mean willingness score was 5.95 ± 0.97.

Table 5: Structure Matrix for Foods and Beverages included in the Second Analysis

	Structure Matrix					
Items	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
Fries	**.754**	.048	.245	-.133	.079	.245
Cookies	**.647**	.096	.077	-.089	.146	.307
Pizza	**.536**	.027	-.035	-.129	.031	-.018
Donuts	**.656**	-.044	.272	-.208	.162	.339
Kool Aid	**.623**	.042	.308	-.289	.199	.146
Lemonade	**.482**	.131	.263	-.044	.002	.073
Banana	.064	**.788**	.205	.216	.196	.022
Grapes	.136	**.587**	.284	.214	.181	.086
Yogurt	-.091	**.537**	.250	.304	.186	.160
Nuts	.100	**.430**	.118	.108	.170	-.012
Sugared Tea	.275	.300	**.861**	-.009	.101	.185
No Sugar Tea	.124	.236	**.715**	.196	.237	.283
Broccoli	-.165	.217	.121	**.787**	.092	.037
Carrots	-.109	.401	.049	**.719**	.223	.118
Chocolate Milk	.214	.252	.213	.004	**.824**	.071
Unflavored Milk	-.035	.202	.067	.280	**.673**	.168
Diet Cola	.130	.098	.195	.116	.125	**.688**
Regular Cola	.615	-.165	.291	-.289	.068	**.640**

Footnotes: Extraction method used principle axis factoring with a Promax rotation. Table entries are item factor loadings. Factor 1-eigenvalue for the summed squared factor loading=3.222, percent of variance=17.9%, rotated model=2.940; Factor 2-eigenvalue for the summed squared factor loading=2.355, percent of variance=13.1%, rotated model=1.967; Factor 3-eigenvalue for the summed squared factor loading=1.035, percent of variance=5.8%,rotated model=1.948; Factor 4-eigenvalue for the summed squared factor loading=0.923, percent of variance=5.1%,rotated model=1.719; Factor 5-eigenvalue for the summed squared factor loading=0.883, percent of variance=4.9%,rotated model=1.506; Factor 6-eigenvalue for the summed squared factor loading=0.615, percent of variance=3.4%,rotated model=1.376; Total Variance Explained by the Model=50.2%

Table 6: Foods and Beverages included in the Final Two-Factor Analysis

	Pattern Matrix			**Structure Matrix**	
Item	Factor 1	Factor 2	**h^2**	Factor 1	Factor 2
Fries	**.770**	.000	.593	**.770**	.098
Donuts	**.651**	-.078	.417	**.641**	.004
Cookies	**.631**	.050	.409	**.637**	.130
Kool Aid	**.598**	-.003	.357	**.597**	.073
Pizza	**.541**	-.040	.289	**.536**	.029
Lemonade	**.503**	.108	.253	**.491**	.168
Bananas	.000	**.765**	.585	.098	**.765**
Grapes	.082	**.604**	.385	.159	**.615**
Nuts	.071	**.403**	.175	.122	**.412**
Yogurt	-.132	**.558**	.310	-.061	**.541**

Table 6 continued: Foods and Beverages included in the Final Two-Factor Analysis

Footnotes: h^2 = Communalities. Extraction method used principle axis factoring with a Promax rotation. Table entries are item factor loadings. Factor 1-eigenvalue for the summed squared factor loading=2.388, percent of variance=23.9%, rotated model=2.349; Factor 2-eigenvalue for the summed squared factor loading = 2.383, percent of variance=13.8%, rotated model=1.487; Cronbach's alpha=0.770 for Factor 1 and 0.664 for Factor 2. Total Variance Explained by the Model=37.7%

Willingness to consume Factor 1 foods was compared between males and females. Levene's test of homogeneity of variance revealed that variances were not equal in the two gender groups ($F=4.634$; $p < .05$) therefore a t-test was performed, with equal variances not assumed (Ruxton 2006). Females (n=127) had a Factor 1 mean score of 5.81 ± 1.09 and males (n=107) had a mean score of 6.11 ± 79). Males had significantly higher scores than females for these processed foods and sweetened beverages ($t_{226.7} = 2.421$; $p < .05$). Preferences for Factor 1 foods and beverages by grade are represented in Table 8. There were no statistically significant differences in scores among grade level in Factor 1. Willingness to consume Factor 1 items was not different between white and non-white adolescents. Mean score was 5.86 ± 1.00 for white youth (n=147) and 6.09 ± 0.91 for non-white adolescents (n=87).

Willingness to consume scores were lower for food items included in Factor 2 (Mean = 5.64 ± 1.18). As shown in Table 9, grapes had the highest mean score, and yogurt had the lowest score.

Table 7: Adolescent Willingness to Consume Foods/Beverages in Factor 1 (n=234)

Items in Factor 1	Mean ± SD
Fries	6.18 ± 1.20
Cookies	6.18 ± 1.14
Donuts	5.66 ± 1.77
Kool-Aid	5.48 ± 1.69
Pizza	6.16 ± 1.33
Lemonade	6.03 ± 1.32

Table 7 continued: Adolescent Willingness to Consume Foods/Beverages in Factor 1 (n=234)

Footnote: Mean values based on the 7 point Likert-type scale 1=Extremely Unwilling, 2=Unwilling, 3=Slightly unwilling, 4=Neither Willing nor Unwilling, 5=Slightly Willing, 6=Willing, 7=Extremely Willing

Table 8: Adolescent Willingness to Consume Factor 1 Foods/Beverages by Grade

	n	Mean ± SD
9th grade	45	5.97 ± 1.17
10th grade	56	6.06 ± .92
11th grade	58	5.88 ± .78
12th grade	75	5.90 ± 1.02

Footnote: Mean values based on the 7 point Likert-type scale 1=Extremely Unwilling, 2=Unwilling, 3=Slightly unwilling, 4=Neither Willing nor Unwilling, 5=Slightly Willing, 6=Willing, 7=Extremely Willing. Not significant, $p \geq 0.05$.

Levene's test of homogeneity of variance indicated that gender variances for Factor 2 were equal ($F = .073$, $p > .05$). A t-test was performed, with equal variances assumed, to compare the Factor 2 scores for females (n=127; mean = 5.71; SD =1.21) and males (n=107; mean = 5.55; SD = 1.15). While females had a higher mean preference score for the foods in Factor 2 that were lower in fat and sugar than males, it was not significantly different ($t_{232} = -1.029$; $p > .05$). There were no differences in willingness to eat Factor 2 foods between grade levels (Table 10). No difference in willingness to consume Factor 2 foods was observed between the white and non-white youth. White adolescents (n=147) had a score of 5.73 ± 1.06 and non-white youth (n=87) had a score of 5.47 ± 1.35.

Table 9: Adolescent Willingness to Consume Foods in Factor 2 (n=234)

Items in Factor 2	Mean ± SD
Grapes	6.25 ± 1.40
Nuts	5.59 ± 1.58
Banana	5.56 ± 1.83
Yogurt	5.13 ± 1.85

Footnote: [a] Mean values based on the 7 point Likert-type scale 1=Extremely Unwilling, 2=Unwilling, 3=Slightly unwilling, 4=Neither Willing nor Unwilling, 5=Slightly Willing, 6=Willing, 7=Extremely Willing

Table 10: Willingness to Consume Factor 2 Foods by Grade Level

	n	Mean ± SD
9th grade	45	5.61±1.23
10th grade	56	5.67±.987
11th grade	58	5.75±1.20
12th grade	75	5.54±1.28

Footnote: not significant, $p \geq 0.05$.

Discussion and Conclusions

The purpose of the present study was to develop a food preference survey to estimate adolescents' willingness to consume energy-dense foods and sugar-sweetened beverages. Results indicated that commonly named energy-dense foods and sugar-sweetened beverages did not group into separate factors but grouped together. Less-processed items such as fruits, nuts, and yogurt were not found in the energy-dense, sugar-sweetened group. These findings suggest that it is possible to create a survey to estimate adolescents' willingness to consume foods and beverages as well as less-processed foods.

Foods identified from focus group interviews were expected to factor in the pre-determined groups of energy-dense and energy-dilute foods and sweetened and unsweetened beverages. These pre-determined groups of foods and beverages had been established by nutritionists, but adolescents' willingness to consume these items did not cluster into these groups. The food items from the final factor analysis clustered into two latent constructs. Factor 1 appeared to represent processed, high-fat and high-sugar items while Factor 2 included fruits, nuts and plain yogurt. Factor 1 contained four high-fat and high-sugar food items and two sugar-sweetened beverages. Adolescents' willingness-to-eat scores were higher for the processed foods high in fat and sugar and the sugar-

sweetened beverages as compared to the scores for the less-processed fruits, nuts, and yogurt.

The questionnaire willingness-to-eat scores in this group of adolescents were consistent for Factor 1 by grade and race and Factor 2 by gender, grade, and race but Factor 1 scores were different between the genders. Males were more willing to consume energy-dense foods and sugar-sweetened beverages than females. This finding is consistent with a sensory preference study conducted by Drewnowski (1989) where he found that preferences for sweet tastes declined sharply between 12-14 years of age in females but males continue to prefer more intensely sweet stimuli into late adolescence.

Future studies need to be conducted to strengthen the study findings. The survey food/beverage item list should be expanded in order to explain more of the convergent variance. Another set of focus group interviews should be conducted to determine additional processed and less-processed foods that adolescents are willing to eat and more sweetened and unsweetened beverages that adolescents are willing to drink. Although the KMO suggests a "good" representation of reliable factors, when additional food and beverage items are added to the survey additional completed surveys will be needed in order to have an adequate sample size. Current literature gives contradictory recommendations regarding the necessary sample size per variable. One resource states that since factor saturation is relatively high, a larger sample size would not be required (Guadagnoli and Velicer 1988). Another recommendation states that with a small number of factors, when communalities are low, the sample size should be larger (MacCallum and Widaman 1999). Given the contradictory statements, it would be safer to follow the recommendation of a larger sample size to determine willingness to eat.

Two types of motivations are involved in health-risk behavior. The first is behavioral intention, which is a conscious deliberation that leads to intended behavior and the second is behavioral willingness, which is a reaction to a situation leading to an unplanned or unintentional behavior (Ohtomo 2013). A habit of unhealthy eating can have an effect on eating behavior. External stimuli, such as environment, can promote motivational factors of unhealthy eating due to the high availability of these foods. A separate study completed by Velazquez et al (2011), suggests that if adolescents perceive that their usual eating habits are healthy they typically consume more healthy foods overall. This indicates that nutrition education can make a difference in healthy eating and if adolescents are aware of nutrition guidelines positive behavior can occur. Once the current survey is finalized, by increasing the number of food items included and validating it with sufficient numbers of participants, this willingness-to-eat survey can be used to estimate the impact of nutrition education programs and as a personal health awareness tool.

References

ADDESSI, E., GALLOWAY, A., VISALBERGHI, E., and BIRCH, L. 2005. Specific social influences on the acceptance of novel foods in 2-5 year-old children. Appetite 45, 264-271.

ANZMAN-FRASCA, S., SAVAGE, J., MARINI, M., FISHER, J., AND BIRCH, L. 2012. Repeated exposure and associative conditioning promote preschool children's liking of vegetables. Appetite 58, 543-553.

CENTERS FOR DISEASE CONTROL AND PREVENTION. 2005. Can eating fruits and vegetables help people to manage their weight? Retrieved from http://www.cdc.gov/nccdphp/dnpa/nutrition/pdf/rtp_practioner_10_07.pdf.

CORNWELL, T., and McALISTER, A. 2011. Alternative thinking about starting points of obesity. Development of child taste preferences. Appetite 56, 428-439.

DREWNOWSKI, A. (1989). Sensory preferences for fat and sugar in adolescence and adult life. Annals of the New York Academy of Sciences 561, 243-250.

FIELD, A. 2009. Discovering statistics using SPSS (3rd edition). Los Angeles, CA: Sage Publications, Inc.

GANCHROW, J., STEINER, J., and DAHER, M. 1983. Neonatal facial expressions in response to different qualities and intensities of gustatory stimuli. Infant Behav. Dev. 6, 473-484.

GUADAGNOLI, E. and VELICER, W. 1988. Relation of sample size to the stability of component patterns. Psychological Bulletin 103, 265-275.

INTERNATIONAL FOOD INFORMATION COUNCIL. 2012. Food and health survey: consumer attitudes toward food safety, nutrition, and health. Retrieved from: http://www.foodinsight.org/Resources/Detail.aspx?topic=2012_IFIC_Foundation_Food_Health_Survey_Media_Resources. Accessed November 3, 2013.

KRAL, T. and ROLLS, B. 2004. Energy density and portion size: their independent and combined effects on energy intake. Physiology & Behavior 82, 131-138.

LAKKAKULA, A., GEAGHAN, J., ZANOVEC, M., PIERCE, S., AND TUURI, G. 2010. Repeated taste exposure increases liking for vegetables by low-income elementary school children. Appetite 55, 226-231.

MACCALLUM, R. and WIDAMAN, K. 1999. Sample size in factor analysis. Psychological Methods 4, 84-99.

MENNELLA, J., JAGNOW, C., and BEAUCHAMP, G. 2001. Prenatal and postnatal flavor learning by human infants. Pediatrics 107, 1-6.

MUST, A., and STRAUSS, R. 1999. Risks and consequences of childhood and adolescent obesity. International Journal of Obesity 23, suppl 2, S2-S11.

OGDEN, C., CARROLL, M., KIT, B., and FLEGAL, K. 2014. Prevalence of childhood and adult obesity in the United States, 2011-2012. Journal of the American Medical Association 311, 806-814.

OHTOMO, S. 2013. Effects of habit on intentional and reactive motivations for unhealthy eating. Appetite 68, 69-75.

RUXTON, G. 2006. The unequal variance t-test is an underused alternative to student t-test and the Mann-Whitney U Test. Behavioral Ecology 17, 668-690.

VELAZQUEZ, C., PASCH, K., RANJIT, N., MIRCHANDANI, G., and HOELSCHER, D. 2011. Are Adolescents' Perceptions of Dietary Practices Associated with Their Dietary Behaviors? Journal of the American Dietetic *Association* 111, 1735-1740.

VELICER, W. and FARA, J. 1998. Effects of variable and subject sampling on factor pattern recovery. Psychological Methods 3, 231-251.

CHAPTER FOUR:
SUMMARY

This study developed a food preference survey to estimate adolescents' willingness to consume energy-dense foods and sugar-sweetened beverages. High-fat and high-sugar food and beverage items included in the survey were expected to cluster together into one or more factors suggesting that adolescents who are willing to consume high-energy dense foods may also be willing to consume sugar-sweetened beverages. The final factor analysis with two factors explained only 37.7% of the variance and indicated that the survey required further development and testing.

After a survey has been developed with sufficient construct validity the convergent validity should be tested. Adolescents' willingness to eat certain food and beverage items could be compared to dietary intake measured from food frequency questionnaires or 24-hour recalls. The willingness-to-eat scores could be compared to lists of foods included in these evaluations. It could also be used to compare diet intake from data collected from newer methods of evaluation such as Remote Food Photography (Martin et al 2009). This would be useful for evaluating survey responses of what adolescents claim to be willing to eat versus what they are actually consuming.

To move forward with the development of this survey instrument, additional focus group interviews are needed to establish more food and beverage items preferred by adolescents. Adding food and beverage items will also increase the number of completed surveys needed for analysis. Once a larger percentage of the variance is explained, this willingness-to-eat survey will be a good indicator of food preferences. If this survey is able to increase adolescent's awareness of their unhealthy food practices, efforts to instill healthy lifestyle changes can begin. Once finalized, this survey can serve

as a useful instrument for evaluating if willingness to consume specific foods and beverages is impacted by nutrition education programs.

Reference

MARTIN, C., HAN, H., COULON, S., ALLEN, H., CHAMPAGNE, C., and ANTON, S. 2009. A novel method to remotely measure food intake of free-living individuals in real time: the remote food photography method. British Journal of Nutrition 101(3), 446-456.

APPENDIX A:
INSTITUTIONAL REVIEW BOARD APPROVAL AND REVIEW

LSU AgCenter Correspondence

February 28, 2012

To: Dr. Georgianna Tuuri

From: Michael Keenan, Chair LSU AgCenter IRB Michael Keenan

Re: Protocol H12-1

Your protocol "Modifying food choices and lifestyles to mitigate obesity in Louisiana: Learning youth and adult food preferences" was approved by the LSU AgCenter IRB on February 27, 2012. The approval will expire one year from that date on February 27, 2013. Approximately 30 days before that a protocol evaluation form will be sent to you for resubmission if the protocol will continue past that date. Also, I will provide you with stamped copies of your consent and assent forms for use in your study.

Protocol Review Form
Full Review

IRB# H12-1 **PI:** Tuuri **Unit:** HUEC

Title: Modifying food choices and lifestyles to mitigate obesity in Louisiana: Learning youth and adult food preferences

IRB PROTOCOL REVIEW CRITERIA:

-----RISK ASSESSMENT (Circle One): (Minimal*) Uncertain Greater than Minimal

*Minimal Risk: "probability & magnitude of harm or discomfort anticipated are not greater in and of themselves than those encountered in daily life or during the performance of routine physical or psychological testing"

1. Are the risks reasonable in relation to the benefits?

Risks and benefits adequately defined?
Yes. Focus groups ask questions about food preferences and cell phone cameras take pictures of foods consumed

2. Does the protocol adequately minimize risks?
Risk is minimal. Parents and youths told not to report alcohol consumption

3. Is the selection of subjects equitable?
Yes. Using 4-H as source of children using 4-H parents for adults.

4. Informed consent/assent document(s) adequate?

Language appropriate to study population?
Consent and assent forms very clear

5. Privacy and confidentiality measures and data security adequate?
Yes

6. Are there adequate provisions for the continual monitoring of the data, and safety of the participants? Yes

7. Other comments/concerns Approved under expedited criterion number 7 as sampling without intervention. Children can be part of this as expedited

Recommendation: Approve ✓ Do not approve

Date 2-27-2012 **Signature** Michael Keenon

LSU AgCenter Institutional Review Board (IRB)
Dr. Michael J. Keenan, Chair
School of Human Ecology
209 Knapp Hall
225-578-1708
mkeenan@agctr.lsu.edu

Application for Approval of Projects Which Use Human Subjects (This application is used for projects/studies that cannot be reviewed through the exemption process.)

- Applicant, please fill out the application in its entirety and include the original and one copy of the completed application as well as parts A-E, listed below. Please submit the completed application to Dr. Michael J. Keenan at the address listed above for review by the LSU AgCenter IRB. Expedited reviews are conducted by the Chair. The Committee meets when full reviews are required or to conduct procedural business.

- A Complete Application Includes All of the Following:

  (A) The original and one copy of the form, one copy of part B and two copies of parts C through E.
  (B) A complete copy of any grant proposal relevant to the project.
  (C) Copies of all instruments to be used.
  Include any recruitment materials including advertisements intended to be seen or heard by potential subjects.
  (D) The consent form that will be used. A copy of the Waiver of Signed Informed Consent is attached and must be completed only if there is intention to use an unsigned consent form. The **script to be used as the unsigned consent script MUST be included** with the waiver of signed informed consent.
  (E) Beginning January 1, 2009: Certificate of Completion of Human Subjects Protection Training for all personnel involved in the project, including students who are involved with testing or handling of data, unless already on file with the LSU AgCenter IRB. Training link:
  http://grants.nih.gov/grants/policy/hs/training.htm

1) **Principal Investigator*:** Georgianna Tuuri, PhD., RD, LDN
   Rank: Associate Professor
   *PI must be an LSU AgCenter, LSU or Pennington faculty member
   Dept: Human Ecology **Ph:** 225-578-1722 **E-mail:** GTuuri@agcenter.lsu.edu
2) **All Co-Investigators:** please include department, rank, phone, and e-mail for each
   Amber B. McGuerty, RD, LDN
   Human Ecology Graduate Student
   Phone: 225-978-0690
   Email: ad_bourgeois@yahoo.com

3) **Project Title:** Modifying Food Choices and Lifestyles to Mitigate Obesity in Louisiana: Learning Youth and Adult Food Preferences

4) **Proposed Start Date:** March 1, 2012 **5) Proposed Duration Months** 12 months
6) **Number of Subjects Requested** 200 youth, 100 adults
7) **7) Funding Sought** _____ **From:** Hatch LAB#94127

LSU AgCenter IRB# H12-1

ASSURANCE OF PRINCIPAL INVESTIGATOR named above

I accept personal responsibility for the conduct (including ensuring compliance of co-investigators/co-workers) in accordance with the documents submitted herewith and the following guidelines for human subject protection: LSU AgCenter's Assurance (FWA00009344) with OHRP (available at https://www.lsuagcenter.net/laes/projects/), the Belmont Report and 45 CFR 46 (available at http://www.lsu.edu/irb). I also understand that copies of **all consent forms must be maintained at the LSU AgCenter for three years after completion of the project. If I leave the LSU AgCenter before that time, the consent forms should be preserved in the Departmental Office.**

Signature of PI Georgianne Tucci Date 2/17/12

ASSURANCE OF STUDENT/PROJECT COORDINATOR named above. If multiple Co-Investigators, please create a "signature page", for all Co-Investigators to sign. Attach the "signature page" to this application.

I agree to adhere to the terms of this document and am familiar with the documents referenced above.

Signature of Co-PI Amber B McGlothlin Date 2/17/12

Part 1: A. Is a HIPAA Agreement Necessary?

Are you obtaining any health information <u>from a health care provider</u> that contains any of the identifiers listed below?

A. Names

B. Address: street address, city, county, precinct, ZIP code, and their equivalent geocodes. <u>Exception for ZIP codes:</u> the initial three digits of the ZIP code may be used, if according to current publicly available data from the Bureau of the Census: (1) The geographic unit formed by combining all ZIP codes with the same three initial digits contains more than 20,000 people; and (2) the initial three digits of a ZIP code for all such geographic units containing 20,000 or fewer people is changed to '000.' (Note: The 17 currently restricted 3-digit ZIP codes to be replaced with '000' include: 036, 059, 063, 102, 203, 556, 692, 790, 821, 823, 830, 831, 878, 879, 884, 890, and 893.)

C. Dates related to individuals
   - **a.** Birth date
   - **b.** Admission date
   - **c.** Discharge date
   - **d.** Date of death
   - **e.** And all ages over 89 and all elements of dates (including year) indicative of such age. Such ages and elements may be aggregated into a single category of age 90 or older

D. Telephone numbers;

E. Fax numbers;

F. Electronic mail addresses;

G. Social security numbers;

H. Medical record numbers (including prescription numbers and clinical trial numbers);

I. Health plan beneficiary numbers;
J. Account numbers;
K. Certificate/license numbers;
L. Vehicle identifiers and serial numbers including license plate numbers;
M. Device identifiers and serial numbers;
N. Web Universal Resource Locators (URLs);
O. Internet Protocol (IP) address numbers:
P. Biometric identifiers, including finger and voice prints;
Q. Full face photographic images and any comparable images;
R. Any other unique identifying number, characteristic, or code; except a code used for re-identification purposes and;
S. The facility does not have actual knowledge that the information could be used alone or in combination with other information to identify an individual who is the subject of the information

___**YES** Your study falls under HIPAA (Health Information Privacy and Accountability Act) and you must obtain either a limited data set use agreement or a HIPPA authorization agreement from the health care provider. This agreement must be submitted with your IRB protocol.

_X_**NO** You do not need a HIPPA agreement.

B. Are pregnant women specifically excluded from participation on the consent form?

_X_**YES** Skip to part C.

____**NO** You need to document the following:

___1. Is the purpose of the activity to meet the health needs of the mother and
___a. Fetus will be placed at risk only to minimum to meet mothers' needs.
___b. Fetus risk is minimal.

___2. Have mother and father given informed consent including potential effects on the fetus?

___3. Father's consent can be omitted when:
___ Purpose of activity is to meet health needs of mother
___ His identity cannot be ascertained
___ He is not reasonably available
___ Pregnancy is from rape

C. Are any of your participants incarcerated?

___**YES** You must document the following information:
___1. Is the study minimal risk? (it must be)

___2. Research fits one of the allowed categories below:
___ Causes or effects of incarceration
___ Study of prisons or prisoners
___ Conditions affecting prisoners as a class
___ Practices that may improve health or well-being of subjects

___3. Are the risks commensurate with risks accepted by non-prisoners?
___ Selection of subjects is fair – controls random
___ Language is understandable
___ Study does not affect parole
___ If, necessary, follow up care will be provided

_X_**NO**

D. Are children involved?

_X_**YES** You need both a parental consent form and a child assent form.
___ If the study has greater than minimal risk and no direct benefits, then you must show that the risk is only a minor increase above minimal, and it involves experiences that are commensurate with ordinary medical, psychological, social or educational situations.

___**NO**

Part 2: Project Abstract – Provide a brief abstract of the project.

_X_ I have attached a project abstract to this application.

Part 3: Research Protocol

A: Describe study procedures

Describe study procedures with emphasis on those procedures affecting subjects and safety measures. Also provide instruments such as surveys and scripts for telephone surveys and focus groups.

_X_ I have attached a description of my study procedures to this application.

B: Answer each of the following questions.

1. Specify sites of data collection.
Focus group interviews will be conducted at 4-H meeting sites with the club supervisor present. For the remote food photography portion of the study, the children will collect the data at home and at school using a provided cellular phone to take pictures of meals.

2. If surgical or invasive procedures are used, give name, address, and telephone number of supervising physician and the qualifications of the person(s) performing the procedures.
N/A

3. Provide the names, dosage, and actions of any drugs or other materials administered to the subjects and the qualifications of the person(s) administering the drugs.
N/A

4. Detail all the physical, psychological, and social risks to which the subjects may be exposed.
Social risks may involve a child feeling uncomfortable having their weight taken in the presence of other student. There are no known physical or psychological risks to discussing food and beverage intake and taking pictures of foods consumed.

5. What steps will be taken to minimize risks to subjects?
A child's height and weight will be taken in a private place under the supervision of the school nurse. All data collected will be handled only by the researchers and kept in a secure location. Results of the study may be published using group means only and names or identifying information will not be included in the publication.

6. Describe the recruitment pool (community, institution, group) and the criteria used to select and exclude subjects.
A convenience sample of children 9-19 will be recruited from 4-H clubs to participate in the focus group interviews. A convenience sample of children attending public and private schools will be recruited to participate in remote food photography. A convenience sample of adult caregivers of 4-H club members will be recruited to participate in focus group interviews.

7. List any vulnerable population whose members are included in this project (e.g. children under the age of 18; mentally impaired persons; pregnant women; prisoners; the aged).
Participants will include children 9-19 years of age.

8. Describe the process through which informed consent will be obtained (informed consent usually requires an oral explanation, discussion, and opportunity for questions before seeking consent form signature).
Informed consent will be obtained by orally explaining the study and requirements of participating to the children and caregivers of the participating children as well as to the adult participants. They will be given the opportunity to ask any questions and they will also be given the researchers contact information in case they have questions at a later date.

9. (A) Is this study anonymous or confidential? (Anonymous means the identity of the subjects is never linked to the data, directly, or indirectly through a code system.)
(B) If a confidential study, detail how the privacy of subjects and security of their data will be protected.
This study will be a confidential study. The participants will be assigned a personal code number for their records. Participant information will be kept private and secure by the researchers.

Part 4: Information on Consent Forms (including Assent Form and Parental Permission Form if minors are involved)

- The consent form must be written in non-technical language which can be understood by the subjects. It should be free of any exculpatory language through which the subject is made to waive, or appears to be made to waive any legal rights, including any release of the investigator(s), sponsor, institution or its agents from liability for negligence. (Note: the consent form is not a contract)

- For example consent forms, please refer to the LSU campus IRB website, http://www.lsu.edu/irb/researchers.shtml

- The LSU AgCenter IRB prefers using signed informed consent. However, if that is impractical, an application to waive signed consent can be requested below. When this waiver is requested, the **LSU AgCenter IRB must be provided with the consent script** that will present the information about consent to human subjects regarding the study/research. All consent forms or scripts must include a statement that the study was approved by the LSU AgCenter IRB and provide LSU AgCenter IRB contact information to participants: Dr. David Morrison at 225-578-4182. **Note: Parental consent usually cannot be waived for studies with children as subjects.**

I am requesting waiver of SIGNED Informed Consent because:

___ **(a)** Having a participant sign the consent form would create the **principal risk** of participating in the study

or that

___ (b) The research presents **no more than minimal risk** of harm to subjects and involves no procedures for which having signed consent is normally required outside of the research environment.

Now that your application is complete, please send two copies of it to the LSU AgCenter IRB for review, at the address listed below.

LSU AgCenter Research & Extension

LSU AgCenter Institutional Review Board
Dr. Michael J. Keenan, Chair
209 Knapp Hall
Baton Rouge, LA 70803
Ph: 225-578-1708
Fax: 225-578-4443
E-mail: mkeenan@agctr.lsu.edu

APPENDIX B:
PARENT/GUARDIAN CONSENT FORM FOR FOCUS GROUP INTERVIEWS

APPROVED BY
LSU AG CENTER
IRB AS #12-1
ON 2-27-2012

IRB# #12-1

CONSENT TO PARTICIPATE IN A RESEARCH STUDY FOR A MINOR
Informed Consent-Focus Group Interview
Parent Consent Form

Dear Parent or Caregiver,

Will you let your child help us?
We would like to have focus group interviews with 6-8 youth to ask questions about their food preferences. If you agree to let your child help us we will ask him/her questions about: what types of foods they prefer to eat and why, examples of sweet and fatty foods, their views on food advertisements and its affect on what foods they choose to eat, and their views on eating away from the home.

The 4-H sponsor in your area has agreed to help us, but we need your help too. You can read more about our project on the back of the page.

Georgianna Tuuri, PhD, LDN, RD
Associate Professor of Nutrition
School of Human Ecology
Phone: 225-578-1722

Amber B. McGuerty, RD, LDN
Graduate Student
School of Human Ecology
Phone: 225-578-1722

The focus group interview has been explained to me and all of my questions have been answered. I may direct additional questions regarding study specifics to the investigators. If I have questions about subjects' rights or other concerns, I can contact Dr. Phil H. Elzer, Associate Vice Chancellor & Associate Director, LSU AgCenter, (225) 578-4182. I will allow my child to participate in the focus group interview described on the back of this page and acknowledge the investigators' obligation to provide me with a signed copy of this consent form.

Your Signature: _____ Date: _____

Information about your child:

Name: _____ (please print)

Gender: _____ Grade: _____

Date of Birth: _____ Age: _____

Race/Ethnicity: _____

Please give us your address and telephone number in case we need to contact you:

Address: _____ Phone Number: _____

_____

IRB#_____

Description of the Study

Project Title: "Learning Youth and Adult Food Preferences"

Investigators: The following investigators are available for questions, M-F 8:00 am-4:30 p.m.

Georgianna Tuuri, PhD, LDN, RD
Associate Professor of Nutrition
School of Human Ecology
(225) 578-1722

Amber B. McGuerty, RD, LDN
Graduate Student
School of Human Ecology
(225) 978-0690

Purpose of the Study: To conduct focus group interviews with youth to better understand food and non-alcoholic beverage preference and consumption.

Inclusion Criteria: Children 9-19 years of age.

Exclusion Criteria: Children less than 9 years of age.

Description of the Study: The focus group interviews will be with 6-8 adolescents and will last 45-60 minutes. Before participating, the parent/caregiver will be asked to complete a consent form for the participating child and the child will be asked to complete an assent form. After the required forms are completed the focus group interview will take place. Questions regarding food and non-alcoholic beverage preference and intake will be asked. Interviews will be recorded for the researchers' purpose. Participants will be asked to not report any alcoholic beverage intake or the researchers will share the information with the proper authorities. The researchers will ask questions regarding: preference for certain types of foods, fast food consumption, and awareness of food advertisements.

Benefit: You will help researchers learn more about youth food preferences and intake of certain types of food and awareness of food advertisements.

Risks: There are no known risks involved.

Right to Refuse: Participation is voluntary. A youth participant will become a part of a focus group interview only if both the youth and the parent/caregiver agree to the youth's participation. The child may be withdrawn at the request of the parent/caregiver or may withdraw himself from the focus group interview at any time.

Privacy: Results of the focus group interviews may be published, but no names or identifying information will be included for publication. A participant's identity will remain confidential unless disclosure is required by law.

Financial Information: For your child's participation in a focus group interview, the 4-H Foundation in your parish will be compensated $20 per participant.

APPENDIX C:
YOUTH ASSENT FORM FOR FOCUS GROUP INTERVIEWS

APPROVED BY
LSU AG CENTER
IRB AS 12-1
ON 2-27-2012

IRB# #12-1

ASSENT TO BE IN A STUDY

Informed Consent – Focus Group Interview

Youth Assent Form

Name of Principal Investigator: Georgianna Tuuri, PhD, RD, LDN (225-578-1722)
Name of Co-Investigator: Amber McGuerty, RD, LDN (225-978-0690)

Name of the Study: "Learning Youth and Adult Food Preferences"

Why are they doing this study?

The researchers want to learn more about the types of foods kids my age like to eat and drink.

What will happen to me?

If I want to be in the study the following things will happen:

- I will answer questions about my preference and intake of certain foods, fast food consumption, and awareness of food advertisements.
- I will be assigned a personal code number for my records. My name will not be used when reporting the study findings.
- I understand that if I report any alcoholic beverage intake the researchers will share the information with proper authorities.

Will the study hurt?

Talking about the food and drinks I like to consume will not hurt me.

What if I have questions?

I can ask questions at any time.

Do I have to be in the study?

I don't have to be in this study if I don't want to and I can quit at any time.

I, _____, agree to participate in the focus group interview guided by researchers from Louisiana State University.

_____	_____	_____
Adolescent Signature	Age	Date
_____		_____
Witness*		Date

*Witness must be present for the assent process, not just for the signature by the minor.

APPENDIX D:
FOCUS GROUP INTERVIEW QUESTIONS

Focus Group Interview Questions

1. What types of food do you prefer to eat? Why?
2. So tell me about sweet foods. Can you give me an example of sweet foods that you like?
3. What can you tell me about fatty foods? Can you give me an example of fatty foods that you like?
4. What do you think about food advertisements? Do food advertisements affect what you eat? Peers, How? Family, How? School, How?
5. Where do you learn about which foods to eat? Does it change what you eat? How?
6. What do you typically drink with a meal at breakfast, lunch, and dinner?
7. When you think about eating away from the home, what comes to mind?
8. What do you like best about those foods? Why?
9. Which places come to mind when you think of fast food? Why?
10. Why do you eat fast food? Are there any other reasons why you choose fast food?

*Always direct conversation to taste preferences.

APPENDIX E:
PARENT/GUARDIAN CONSENT FORM FOR FOOD PREFERENCE SURVEY

IRB# H12-1

CONSENT TO PARTICIPATE IN A RESEARCH STUDY FOR A MINOR
Informed Consent-Food Preference Survey
Parent Consent Form

Dear Parent or Caregiver,

Will you let your child help us?
We would like to find out what foods and beverages kids like to eat and drink. If you agree to let your child help us we will ask them to complete a food preference survey by filling in the appropriate circles for their responses. Louisiana State University will provide the survey and explain to your child what to do. The researcher will ask your child's age and measure their height and weight. Your child will be assigned a personal code number for their records. Their name will not be used when reporting the study findings.

Georgianna Tuuri, PhD, LDN, RD
Associate Professor of Nutrition
School of Human Ecology
Phone: 225-578-1722

Amber B. McGuerty, RD, LDN
Graduate Student
School of Human Ecology
Phone: 225-978-0690

The food preference study has been explained to me and all of my questions have been answered. I may direct additional questions regarding study specifics to the investigators. If I have questions about subjects' rights or other concerns, I can contact Dr. Phil H. Elzer, Associate Vice Chancellor & Associate Director, LSU AgCenter, (225) 578-4182. I will allow my child to participate in the food preference study described on the back of this page and acknowledge the investigators' obligation to provide me with a signed copy of this consent form.

Your Signature: _____ Date: _____

Information about your child:

Name: _____ (please print)

Gender: _____ Grade: _____

Date of Birth: _____ Age: _____

Race/Ethnicity: _____

Please give us your address and telephone number in case we need to contact you:

Address: _____ Phone Number: _____

_____

IRB# H12-1

Description of the Study

Project Title: "Learning Youth and Adult Food Preferences"

Investigators: The following investigators are available for questions, M-F 8:00 am-4:30 p.m.

Georgianna Tuuri, PhD, LDN, RD
Associate Professor of Nutrition
School of Human Ecology
(225) 578-1722

Amber B. McGuerty, RD, LDN
Graduate Student
School of Human Ecology
(225) 978-0690

Purpose of the Study: To learn what types of foods and beverages children like to eat and drink.

Inclusion Criteria: Children 12-17 years of age.

Exclusion Criteria: Children less than 12 years of age.

Description of the Study: Children enrolled in the study will complete a food preference survey by filling in the appropriate circles for their responses. The information will be analyzed by the researchers listed above. Before participating, the parent/caregiver will be asked to complete a consent form for the participating child and the child will be asked to complete an assent form. After the required forms are completed survey instructions will be explained to the child by Louisiana State University researchers.

Benefit: You will help researchers learn more about youth food preferences and intake of certain foods.

Risks: There are no known risks involved.

Right to Refuse: Participation is voluntary. A youth participant will participate in the remote food photography study only if both the youth and the parent/caregiver agree to the youth's participation. The child may be withdrawn at the request of the parent/caregiver or may withdraw himself from the study at any time.

Privacy: Results of the study may be published, but no names or identifying information will be included for publication. A participant's identity will remain confidential unless disclosure is required by law.

Financial Information: There is no cost to participate in this study.

APPENDIX F:
YOUTH ASSENT FORM FOR FOOD PREFERENCE SURVEY

IRB# H 12-1

ASSENT TO BE IN A STUDY
Informed Consent – Food Preference Survey
Youth Assent Form

Name of Principal Investigator: Georgianna Tuuri, PhD, RD, LDN (225-578-1722)
Name of Co-Investigator: Amber McGuerty, RD, LDN (225-978-0690)

Name of the Study: "Learning Youth and Adult Food Preferences"

Why are they doing this study?

The researchers want to learn more about the types of foods and beverages kids my age like to eat and drink.

What will happen to me?

If I want to be in the study the following things will happen:

- I will simply complete a food preference survey by filling in the appropriate circle for my responses.
- I will tell the researchers my age and will have my weight and height measured.
- I will be assigned a personal code number for my records. My name will not be used when reporting the study findings.

Will the study hurt?

Completing the food preference survey will not hurt me.

What if I have questions?

I can ask questions at any time.

Do I have to be in the study?

I don't have to be in this study if I don't want to and I can quit at any time.

I, _____, agree to participate in completing the food preference survey provided by the researchers from Louisiana State University.

_____	_____	_____
Adolescent Signature	Age	Date
_____		_____
Witness*		Date

*Witness must be present for the assent process, not just for the signature by the minor.

APPENDIX G:
FINALIZED FOOD PREFERENCE SURVEY

Food Preference Survey

Subject# _____

Please completely fill in the appropriate circle
for your response, using a **#2 pencil** or **black ink pen**. ●

How willing are you to eat or drink the following foods or beverages? :

	Extremely unwilling	Unwilling	Slightly unwilling	Neither willing nor unwilling	Slightly willing	Willing	Extremely willing
Raw or Steamed Broccoli	○	○	○	○	○	○	○
French Fries	○	○	○	○	○	○	○
Kool-Aid (made with sugar)	○	○	○	○	○	○	○
Nuts or Peanut Butter	○	○	○	○	○	○	○
Water	○	○	○	○	○	○	○
Low-fat or fat-free yogurt	○	○	○	○	○	○	○
Unsweetened or artificially sweetened tea	○	○	○	○	○	○	○
Carrot sticks (with no more than 2 Tbsp low-fat dressing)	○	○	○	○	○	○	○

Grapes	○	○	○	○	○	○	○
Regular Cola Drinks	○	○	○	○	○	○	○
Glazed Donut	○	○	○	○	○	○	○
Low-fat unflavored milk	○	○	○	○	○	○	○
Cookies	○	○	○	○	○	○	○
Diet Cola Drinks	○	○	○	○	○	○	○
Lemonade	○	○	○	○	○	○	○
Coffee with 1 tsp/ 1 sugar packet or less	○	○	○	○	○	○	○
Pizza with meat topping	○	○	○	○	○	○	○
Low-fat Chocolate Milk	○	○	○	○	○	○	○
Banana	○	○	○	○	○	○	○
Tea sweetened with sugar	○	○	○	○	○	○	○

Demographics:

Type of School	Public School		Non-Public School	
	◯		◯	
Grade Level	9th Grade	10th Grade	11th Grade	12th Grade
	◯	◯	◯	◯
Race	African American or Black	Caucasian or White	Hispanic or Latino	Other
	◯	◯	◯	◯
Gender	Male		Female	
	◯		◯	

VITA

Amber McGuerty was born in Lutcher, Louisiana. She received her Bachelor of Science Degree in Dietetics in May of 2010 from Nicholls State University, Thibodaux, Louisiana. Amber began a master's program in the Spring of 2012 at Louisiana State University in the School of Human Ecology with a concentration in human nutrition. She is a registered dietitian and a member of the American Society for Nutrition and the Academy of Nutrition and Dietetics.