# The Role of Sociodemographic, Behavioral, and Environmental Factors on Dietary Practices of Students Attending Alternative High Schools

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# Abstract

The aim of this dissertation was to describe selected dietary practices and to examine how they associate with demographic and school food environmental factors and substance use among a sample of alternative high school students. The dietary practices examined in this research are consumption of regular soda, sports drinks, other sugar-sweetened beverages, fruits and vegetables, and frequency of fast food restaurant use. Bronfenbrenner's ecological model guided the development of this research. Data were drawn from the Team COOL (Controlling Overweight and Obesity for Life) pilot study, a multi-component diet and physical activity intervention trial to promote healthy weight loss or prevent excess weight gain in six alternative public high schools (four urban and two suburban) in the St. Paul- Minneapolis metropolitan area**.** A convenience sample of 145 students (gender: 52% male; age: 63% <18 years; race/ethnicity: 39% white, 32% black, and 29% other/multiracial) completed baseline surveys in the fall of 2006. The current study used a cross-sectional design, and mixed model analysis of variance was utilized to examine associations between students' selected dietary practices and the explanatory variables in separate analyses for each outcome variable.

This research consisted of three studies. The first study examined prevalence of selected dietary practices and their associations with gender, race/ethnicity and socioeconomic status among alternative high school students**.** A major finding that emerged from this study was that black students reported higher consumption of sugar-sweetened beverages, high fat foods and fast food restaurant use than all other students. The second study examined dietary practices and factors regarding students' perceptions of the school food environment. Two scales were developed to assess

eating and drinking opportunities during the school day and students' perceptions of the healthfulness of the school food. The findings of this study indicated that more eating and drinking opportunities during the school day were associated with higher student consumption of all sugar-sweetened beverages, high fat foods, and frequency of fast food restaurant use. The third study described associations between dietary practices and the prevalence of cigarette, alcohol, and marijuana use individually, as well as with multi-substance use among alternative high schools students. The results indicated that this group of at-risk youth frequently used substances, and that their use of cigarette, alcohol, and marijuana as well as multi-substance use were each associated with higher consumption of high fat foods. In addition, cigarette smoking was associated with higher consumption of regular soda, high fat foods, and higher frequency of fast food restaurant use.

Overall, the data show that this sample of alternative high school students reported many unhealthful dietary practices and frequently used cigarettes, alcohol and marijuana. Unhealthful dietary practices are strongly correlated with an increased incidence of chronic disease and overweight that are prevalent among minorities. Correlations between substance use and unhealthful dietary practices confirm previous findings of the covariation of health compromising behaviors that are prevalent among at-risk youth. Although the diets of most adolescents can be improved, our findings emphasize that minority and low income youth, in particular, will greatly benefit from nutrition education and comprehensive health programming that focuses in fostering a healthful school food environment and reduces health risk behaviors among students attending alternative high schools.

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# Introduction

Despite scientific evidence that diet is a major factor in the development of chronic disease and mortality (Willett, 1994) and there are organized efforts to provide guidelines for a healthier lifestyle, the diets of most adolescents are lower than recommended in fruits and vegetables and higher in dietary fat, sugar-sweetened beverages and fast food intake (Cook, Friday, 2004; Troiano, Briefel et al., 2000; Nielsen, Popkin, 2004). Interestingly, unhealthy dietary habits parallel the increase in overweight and the obesity epidemic and its consequence of Type 2 diabetes among children and adolescents (NIH, 2007). While scientific findings suggest that multiple factors contribute to overweight and obesity, excess energy intake coupled with reduced energy consumption (i.e. the energy balance equation) is often a cause for weight gain (Butte and Caballero, 2005)

To date, observational studies have demonstrated that demographic, behavioral, and environmental factors are linked to children's dietary practices (Neumark-Sztainer, Story, et al., 2002; Xie, Gilliland, et al., 2003; Story, Neumark-Sztainer, et al., 2002; Kubik, Lytle, et al., 2003(a)). The family food environment has long been shown to play an important role in dietary intakes of children (Boutelle, Fulkerson, et al. 2007; Hanson, Neumark-Sztainer, et. al., 2005). However, changes in social structure, increased availability of energy dense foods, expanded food promotional efforts by the food and beverage industry, and the availability of multiple food and beverage sources in school, have expanded the number of factors that contribute to dietary practices of youth (Story, Kaphingst, et al. 2008; Chester, Montgomery, et al., 2007).

There is increased awareness that the school food environment, with the availability of foods of low nutritive value, and policies that increase the eating and drinking opportunities for students outside the school meal programs, does not foster healthful dietary practices (Fox, Gordon, et al., 2009; Briefel, Crepinsek, et al, 2009; O'Toole T, Anderson, et al., 2007). The school food environment has also been of concern to parents and school staff (French, Story, et al., 2002; Kubik, Lytle, et al., 2002; Kubik, Lytle, et al., 2005), especially in light of the overweight and obesity epidemic among youth (Ogden, Carroll, et al., 2008). Vending machines and a la carte, competitive food programs are abundant in schools and have become the main source of food especially among some high school students (Fox, Gordon, et al., 2009). Studies conducted in traditional middle and high schools have linked food availability in school to students' dietary practices (Cullen, Zakeri, et al., 2004; Kubik, Lytle, et al., 2003(a)). Few studies that examined school policies have found a significant association between these policies and students' eating and drinking practices during the school day (Neumark-Sztainer, French, et al., 2005). Increasingly, the role of the school food environment on the dietary intake of students has been gaining national recognition and national efforts have focused on implementing school wellness policies. Furthermore, national surveillance studies have provided a comprehensive picture of the school food environment including student eating practices, school food availability and school food related policies and practices (Story, 2009; O'Toole T, Anderson, et al., 2007).

The use of substances such as cigarettes, alcohol, and marijuana are prevalent behaviors among adolescents (CDC-YRBS 2008). Studies have found significant correlations between socioenvironmental factors and substance use; living in environments with high inequalities increased the likelihood of using alcohol and marijuana among both adolescents and adults (Galea, Ahern et al., 2007; Hill, Angel

2005), and living in neighborhoods with lower education attainment increased the likelihood of cigarette smoking (Scarinci, Robinson et al., 2001). Interestingly, a nationally representative study of adolescents found that as they transition to young adulthood, they are more likely to smoke, binge drink, and use marijuana (Harris, Gordon-Larsen, et al, 2006). Covariation of health risk behaviors, including correlation between use of different substances and between substance use and other risk and health-compromising behaviors has been observed among youth (Ellickson, Saner, et al., 1997; Bray, Zarkin, et al. 2000). Among a large sample of 7 – 12 grade students participating in the Minnesota Adolescent Health Survey, daily or weekly cigarette, alcohol, or marijuana use was strongly correlated with unhealthy eating behavior (Neumark-Sztainer, Story, et al., 1997). The same study also reported that students with high risk of school drop out had an odds ratio of 3.5 times of engaging in unhealthy eating behaviors (Neumark-Sztainer, Story, et al., 1997).

Many observational studies have focused on examining the prevalence of dietary practices and their associations with demographic, behavioral, and school environmental factors among adolescents attending traditional schools (Neumark-Sztainer, Story, et al., 1997; Neumark-Sztainer, Story, et al., 2002; Neumark-Sztainer, Wall, et al., 2003; Lytle, Varnell et al., 2003; Kubik, Lytle, et al., 2002, Fox, Gordon, et al., 2009; O'Toole, Anderson, et al., 2007). However not all youth are captured in these studies. Youth at risk of academic failure often attend alternative high schools and dietary practices of these students and the school food environment in these schools have rarely been included in studies to date. The majority of alternative high schools are located in urban districts, and enroll a high percentage of ethnically and socioeconomically diverse students (Kleiner B, Porch, et al., 2002). National surveillance studies assessing school food policies and school food availability have not included

alternative high schools and their students (Fox, Gordon, et al., 2009; O'Toole, Anderson, et al., 2007), despite the high enrollment of low income and minority youth who are vulnerable to obesity and related health outcomes (Kumanyika. 2008). Studies examining the prevalence of dietary practices of students attending alternative high schools are scarce (Grunbaum, Lowry, et al., 2001; MN Student Survey-ALC, 2007), and only two papers have assessed the school food environment of these schools (Kubik, Lytle et al., 2004; Kubik, Lytle et al., 2005).

There is strong scientific evidence that the school food environment plays an important role in the eating behaviors of students. Also, behaviors such as substance use are prevalent among adolescents and correlate with other risk behaviors. Findings to date indicate that youth who engage in risk behaviors tend to use substances more frequently that place them in danger of multiple health risk and compromising outcomes later in life. Given the limited information available on the eating habits, food environment at school, and substance use among alternative high school students, the goals of this dissertation are to:

1) Review the literature on adolescent development and socioenvironmental factors on youth dietary behaviors;
2) Provide an overview on alternative high schools and students in these schools. Review the literature on the prevalence and correlates of youth dietary practices, such as regular soda, sports drinks, other sugar-sweetened beverages, high fat foods, fruits and vegetables, and frequency of fast food restaurant use, especially as they relate to demographic, school food environmental, and behavioral factors. Also provide a literature review on the school food environment and substance use with emphasis on 'at-risk' youth;

3) Describe the prevalence of regular soda, sports drinks, other sugar-sweetened beverages, high fat foods, fruits and vegetables, and frequency of fast food restaurant use practices among a group of alternative high school students and associations between these dietary practices and demographic and school food environmental factors, and substance use;
4) Discuss significance of findings and implications for future research including implications for public heath practice and policies.

The current research utilizes a cross-sectional design of baseline data from the Team COOL (Controlling Overweight and Obesity for Life) pilot study, a diet and physical activity intervention in alternative high schools. The Principal Investigator of the Team COOL study is Dr. Marti Kubik. The study was supported by a grant from the National Institutes of Health (NIH).

The dissertation proposal is organized as follows:

- Chapter 1 includes a literature review on adolescent development and socioenvironmental factors as they are related to youth dietary practices. An in-depth review of the prevalence and correlates of sugar-sweetened beverage, high fat food, and fruit and vegetable intake, and frequency of fast food restaurant use among adolescents is provided. Also a description of alternative high schools and characteristics of students attending alternative high schools is presented. The impact of nutrition on major health outcomes, and tracking and clustering of dietary and heath compromising behaviors is also described.
- Chapter 2 describes the purpose of this research and the Ecological model that is used to guide the conceptual framework of this dissertation. Description of the Team COOL study, data collection methods, and measures used in this research are also included in this chapter.

- Chapter 3 (Manuscript 1) is an examination of selected dietary practices, such as consumption of regular soda, sports drinks, other sugar-sweetened beverages, fruits and vegetables, and fast food restaurant use, and their associations with demographic factors (gender, race/ethnicity, and socioeconomic status) among a sample of students attending alternative high schools.
- Chapter 4 (Manuscript 2) describes the school food environment including student reported eating and drinking opportunities during the school day and student perceptions of the healthfulness of the school food environment and associations with the same dietary practices among alternative high school students .
- Chapter 5 (Manuscript 3) describes substance use, including cigarette, alcohol and marijuana and multi-substance use among alternative high school students. Associations between individual substances and multi-substance use and student dietary practices are examined.
- Chapter 6 provides a review of the major findings of the three studies, as well as strengths and limitations of the research. This chapter also discusses implications for future research and implications for public health practice and policies.

# Chapter 1. Literature Review

This chapter begins with a broad description of the developmental changes that occur during adolescence and their effect on youth behavior, especially on eating and substance use. The section continues with a description of the influence of socioenvironmental factors on the development of adolescent behavior with a special focus on at-risk behaviors. A detailed background on the prevalence and correlates of selected dietary practices, such as consumption of sugar-sweetened beverages, high fat foods, fruits and vegetables, and fast food restaurant use is provided. As previous findings support the tracking of dietary and health risk behaviors into young adulthood, as well as covariation of health compromising behaviors, these concepts are described as well. A description of alternative high schools and students attending these schools is provided, since this research focuses on eating behaviors and their correlations with factors in the school food environment and substance use among a group of students attending alternative high schools.

## Adolescent Development and Dietary Behavior

The transition from childhood to adolescence is characterized by significant and rapid physical, cognitive, and psychosocial changes that work in concert to shape behavior. The occurrence of a ‘growth spurt’ defines the rapid physical changes that take place during adolescence (Rogol, Roemmich et al., 2002). Also, puberty, a dynamic period that starts in early adolescence involves great sexual differentiation and linear growth (Rogol, Roemmich et al., 2002). There are gender and racial differences in the onset and progression of physical changes. The onset of puberty occurs sooner in girls than in boys and the average age of menarche is slightly earlier in black than white girls

(Rogol, Roemmich et al., 2002). Also, black girls tend to have higher body mass index (BMI) than white girls during puberty (Rogol, Roemmich et al., 2002). Dietary intake contributes to either malnutrition or overweight and obesity, which are associated with late or early sexual maturation, respectively (Rogol, Roemmich et al., 2002).

An important cognitive change, and one that has implications in behavior change efforts, especially during late adolescence, is the emergence of more abstract thinking and the increased ability to comprehend future outcomes of a present behavior (Contento, 2007). With respect to the link between food and health, adolescents become more capable of understanding the longer-term health consequences of their current eating behavior, although the notion of long term health status is still a distant concept for them.

The rapid physical and pubertal changes that occur during adolescence are accompanied with psychosocial states like search for identity and autonomy, intimate relationships, and goal setting and achievement (Contento, 2007; Boeree, 1997). The development of sexual maturation during this period shifts the focus of adolescents to personal appearance. As they become more preoccupied with their body image (Contento, 2007), adolescents may change their eating patterns to achieve their perceived 'ideal' body. When the goal is to achieve a thinner body, dietary changes may include self induced energy restriction that often lead to overall growth retardation and disorders associated with nutrient deficiencies (Rogol, Clark et al., 2000). Adolescent quest for identity and autonomy often creates friction with adults in their lives (Culbertson, Newman et al., 2003) and moves the focus of significant relations from school or neighborhood to peer groups and other role models (Boeree, 1997). The change to increased self preoccupation and autonomy has made adolescents the target of marketers of food products using extensive media tactics in venues such as schools

and other community environments (Story, Neumark-Sztainer et al., 2002). Although parents still remain the primary role models for dietary behaviors, adolescents spend more time with peers who become their social companions for meals eaten away from home (Story, Neumark-Sztainer et al., 2002). The need for autonomy and peer approval are necessary phases in adolescent development, however in light of adolescent overweight and obesity (Ogden, Carroll et al., 2008) and environmental factors including increased availability of fast food venues and other high fat food sources (Nielsen, Siega-Riz, et al., 2002; Kant, Graubard et al., 2004, Popkin Duffey et al., 2005), the long-term health of adolescents is compromised. In addition, other health-compromising behaviors, like substance use are initiated during adolescence (Warren, Kann, et al., 1997) in an effort to find ones identity, despite the behavior's negative long-term health implications (Boeree, 1997).

Supporting adolescents in their quest for independence, autonomy and overall healthy development, yet providing them with the tools to insure long-term health requires the persistent and collective support from family, educators, community, and policymakers. During late adolescence, cognitive and psychosocial development is further solidified and adolescents become more comfortable with their acquired identity, values, and body image. With their improved abstract thinking, adolescents are more capable in making choices, understanding the concept of trade-offs (Contento, 2007), and becoming more media literate. They start looking into the future by setting career goals and making future plans. As older adolescents attain more independence and earn their own money, they make more independent decisions about their food choices and participate in food purchasing decisions for their families (Story, Neumark-Sztainer et al., 2002). Thus, late adolescence is an appropriate time to benefit from nutrition education and from a food environment that fosters healthful food choices. Although

older adolescents can better conceptualize long-term benefits compared to younger adolescents, emphasizing both proximal and long-term benefits of healthful eating can be effective, since the concept of future health status is less imminent during this time (Story & Resnick, 1986). Working within the framework of adolescents' desire for independence, relevant nutrition education must emphasize issues relating to time availability, taste, availability and cost of healthful foods, and benefits and barriers to healthful food choices (Contento, 2007).

**Socioenvironmental Characteristics and Adolescent Development**

Nature and nurture which define ones genetic predisposition and environmental factors have long been identified as equally essential domains in human development. Bronfenbrenner in his Bioecological model posits that measureable environmental factors, termed 'proximal processes' such as mother-infant interactions can enhance the genetic potential of an individual to achieve his developmental aptitude (Bronfenbrenner and Ceci, 1994). However, there is an underline context, socioeconomic status, by which the various environmental factors exert their influence on the development of an individual. Conventionally, socioeconomic status has been measured either individually or collectively by family income, parental education, parental occupation, and family structure (IOM, 2006). However, other measures of socioeconomic status, such as neighborhood deprivation have been associated with childhood cognitive and psychosocial development (Duncan, Brooks-Gunn, et al., 1994). According to Culbertson, there are challenges or threats throughout the developmental process that may affect the course of normal childhood psychosocial development (Culbertson, Newman, et al., 2003); one of these threats to development is living in poverty (Culbertson, Newman, et al., 2003). Studies have shown that persistent family poverty

and neighborhood income are two of the strongest predictors of young children's cognitive development (Duncan, Brooks-Gunn, et al., 1994). Duncan and et al., studied 900 low-birth weight premature children to examine the relative influence of family income, neighborhood income, and other family-related socioeconomic variables on 5-year developmental outcomes. The results indicated that family income, maternal education, father's presence, racial differences in income-to-needs ratio, home learning environment and other maternal characteristics, and neighborhood income accounted for the 10.5 IQ difference between black and white children, with a family income accounting for the highest (2.9 points) IQ difference (Duncan, Brooks-Gunn, et al., 1994). The results of the same study also showed that low neighborhood income was associated with externalizing behavior like, aggression, fighting, and acting out (Duncan, Brooks-Gunn, et al., 1994). Also, studies have shown that children who live under the poverty limit are 1.3 times as likely to have learning disabilities, as compared to more affluent children (Brooks-Gunn & Duncan, 1997). Furthermore, the long duration of family poverty has a greater effect on cognitive abilities than the short duration of poverty (Brooks-Gunn & Duncan, 1997).

Although family poverty is strongly linked to cognitive abilities of younger children, the effect of family poverty declines during adolescence (Brooks-Gunn & Duncan, et al., 1997). However, socioeconomic indicators like parental education and mother's work that are present in childhood are strong indicators of high-school completion, whereas persistent family poverty and being on welfare during middle adolescence (12-15 years) are negative determinants of high school completion (Haveman, Wolfe, et al., 1991). Furthermore, in a 20-year longitudinal study of black urban mother-child pairs, Baydar et al., found that compromised cognitive and behavioral abilities of preschool children, as well as family income during childhood and early adolescence were strong negative

predictors of document literacy (ability to use written documents) in young adulthood (Baydar, Brooks-Gunn, et al., 1993). The increased parental conflicts as well conflicts between parents and children that arise due to persistent economic hardship are proposed as possible pathways that explain the impact of family poverty on children's psychosocial development (Conger, Ge, et al., 1994; McLoyd, 1990).

Neighborhood characteristics have been associated with children's and adolescents' cognitive and psychosocial development and behavior (Brooks-Gunn & Duncan, 1997). The influence of neighborhood characteristics on children's development and behavior operate through various mechanisms. Family poverty may limit neighborhood choices that lead to selection of neighborhoods with limited learning and health enhancing resources, higher neighborhood disorganization, choice of neighbors and peer groups (Brooks-Gunn & Duncan, 1997; Hill & Angel, 2005; Galea, Ahern et al., 2007; Elgar, Roberts, et al., 2005). Using a nationally representative data, Lee et al, found that youth who lived in lower-SES neighborhoods including low income, high poverty levels, low education, low housing values, and high percent of blue-collar workers had poorer dietary behaviors than youth who lived in higher-SES neighborhoods, after controlling for individual-level SES and demographic factors (Lee & Cubin, 2002). One of the important impacts of neighborhood distress is an increased risk of school drop-out (Crowder & South, 2003). In a 25-year longitudinal study of 6762 adolescents between the ages of 14 to 19 years, the risk of dropping out was 20% higher among those who were in the $90^{th}$ percentile as compared to the average of the Neighborhood Disadvantage Index (NDI), a 6-item scale measuring neighborhood socioeconomic status, after adjusting for family resources and other confounders (Crowder & South, 2003). In the past twenty years, the impact of neighborhood distress on dropping out of school increased significantly among black youth; the risk of dropping

out was higher among male and among older than younger adolescents (Crowder & South, 2003).

The neighborhood environment has also been linked to personal and behavioral outcomes, such as overweight/obesity, increased substance use, and poor dietary practices (Kumanyika, 2008; Casagrande, Whitt-Glover, et al., 2009). Although direct link between components of the physical environment and development of overweight and obesity has not yet been established, there is evidence that the physical environment, including lack of physical space, limited resources, and concern for safety, limits physical activity and often contributes to overweight and obesity (Estrabrooks PA, Lee et al., 2003; Giles-Corti B, Donovan, et al., 2002; Casagrande, Whitt-Glover, et al., 2009); these limitations were more profound in lower socioeconomic neighborhoods (Estrabrooks PA, Lee et al., 2003). In addition, studies have shown higher concentration of fast food restaurants and less access to large supermarkets and other sources of reasonably priced fresh produce in lower income and ethnically diverse neighborhoods (Morland K, Wing, et al., 2002; French, Story, et al., 2001; Powell, Chaloupka, et al., 2007).

Both neighborhood and individual socioenvironmental factors are strongly associated with substance use for both adolescents and adults (Wilson, Syme et al., 2005; Galea, Ahern, et al., 2007; Resnick, Bearman, et al., 1997). A national study of 8165 adolescents found that being older, male, or having a caregiver with low educational attainment increased the odds of cigarette smoking measured by smoking at least one cigarette in the last month (Lee & Cubbin, 2002). Perceived neighborhood disorder and distress measured by factors such as lack of safety, drug dealings, high unemployment, assaults, gangs, teenage pregnancy, and lack of police supervision was strongly associated with heavy drinking which was mediated by anxiety and depression

among 2400 low income families (Hill & Angel, 2005). Also, neighborhood education inequality, measured by the education Gini coefficient, was associated with higher prevalence of alcohol consumption and marijuana use among adults (Galea, Ahern, et al., 2007). In another study, Wilson et al., examined student perceived neighborhood characteristics and substance use in 369 ethnically and socioeconomically diverse middle school adolescents (Wilson, Syme et al., 2005). Student perception of neighborhood disorder was positively associated with cigarette, alcohol, and marijuana use, and a higher sense of hope was inversely associated with use of the same substances (Wilson, Syme et al., 2005). In a longitudinal study of 657 adults that were followed since birth, Gilman et al, found that family poverty during childhood was associated with increased risk of cigarette smoking initiation during childhood and with other family SES indicators (parental occupation and maternal education) were associated with smoking progression and cessation (Gilman, Abrams et al., 2003). Among adolescents, socioenvironmental factors including low parental education, living with one parent, family violence, and negative life events were significantly associated with increased risk of cigarette smoking and alcohol consumption (Simantov, Schoen, et al., 2000).

The scientific evidence presented thus far lends support for the socio-environmental factors on the psychosocial and behavioral development of children and adolescents. It has been shown that adverse social environments, including lower family and neighborhood socioeconomic status are linked to high risk behaviors among adolescents. In addition, these environments often lack the protective factors, like cohesive families, parent modeling of health behavior, neighborhood resources, caring adult, and positive peer models to name a few, that are necessary to lessen the impact of risk on adolescent behavior (Jessor, Turbin, et al., 1998; Jessor, 1991). In a large

study of middle school adolescents assessing individual and social protective and risk factors of health enhancing behaviors that included a healthy diet and regular exercise, Turbin et al, concluded that social protective factors instead of social risk factors explained more of the variation in health enhancing behaviors (Turbin, Jessor, et al., 2006). Risk behaviors and health-compromising behaviors, such as poor dietary practices, substance use, delinquency, truancy, school dropout, driving after drinking, and unprotected sexual intercourse not only influence safety and chronic health, but also social and personal outcomes (Jessor, 1991). Life-compromising outcomes that are derived from the risk behaviors are school failure, chronic disease, teen pregnancy, and depression (Jessor, 1991).

Youth who experience the outcomes of engaging in risk behaviors are often labeled ‘at-risk.’ As Jessor states, the meaning of ‘at-risk’ varies depending on whether youth actively pursue the risk behaviors (substance use, unprotected sexual activity, or truancy) or contemplate on engaging a risk behavior or having partially initiated, like starting use of alcohol (Jessor, 1991). Those who actively pursue the risk behaviors are often older, experienced a teen pregnancy, or failed at school (Jessor, 1991). Alternative high school students are labeled ‘at-risk’ because many are already involved in risk behaviors leading to immediate negative health and social outcomes. These students are the focus of this research. A more detailed description of alternative high schools and the students attending these schools will be provided later in this chapter.

**Reasons to Examine Health Related Behaviors**

To date, scientific evidence has provided support for the link between health-related behaviors including poor dietary habits and substance use and adverse health outcomes. Furthermore, tracking of health related behaviors into adulthood and

covariation of behaviors are two reasons that support examination of health related behaviors and intervention efforts in childhood and adolescence. The following section of the literature review provides a brief overview of the role of nutrition on health outcomes, and tracking and covariation of health related behaviors especially dietary practices and substance use.

## The Role of Nutrition on Health Outcomes

Diet plays an important role in the development of chronic diseases and mortality. In the United States, one out of five deaths is attributed to poor nutrition and sedentary lifestyles (USDA, 2005). Many chronic diseases such as cardiovascular disease (CVD), diabetes, cancer, overweight and obesity are associated to poor nutrition (USDA, 2005) that mainly includes diets low in fruits and vegetables and high in fat, especially the saturated kind (Willett , 1994).

### *Overweight and Obesity*

The increase of overweight and obesity in the last two decades has reached epidemic proportions for both children and adults. Approximately 197 million Americans are either overweight or obese (AOA, 2007). Both overweight and obesity are more prevalent in populations with lower education levels (AOA, 2007). In 1999-2002 the prevalence of obesity ($95^{th}$ percentile- BMI $\geq$ 30) among adolescents (12-19 years) was 16.1%, an increase of 164% since 1971-1974 (Flegal, 2005). According to national data, no significant change in BMI for all children (2-19 years) has been observed between 2005-2006 and 2003-2004 measurement periods (Ogden, Carroll, et al., 2008). However, despite the fact the BMI rate has not changed, the rate still remains high among children and efforts to reduce it should continue.

Obesity has been associated with numerous negative outcomes such as high blood pressure, type II diabetes, gall-bladder disease, dyslipidemia and heart disease (Must, Spadano, et al., 1999). In addition, it has been observed that negative health consequences of obesity in childhood such as cardiovascular changes and symptoms of the metabolic syndrome (obesity, hypertension, dyslipidemia, and insulin resistance) track into adulthood (Raitakari, Juonala, et al., 2005; Chen, Srinivasan, et al., 2007). Many factors contribute to the increasing trend of overweight and obesity, such as genetics, metabolic, social-environmental, behavioral and psychosocial (AOA, 2007). However, the abundance and accessibility of a variety of food choices and the change in social environment that gave way to unstructured eating behavior cannot be ignored. Often children and adolescents have unlimited access to snacks and soft drinks at schools that enhance constant "grazing" of high energy and low-nutrient dense foods.

Findings for adolescents aged 12-19 years revealed that while fat intake has declined by 100 kcal per day, carbohydrate intake has increased to 240 kcal per day for girls and 350 kcals for boys between mid-70s to mid-90s (Enns, Mickle, et al., 2003). Intake of snack foods such as chips, crackers, pretzels or popcorn has increased from 5 grams to 15 grams and soft drink consumption has increased from 208 grams to 396 grams per day (Enns, Mickle, et al., 2003). It is not surprising that children who consume two or more soft drinks per day have higher risk of becoming overweight or obese (Welsh, Cogswell, et al., 2005).

*Cardiovascular Disease*

More than one in three Americans (37%) suffer from cardiovascular disease (CVD) and close to 900,000 die from the disease (AHA, 2007). Coronary heart disease (CHD) accounts for 7.3% and myocardial infarction accounts for 3.7% of CVD (AHA,

2007). Findings from epidemiological studies have documented that risk factors of CVD such as elevated plasma lipoprotein levels, blood pressure, and overweight/obesity start in childhood and manifest in adulthood (Berenson, Srinivasan, 2005). There is also evidence from long term prospective studies that signs of atherosclerosis (fatty streaks) begin in childhood (Tsimikas, Witztum, 2007).

Studies support the protective effect of fruits and vegetables through their antioxidant content on cardiovascular disease (Ness, Powels, 1997; Knekt, Reunanen, et al., 1994). The long term manifestation of CVD with strong evidence of the positive impact of diets rich in fruits and vegetables and the negative impact of dietary fat, especially saturated fat, emphasizes the importance of health related interventions that begin in childhood and adolescence.

*Type 2 Diabetes Mellitus*

One of the health consequences of obesity is the increasing incidence of type 2 diabetes, especially among children and adolescents (NIH, 2007). About 20 million Americans have type 2 diabetes, an increase of 49% in the last ten years (NIH, 2007). Due to lack of precise screening methods to diagnose type 2 diabetes in children and adolescents, there are no specific prevalence rates available, however, it is estimated that among the newly diagnosed children with diabetes 8% to 46% of them have type 2 diabetes (NIH, 2007). Based on population studies, the segment of the population for whom prevalence of type 2 diabetes in children is known is Native Americans, and the statistics are staggering. Close to 51 per 1000 Pima Indian children between the ages of 15 and 19 have type 2 diabetes, compared to the prevalence of type 1 diabetes of 1.7 per 1000 children in the U.S (NIH, 2007).

Dietary intakes, especially high consumption of regular soft drinks have been associated with obesity and incidence of type 2 diabetes in adults (Schultze, Manson, et al., 2004). Diets rich in fruits, vegetables, whole grains and low in dairy fat were found to help manage type 2 diabetes by lowering blood glucose (Azadbakht, Mirmiran, et al., 2005).

*Cancer*

Even though cancer is a multi-factorial disease, the report “Food, Nutrition and the Prevention of Cancer: A Global Perspective” points out that dietary choices directly contribute to 30% to 40% of all cancers (American Cancer Society, 1997). This report further emphasizes that diets rich in vegetables, fruits, legumes, and grain-based foods are recommended, due to their protective properties mainly against cancers of the gastrointestinal and respiratory tracts (American Cancer Society, 1997). Intake of fruits and vegetables were found to further protect against lung cancer among non smoker adults (Feskanich, Ziegler, et al., 2000). Findings about the effect of dietary fat on cancer development are inconclusive, especially on the types of fats and their impact on different types of cancers. Recent studies examining the effects of food groups on cancer found that the meat and fat diet was strongly associated with the development of squamous cell carcinoma of the skin and a diet rich in green leafy vegetables was associated with decreased risk of developing tumors by 54% (Ibiebele, van der Pols, 2007). On the other hand, meat and fat diets did not seem to be positively associated with incidence of prostate cancer in a large multi-ethnic cohort (Park, Murphy, et al., 2007). However, a combined analysis of 12 case-control studies showed a significant positive association between breast cancer risk and saturated fat intake in postmenopausal women (Howe, Hirohata, et al., 1990).

In summary, overweight and obesity among youth has significantly increased in the past three decades. One of the concerning outcomes of the epidemic of obesity is the increase in the prevalence of type 2 diabetes in children. Significant scientific evidence supports that diets rich in fruits, vegetables, and whole grains reduce the risk of chronic disease. In contrast, diets high in added sugar and dietary fat intake, especially saturated fat, have negative effects on health outcomes, as they increase overweight and obesity and risk of chronic disease. Despite the evidence of the health benefits of a healthful diet, studies have shown that within two decades consumption of snack foods has increased by threefold and consumption of soft drinks has increased by 90% among adolescents. Therefore, health and nutrition programs are essential in reversing the trend in overweight and obesity among youth and in changing dietary behaviors to increase intake of more healthful foods.

Tracking of Behaviors from Childhood to Adulthood

One of the important reasons for evaluating health related behaviors and initiating health promotion efforts during childhood and adolescence is because of the premise that behaviors track from youth into adulthood (Kelder, Perry, et al., 1994). In the case of health compromising behaviors such as poor diet and substance use, early detection and intervention may prevent these behaviors from turning into deeply rooted habits that may negatively impact future health outcomes (Wang & Wang, 2003). Therefore, it is of interest to examine the stability of behaviors over time in order to decide the timing of interventions (Twisk 2003). Tracking of behaviors denotes the maintenance of the individual's relative position of behavior in a study population over time (Wang & Wang, 2003). Tracking is usually measured either by examining the coefficient of the association of two measurements, or at a group level examining the

relative stability of means or frequencies of a behavior over time (Kelder, Perry, et al., 1994; Lien, Lytle, et al., 2001). In this dissertation, although tracking of dietary behaviors and substance use has not been examined, the cross-sectional assessment of these behaviors allows for establishing baseline values for at risk youth attending alternative high schools.

Various studies involving adolescents have demonstrated longitudinal tracking of dietary behaviors and substance use (Kelder, Perry, et al., 1994; Lien, Lytle, et al., 2001; Kvaavik, Andersen, et al., 2005), however other studies did not observe tracking of various behaviors (Twisk, Kemper, et al. 1997; Cusatis, Chinchilli, et al., 2000). In a cohort of adolescents that were followed from 6$^{th}$ to 12$^{th}$ grade, Kelder and colleagues found that the groups of students maintained their relative ranking position of self-reported healthful food choices (Kelder, Perry, et al., 1994). The Bogalusa Heart Study, which assessed fruit and vegetable intakes in 10-year old children and later in 19-28 year old young adults found consumption of fruits and fruit juice to decrease and consumption of vegetables to stay at initial levels (Demory-Luce, Morales, et al., 2004). The Norwegian Longitudinal Health Behavior study that followed males and females from age of 14 to 21 years observed tracking of fruit and vegetable and soft drink consumption (Lien, Lytle, et al., 2001). For example, the different consumption group levels maintained their frequency of consumption rank order for fruits, vegetables, and soft drinks, although an overall decline in the consumption of fruits and vegetables and an increase in the consumption of soft drinks was observed at the population level (Lien, Lytle, et al., 2001). Dietary habits such as soft drink consumption during adolescence continue into young adulthood and even later. A study examining stability of soft drink consumption over time found moderate to high tracking from adolescence to young adulthood and young adulthood to later adulthood, but found low tracking from

adolescence to later adulthood (Kvaavik, Andersen, et al., 2005) possibly due to longer tracking time.

Using the Project EAT data set, a few studies have explored adolescent eating behaviors over time (Larson, Neumark-Sztainer, et al., 2007; Bauer, Larson, et al., 2009). In this sample, males and females reduced their intake of fruits and vegetables by an average of 0.7 daily servings from early to middle adolescence and by an average of 0.6 servings from middle to late adolescence (Larson, Neumark-Sztainer, et al., 2007). Using the same data set, males and females increased their fast food consumption by an average of 12% from early to middle adolescence, and only males increased their consumption by 8% from middle to late adolescence (Bauer, Larson, et al., 2009).

The Penn State Young Women's Health Study that followed females for 6 years starting at age 12 did not observe tracking of nutrient intakes (Cusatis, Chinchilli, et al., 2000). The Amsterdam Growth and Health study followed males and females from the age of 13 to 27 years and observed low tracking for dietary behaviors related to coronary heart disease risk, however the same study found high tracking for smoking (Twisk, Kemper, et al., 1997). Onset of smoking was measured in a cohort of students that were annually measured from $6^{th}$ to $12^{th}$ grade and were divided into four groups of smoking status assessing conversion rate to weekly smoker from never smoker, experimenter, and quitter (Kelder, Perry, et al., 1994). For each smoking group a steady and increasing onset to weekly smoking has been observed; for example, fewer never smokers became weekly smokers than experimenter or quitter smokers became weekly smokers (Kelder, Perry, et al., 1994).

Measuring and interpreting tracking of behavior and most importantly measuring the magnitude of tracking has been challenging and has not always been considered in studies (Twisk, 2003; Wang & Wang, 2003). Assessment of the magnitude of tracking is

a factor of the baseline age of the subjects, total length of longitudinal period, and number of measurements. Although due to these challenges it is difficult to draw comparison of the tracking coefficients between studies, overall the studies show longitudinal correlations in dietary intakes and smoking behavior. Furthermore, longitudinal changes in dietary intake may indicate influence of socioenvironmental factors on dietary behaviors further emphasizing the need to examine the impact of these factors on dietary behaviors.

## Covariation of Behaviors

Covariation of health behaviors is based on the principle that there is an intercorrelation of behaviors which is explained by an underlying single factor (Jessor, 1991). Clustering of variables occurs when the observed combined distribution of variables is higher than the expected joint prevalence of the same variables (observed/expected ratio), assuming statistical independence among variables (Tobias, Jackson, et al., 2007; Ebrahim, Montaner, et al., 2004). Identifying the underpinning factor that binds the cluster of health behaviors allows for a holistic approach to understanding and treating a cluster of risk behaviors (Jessor, 1991). Covariation of behaviors may point to the common etiology of the occurrence of behaviors and directs the focus to lifestyle instead of individual behaviors (Neumark-Sztainer, Story, et al., 1997).

Studies that focused on health behaviors indicated that the strongest covariation is often observed for problem behaviors such as drug and substance use, criminal behavior, alcohol abuse and sexual behavior, collectively termed “syndrome” of problem behaviors among adolescents (Turbin, Jessor, et al., 2000; Jessor, 1991; Donovan, Jessor, et al., 1993). In a study measuring correlates of high school adolescent behavior,

Turbin et al., found covariation of cigarette smoking with only problem behaviors (early sexual intercourse, alcohol use, delinquency, or illicit drug use) and not with health-compromising behaviors, like unhealthy diets (Turbin, Jessor, et al., 2000). However, evidence also supports moderate covariation for non-problem but health compromising behaviors, such as eating, physical activity, and safety behaviors (Jessor, 1991; Donovan, Jessor, et al., 1993). Similar conclusions were drawn by another study among adult populations in New Zealand (Tobias, Jackson, et al., 2007). Unhealthy behaviors (smoking, unhealthy drinking, inactive, and unhealthy diet) were found to be more clustered than healthy behaviors (no tobacco, healthy alcohol use, physical activity, and fruit & vegetable consumption) (Tobias, Jackson, et al., 2007).

Numerous studies have demonstrated the covariation of health compromising and health risk behaviors (Burke, Milligan, et al., 1997; Neumark-Sztainer, Story, et al., 1997). Through cluster analysis, Burke and colleagues found smoking, excess alcohol consumption, and unhealthy dietary choices to cluster among 18-year old Australian men and women (Burke, Milligan, et al., 1997). Factor analysis that guided the identification of clusters of behaviors among adolescents indicated that adolescents engaging in risk-seeking behaviors, such as tobacco, alcohol and marijuana use had almost twice the likelihood of unhealthful eating defined as less than daily intake of dairy, fruit or fruit juice, vegetables, more than once daily of soft drinks, chips, and other sugar-sweetened snacks (Neumark-Sztainer, Story, et al., 1997). Also, adolescents with high school drop-out risk had more than four times the likelihood of unhealthy eating (Neumark-Sztainer, Story, et al., 1997). In contrast, health-promoting behaviors were protective against unhealthful eating (Neumark-Sztainer, Story, et al., 1997). Among adults, the strongest covariation was found between smoking and excessive alcohol consumption in the youngest age group (20-29) and smoking and fruit/vegetable

consumption in the oldest group (Schuit, van Loon, et al., 2002). Exploring covariation of multiple health-related behaviors is important as increasing evidence suggests that higher clustering of health risk behaviors is associated with higher risk of morbidity, due to synergistic effect of the variables of interest (Ebrahim, Montaner, et al., 2004; Schlecht, Franco, et al., 1999; Raitakari, Leino, et al, 1995). Therefore, it is important to consider the underlying factors associated with a cluster of health behaviors in order to design comprehensive health promotion interventions that address multiple lifestyle behaviors for adolescents.

## Selected Dietary Practices and their Associations with Demographic, Behavioral and Environmental Factors in the Lives of Adolescents

The outcomes of interest of this research are consumption of regular soda, sports drinks, other sugar-sweetened beverages, high fat foods, fruits and vegetables, and frequency of fast food restaurant use. Prevalence of consumption of each outcome variable as well as demographic, behavioral, and environmental influences on these outcomes are examined.

### Sugar-Sweetened Beverage Consumption: Prevalence and Correlates among Adolescents and Young Adults

According to dietary recommendations introduced by the Institute of Medicine, the beverage of choice available to students at no cost should be water (IOM, 2007). Other recommended beverages include low-fat milk and 100% fruit juice (8 oz. for high school students) (IOM, 2007). Beverages including non-caffeinated, non-fortified with less than 5 calories per portion are allowed after school for high school students only, because they meet the 2005 Dietary Guidelines for Americans (IOM, 2007).

In the last thirty years, soft drink and other sugar-sweetened beverage consumption has almost tripled, and the highest increase has been seen in adolescents (Troiano, Briefel, et al., 2000; Nielsen, Popkin, 2004) providing the majority of added sweeteners in their diet (Guthrie, Morton, 2000). Regular soda and fruit drinks combined provide 42.7% of added sugars in the American diets (Guthrie, Morton 2000). According to national data, there has been a 10% increase (204 vs. 224 calories) in the per capita energy contributed by sugar-sweetened beverages among all youth between 1988-1994 and 1994-2004 survey periods (Wang, Bleich et al., 2008). During the same period, the per capita energy contribution of 100% fruit juice consumption increased by 26% (38 vs. 48 calories) among all youth (Wang, Bleich et al., 2008). In 1999-2004, 84% of adolescents (12-19 years) consumed sugar-sweetened beverages daily, and the amount they consumed was 354 calories (16% of total daily energy intake), representing a 5% increase from 1988-1994; in contrast, only 58% of adolescents consumed milk daily (Wang, Bleich et al., 2008). Although regular soda represented 50% of all sugar-sweetened beverages among adolescents, the largest increase between 1988-1994 and 1994-2004 was seen in sports drink consumption (1% vs. 3%) (Wang, Bleich et al., 2008). The home environment was the largest contributor of calories from sugar-sweetened beverage (60%-80%) consumption among all youth, however the school environment also contributed 15% of the consumption among adolescents. In 2003-2004, among adolescents 13.4% of all sugar-sweetened beverages were purchased from fast food restaurants and about 5% from the school cafeteria and vending machines (Wang, Bleich et al., 2008). Among students participating in 2007 Youth Risk Behavior Survey, soft drink consumption was 34% (CDC, 2008). In addition, from young school-age to adolescence consumption of soft drinks increased by 20% (Harnack,

Stang, et al., 1999) and from adolescence to young adulthood increased three to five-fold (Lien, Lytle, et al., 2001).

There are demographic differences among regular soft drink consumers. A national data of 1994 indicated that consumption of 12 oz soft drink was significantly associated with being a black male and living in an urban area (Harnack, Stang, et al., 1999). A recent national study that examined sugar-sweetened beverage and fruit juice consumption between 1988-1994 and 1994-2004 also found that the largest increase in energy contribution from sugar-sweetened beverage consumption was among 6-11 year old males and among black and Hispanic than white youth (Wang, Bleich et al., 2008). For 100% fruit juice consumption, the largest increase in daily calories from these beverages was found among adolescents and among black and Hispanic than white youth of all ages (Wang, Bleich et al., 2008). However, according to another national data of 1998, more white than black adolescents consumed twice as much regular soft drinks, but black males consumed twice as much fruit juice than whites or Hispanics (Storey, Forshee, et al., 2004). A study involving both adults and their young adolescent children found higher consumption among children. For adults, younger age and lower education was associated with regular soft drink consumption (Elfhag, Tynelius, et al., 2007).

Based on the findings of epidemiologic and experimental studies, there is evidence that the trend in soft drink and other sugar-sweetened beverage consumption parallels the trend in overweight and obesity in children and adolescents (Vartanian, Schwartz, et al., 2007; Malik, Schulze, et al., 2006; Ludwig, Peterson, et al., 2001). Although studies evaluating soft drink consumption and body weight among children and adolescents have produced mixed results, there is consistent scientific evidence of the association between soft drink consumption and increased energy intake (Vartanian,

Schwartz, et al., 2007). A meta-analysis of various study designs examining the associations between soft drink consumption and body weight and energy increase found that out of 21 studies relating to soft drink consumption and energy increase 19 of them indicated strong associations (Vartanian, Schwartz, et al., 2007). With respect to soft drink consumption and body weight, most studies showed weak positive associations, with the exception of experimental designs that found moderate associations (Vartanian, Schwartz, et al., 2007). A study of preschool children using NHANES 1999-2002 data did not find any association between sugar-sweetened beverage consumption and pre-school children's weight, despite the positive association between sugar-sweetened beverage consumption and increased energy intake (O'Connor, Yang, et al., 2006). Longitudinal studies involving young adolescent females observed a significant increase in the consumption of sugar-sweetened carbonated beverages and sugar, as well as significant association between percentage of calories from soda consumption, and BMI z-score (Phillips, Bandini, et al., 2004; Lee, Novotny, et al., 2007; Ludwig, Peterson, et al., 2001). These differences in the association between increased energy intake from sweetened beverage consumption and weight status in children may be due to weight fluctuations characteristic of children's developmental stages (O'Connor, Yang, et al., 2006). For example, if children were followed through their growth spurt (i.e. adiposity rebound 5.5-6 years), associations between increase in energy intake due to sweetened beverage consumption and increase in weight may be significant (O'Connor, Yang, et al., 2006). While causal inferences cannot be drawn from these studies, there is evidence that weight gain and higher consumption of soft drinks follow a parallel trend.

A possible explanation of the etiology and mechanisms of sweetened beverage consumption and increase in obesity has been attributed to increased high-fructose corn

syrup use in the place of sugar as a beverage sweetener. Significant epidemiologic findings show that increased use of high-fructose corn syrup in the last thirty years parallels the increasing rates of overweight and obesity during the same time period (Bray, Nielsen, et al., 2004). According to the same study, high fructose corn syrup contributes about 132 calories per day (Bray, Nielsen, et al., 2004). The metabolic pathway of fructose differs from that of glucose in that fructose bypasses an important regulatory point driven by hepatic ATP status in the glucolysis pathway, thus fructose is metabolized to fatty acid at a greater rate than glucose (Jurgens, Haass, et al., 2005) and contributes to de novo lipogenesis and lack of stimulation of insulin secretion (Bray, Nielsen, et al., 2004). This has been demonstrated through higher accumulation of fatty acids in the livers of mice exposed to fructose consumption as compared to controls (Jurgens, Haass, et al., 2005).

Another consequence of increased soft drink consumption is the lower intake of calcium, a particularly worrisome fact especially among females, due to the importance of calcium in bone development (Vartanian, Schwartz, et al., 2007; Harnack, Stang, et al., 1999; Troiano, Briefel, et al., 2000; Hanson, Neumark-Sztainer, et al., 2005). Independent of lower consumption of calcium, high consumption of carbonated beverages increased the likelihood of bone fractures by three-fold in females attending an urban high school (Wyshak, 2000). Consumption of sugar-sweetened beverages has a negative effect on diet quality, as indicated by reduced intake of fruits and vegetables, and important nutrients such as folate and iron and increased intake of fat and saturated fat (Frary, Johnson et al, 2004; Kant 2003).

Research of the association of substance use and sweetened beverage consumption is very limited with two findings of a positive association between smoking and soft drink consumption among adolescents (Larson, Story, et al., 2007; Lien, Jacobs,

et al., 2002). Adult males who tend to be heavy long-soft drink consumers are more likely to smoke as compared to light consumers (Kvaavik, Andersen, et al., 2005). Strong taste for soft drinks was the strongest predictor of soft drink consumption among older children (8-13 years), however home and school availability, parent and friend soft drink consumption and water consumption were also shown to be significant predictors (Grimm, Harnack, et al., 2004).

In summary, more than four out of five adolescents consume sugar-sweetened beverages daily representing 16% of daily energy intake, and consumption of these beverages significantly increased in the last two decades. Although studies examining gender differences in sugar-sweetened beverage consumption produced inconsistent results, most studies observed higher consumption of these beverages among black male adolescents. Studies also found higher soft drinks consumption among white and higher fruit juice consumption among black adolescents. Scientific evidence indicates a consistent association between sugar-sweetened beverage consumption and increased energy intake. However the association between sugar-sweetened beverage consumption and increased BMI has not been consistent.

High Fat Food Intake: Prevalence and Correlates among Adolescents and Young Adults

The 2005 Dietary Guidelines for Americans recommend limiting the percent of calories from total fat and saturated fat to no more than 25% to 35% and 10%, respectively (HHS, 2005). Contrary to low intake of fruits and vegetables, adolescents have higher than recommended dietary fat intake, despite the gradual decrease in the mean percent of energy from total fat from 36.8% to 36.4% between NHANES I (1971-1974) and NHANES III (1988-1994) (Troiano, Briefel et al, 2000). Total fat as a percent of energy intake is higher among black than white adolescents, with black female

adolescents having higher intake than black males (Troiano, Briefel et al, 2000). Saturated fat intake as a percent of total calories has also declined, however it remains higher than recommended for both male and female adolescents between the ages of 12 to 19 years. Comparing between white and black adolescents, both black males and females had higher saturated fat consumption (12.2% of energy) (Troiano, Briefel et al, 2000). A high school intervention to decrease fat consumption had a positive effect on fat and energy intake only on females (Haerens, Ilse De Bourdeaudhuij, et al, 2007).

Social-environmental and socioeconomic factors are associated with dietary fat intake. Higher fat intake was found to be negatively associated with both parental education and living in a two-parent household as opposed to a one-parent household for 9 to 19 year old females (Kronsberg, Obarzanek, et al., 2003). A study conducted with a large and diverse group of adolescents found that there were 20% more females from high SES consuming diets with less than 30% of calories from fat as compared to those in the mid-low SES group; the SES difference was 9% for male adolescents (Neumark-Sztainer, Story, et al., 2002). According to the results of a large national data of 1994-1996, only 24% and 14% of low-income preschool children met the national guidelines for total and saturated fat intake, respectively, as compared to their high-income counterparts of whom 41% and 28% met the guidelines to total and saturated fat, respectively (Gleason, Rangarajan et al., 2000). When dietary fat was broken down to the type of fatty acids, consumption of polyunsaturated fatty acids, which is the recommended type of fatty acid, was more frequently consumed as adolescent family income increased (Xie, Gilliland, et al., 2002). Other studies examining socioeconomic status and dietary intake in adolescents produced mixed results (Milligan, Burke et al, 1998; Winkleby, Robinson, et al., 1999).

Snacking is one of the main sources of dietary fat intake in the United States. According to national data, for both adolescents and young adults prevalence of snacking has increased between 1978 and 1996 from 77% to 88% and 77% to 84%, respectively (Jahns, Siega-Riz et al., 2001; Zizza, Siega-Riz et al., 2001). Snacking occasions have seen the largest increase (0.4 snacking occasion), instead of size of snacks, contributing to 30% increase of daily calories (25% of daily calories) from snacking among adolescents (Jahns, Siega-Riz, et al., 2001). Percent of dietary fat due to snacking has also seen a significant increase for both adolescents (22% of total daily fat) and young adults (19% of total daily fat) (Zizza, Siega-Riz, et al., 2001;Jahns, Siega-Riz, et al., 2001). Sociodemographic factors related to snacking have indicated that among all children, adolescents (12-18 years) had the lowest prevalence of snacking (except Hispanic) and were found to be more male than female (Jahns, Siega-Riz, et al., 2001). Higher prevalence of snackers was found among whites and Hispanics than blacks, and among higher income level and parent education (Jahns, Siega-Riz, et al., 2001). Among young adults, both males and females in the highest income category consumed snacks equally (Zizza, Siega-Riz, et al., 2001).

Studies examining associations between substance use and fat intake are scarce and produced mixed results (Burke, Milligan et al., 1997; Larson, Story, et al., 2007; Strauss, Mir, 2001). Among 18-year old Australian adolescents, higher fat intake was associated with cigarette smoking (Burke, Milligan et al., 1997). However, other studies involving adolescents did not confirm these associations (Larson, Story, et al., 2007; Strauss, Mir, 2001). A study of adolescents who participated in NHANES III has not found significant associations between cigarette smoking and energy from fat (Strauss, Mir, 2001). More studies are needed to explore the correlation between substance use and high fat food intake among adolescents.

Availability and accessibility have also been found to correlate with high-fat snack consumption in both quantitative and qualitative studies (Hsieh, 2004; Martens, van Assema, et al., 2005). Correlation between meal frequency and snack consumption indicated that adolescents who consume only one meal per day or eat only snacks (poor diet) were found to be black females, from single female parent household, and had lower education level and lower SES (Siega-Riz, Carson, et al., 1998). Availability of venues that offer high fat foods as snacks was positively associated with higher percent of daily calories from fat (Kubik, Lytle, et al., 2003 (a)). In schools that had a la carte programs, the students had 2.59% and 1.06% higher daily calories from total and saturated fat, respectively (Kubik, Lytle, et al., 2003 (a)).

In summary, among adolescents the mean percent of energy from total fat and saturated fat has decreased in the past three decades, although it is still higher than recommended. Total fat and saturated fat intake is higher among black than white adolescents. In most studies lower fat intake was associated with higher SES including higher parental education and higher family income. Snacking has been found to be associated with increased fat intake, and snacking among adolescents has significantly increased in the past thirty years. Studies have indicated that availability of snacks at schools was associated with higher percent of daily calories from fat. The literature is limited on the link between fat intake and substance use, and the few studies on this topic did not observe an association. Certainly, adolescents have access to the types of foods such as snacks that contribute to their fat intake. Exploring innovative ways to decrease the availability of high fat snacks, especially in schools, and increase the availability of more healthful items is necessary.

Fruit and Vegetable Intake: Prevalence and Correlates among Adolescents and Young Adults

According to 2005 Dietary Guidelines for Americans, 4.5 cups (9 servings) of fruits and vegetables are recommended for 2000 daily calories (HHS, 2005). Based on calorie levels of 1500-3200 the recommended daily servings range from 5 to 13 (HHS, 2005). National nutrition data indicate that the diets of adolescents are lower than recommended for fruits and vegetables (Cook, Friday, 2004; Guenther, Dodd, et al., 2006). In the 2007 Youth Risk Behavior Survey (YRBS), the percent of students that consumed fruits and vegetables five or more times per day has declined by 10% between1999 and 2007 (1999:23.9%, 2005:21.4%) (CDC 2008). A nationally representative study using 1999-2000 data from the National Health and Nutrition Examination Survey (NHANES) indicated that on average adolescents (14-18 years) consumed 4.4 daily servings of combined fruits and vegetables, and only 0.7% of males and 1.5% of females consumed the MyPyramid recommendations of 10 or more combined servings of fruits and vegetables a day (Guenther, Dodd, et al., 2006). A study by Larson et al, examining secular and longitudinal trends of daily servings of fruits and vegetables between 1999 and 2004 found a decrease in age-matched secular trends of 0.7 and 0.4 daily servings among middle adolescent girls and boys, respectively (Larson, Neumark-Sztainer, et al., 2007).

There are gender and racial differences in the consumption of fruits and vegetables. In 2007, the percent of students having eaten fruits and vegetables five or more times daily was higher among male (22.9%) than female (19.9%) and higher among blacks (24.9%) and Hispanics (22.0%) than whites (18.8%) (CDC–YRBSS, 2008). While black adolescents had the highest consumption of fruits, their consumptions of vegetables were the lowest of all other groups (Neumark-Sztainer,

Story, et al., 1996), emphasizing the importance of exploring racial differences in dietary behaviors when designing nutrition interventions. As adolescents age, their intake of fruits and vegetables appears to decline with 23.7% of 9th grade students and only 18.6% of 12th grade students having eaten five or more servings of fruit and vegetables per day in 2005 (CDC, 2008). In an ethnically diverse study examining family environmental influences on dietary intakes, mean daily servings of fruits and vegetables declined after five years, between high school and young adulthood (Arcan, Neumark-Sztainer, et al., 2007). Poor dietary practices during adolescence continue into young adulthood (20-29 years). More than half of young adults consume less than one daily serving of fruit (males: 63%, females: 59%), and one out of five consume less than one daily serving of vegetables (males: 19%, females: 20%) (Cook, Friday, 2004).

Socioeconomic status appears to play an important role in the intake of fruits and vegetables. Studies have shown a more consistent and positive association between socioeconomic status, represented by either adult income or level of education, and fruit and vegetable consumption among adults than among adolescents (Giskes, Turrell, et al., 2001; Irala-Estevez, Groth, et al., 2000; Neumark-Sztainer, Story, et al., 1996). The variability of the measures used to evaluate SES in various studies involving adolescents is one factor that may lead to inconsistent outcomes. While household income was not found to be associated with adolescent intakes (Giskes, Turrell, et al., 2001), parental education appears to provide a more consistent and positive association with adolescent intakes of fruits and vegetables (Xie, Gilliland, et al., 2002; Neumark-Sztainer, Story et al., 2002; Lien, Jacobs 2002). Free or reduced lunch which is often used in studies to represent SES was not associated with fruit and vegetable consumption in a sample of adolescents (Lytle, Varnell, et al., 2003). A study that used a combination of both parental education and family income to describe SES found

significant differences in consumption of fruits and vegetables between high and low SES groups (Neumark-Sztainer, Story, et al., 1996). Education is an important determinant of socioeconomic status, because of its contribution to better employment that often leads to higher family income. In addition, people with higher education may be in a better position to understand and follow dietary recommendations and make better decisions about their health.

Perceived home food availability and its association with fruit and vegetable consumption have been examined more extensively than school food availability. Perceived availability and accessibility of fruits and vegetables at home has been found to be a significant correlate of intake for both children and adolescents (Kratt, Reynolds, et al., 2000; Bere, Klepp 2004; Granner, Sargent, et al., 2004; Hanson, Neumark-Sztainer, et al., 2005; Bere Klepp, 2005; Arcan, Neumark-Sztainer, et al., 2007). Only one of these studies examined longitudinal associations and found dinner time fruit and vegetable availability during adolescence to predict consumption of these foods in young adulthood (Arcan, Neumark-Sztainer, et al., 2007).

Perceived availability of foods at school was also found to influence intakes. In a focus group conducted in alternative high schools, Kubik and colleagues found that availability of foods, in addition to time and cost, to be the most frequently reported factor influencing students' eating behaviors (Kubik, Lytle, et al., 2005(a)). In another qualitative study, limited availability of healthy foods at schools was mentioned as a barrier to eating healthy (Croll, Neumark-Sztainer, et al., 2001). Significant associations were found between school food availability and student reported fruit and vegetable consumption (Kubik, Lytle, et al., 2003(a)). With the existence of a la carte meals at schools, students reported consuming 0.65 less daily servings of fruits and 0.84 less

daily servings of fruits and vegetables, as compared to schools without a la carte programs (Kubik, Lytle, et al., 2003 (a)).

Food security reflects the SES of a household. In a large and diverse group of adolescents, food security and intake of fruits and vegetables were significantly correlated (Neumark-Sztainer, Wall, et al., 2003). However the association was mediated by home availability of these foods (Neumark-Sztainer, Wall, et al., 2003), which shows that one of the factors that influences food availability is the financial situation of a household. Food security operated through self-efficacy was found to be one of the strongest determinants of improved diet quality among newly arrived Latino women (Roney & Haldeman, 2006). According to national data, women in food insecure households as compared to food secure households had lower intakes of fruits and vegetables, two food groups that make up the components of the HEI score (Basiotis, Lino, 2002).

Cigarette smoking has a negative influence on the consumption of fruits and vegetables among adolescent females, according to national data (Wilson & Nietert, 2002). This association differed by race with white smokers consistently having lower intakes of fruits, vegetables and fruit juices in a dose response relationship (Wilson & Nietert, 2002). In another cross-sectional study of ethnically diverse adolescents, cigarette smoking was significantly associated with fruit and vegetable consumption (Larson, Story et al., 2007). The clustering of health compromising behaviors such as unhealthy weight control behaviors (binge eating) and substance use (tobacco, alcohol and marijuana) are strongly and negatively associated with fruit and vegetable consumption (Wilson & Nietert, 2002). This clustering of health compromising behaviors may be the result of personal and social-environmental conditions that need to be

considered when designing interventions since some groups of adolescents are more vulnerable than others.

In summary, consumption of fruits and vegetables among adolescents is quite low; only 1 in 5 consumes the recommended daily servings of fruits and vegetables. Gender and racial differences in fruit and vegetable consumption indicate that white females had the lowest consumption of fruits and vegetables. However, although black adolescents had the highest consumption of fruits, they had the lowest consumption of vegetables. Findings were not consistent on the association between adolescent fruit and vegetable consumption and SES. Although higher parental education and higher family income was associated with higher adolescent consumption of fruits and vegetables, free/reduced lunch participation was not associated. Food insecurity, on the other hand, was significantly associated with lower consumption of fruits and vegetables. Student perceived availability of fruits and vegetables at home was correlated with consumption of these foods. The availability of other foods at schools, such as a la carte was associated with lower consumption of fruits and vegetables. Comprehensive health and nutrition programming at schools is warranted, since health compromising behaviors like unhealthful diets and substance use often cluster among adolescents, as studies indicated a significant inverse association between substance use and fruit and vegetable consumption.

## Fast Food Restaurant Use: Prevalence and Correlates among Adolescents and Young Adults

As the diets of Americans have shifted to include a third of the calories from away from home foods, fast food restaurants are one of the main contributors to dietary fat intake (Guthrie, Lin, et al., 2002; Befort, Kaur, et al., 2006). It has been observed that

food consumed by children and adolescents from fast food restaurants has seen the smallest decline with respect to the percent of energy from fat (Guthrie, Lin, et al., 2002). While there is a range of healthy choices in fast food restaurants, hamburgers and French fries continue to top the list in terms of sales volume (French, Harnack, et al., 2000). Fast food consumption usually includes foods high in total fat, saturated fat, carbohydrate, added sugars and low in dietary fiber, fruits and vegetables (Bowman, Gortmaker, et al., 2004). According to national data of 1996, on an average day 30% of all children had eaten in a fast food restaurant and the percent of fast food consumers was higher among older adolescents with about 17% higher energy intake as compared to non-fast food consumers (Bowman, Gortmaker, et al., 2004). Moreover, as adolescents become young adults, their fast food intake increases (Harris, Gordon-Larsen, et al., 2006; Larson, Neumark-Sztainer, et al., 2008). A longitudinal study examining trends in fast food consumption among ethnically and socioeconomically diverse adolescents indicated an increase in fast food consumption from early to middle adolescence (Bauer, Larson, et al., 2009(a)). Among males, a 36% increase in the frequency of fast food consumption has been found from early to middle adolescence (Bauer, Larson, et al., 2009 (a)) and a 33% increase from middle adolescence to young adulthood (Larson, Neumark-Sztainer, et al., 2008), indicating factors associated with developmental stages (Bauer, Larson, et al., 2009). Secular trends, which represent frequency of fast food intake of the same age at different times, have shown an 8% increase among middle school females adolescents, indicating environmental factors contributing to this increase (Bauer, Larson, et al., 2009). In studies that involved adult populations, young adults (20-39 years) reported higher fast food restaurant use as compared with all other age groups (Satia, Galanko et al, 2004; French, Harnack et al, 2000). In addition to the contribution of fast food to dietary fat intake, a positive

association has also been found between fast food restaurant use, sodium and soft drink consumption, and an inverse association has been found between fast food restaurant use and fruit, vegetable and milk intake among adolescents and adults (Paeratakul, Ferdinand, et al., 2003; Jeffery, Baxter, et al., 2006).

Studies present strong evidence of the association between fast food restaurant use and socio-demographic factors. Being a black older adolescent or young adult is strongly associated with frequency of fast food restaurant use (Troiano, Briefel, et al., 2000; Paeratakul, Ferdinand, et al., 2003; Schmidt, Affenito, et al., 2005; Befort, Kaur, et al., 2006). In another study of ethnically and socioeconomically diverse adolescents, females in other racial category (Hawaiian or Pacific Islander, American Indian or Native American and mixed heritage) followed by black adolescents more frequently used fast food restaurants three or more times a week than all other races (Bauer, Larson, et al., 2008). Findings do not conclusively support one gender over the other in the frequency of fast food restaurant use. Some studies indicate that male adolescents more frequently consume fast foods (Paeratakul, Ferdinand, et al., 2003; Bowman, Gortmaker, et al., 2004; French, Story, et al., 2001), others show female young adults (Satia, Galanko, et al., 2004) and others show no gender differences (Neumark-Sztainer, French, et al., 2005). Depending on the way family income was measured, some studies reported those with higher income (>300% of poverty) (Bowman, Gortmaker, et al., 2004; Paeratakul, Ferdinand, et al., 2003) and others in the lowest socioeconomic status to use fast food restaurants (French, Harnack, et al., 2000). Young adults with some college education were more likely to use fast food restaurants (Satia, Galanko, et al., 2004) than those with lower educational attainment. Among adolescents, lower income females were found to visit fast food restaurants more often compared to higher income females (French, Story, et al., 2001; Bauer, Larson, et al., 2008). Research on

substance use and fast food restaurant use is very limited. Smoking was found to be positively associated with fast food consumption in a large and diverse group of adolescents (Larson, Story, et al., 2007).

Although the food environment surrounding schools has been previously suggested as a contributor to dietary behavior (Story, Neumark-Sztainer, et al., 2002), more recently public health research has expanded its focus to include assessment of the neighborhood food environment especially its proximity to schools (Austin, Melly, et al., 2005; Zenk & Powell, 2008). The few studies that examined density of neighborhood food venues have found higher concentration of fast food establishments around schools (Austin, Melly, et al., 2005; Zenk & Powell, 2008). A study assessing fast food restaurant density around schools in Chicago neighborhoods found one third of schools and 80% of schools to have at least one fast food restaurant within a 5-minute walk and a 10-minute walk, respectively (Austin, Melly, et al., 2005). More importantly, the same study found a higher degree of clustering of fast food restaurants within 1.5 km distance from schools than in other areas in the city (Austin, Melly, et al., 2005). Another study examining fast food and convenience store concentration around schools using a nationally-representative study found 61% more fast food restaurants and equal number of convenience stores within walking distance from high schools than middle schools. Furthermore, the presence of a high school and not a middle school in a neighborhood was associated with 1.32 times the likelihood of having a fast food restaurant than in neighborhoods without a secondary school (Zenk & Powell, 2008). Contrary to other studies (Austin, Melly, et al., 2005), the study by Zenk et al, found higher concentration of food outlets in the lowest versus highest income neighborhoods (Zenk & Powell, 2008). With respect to race and food retail density, schools located in racially diverse neighborhoods (other than white or black) compared to white neighborhoods had 1.4

and 1.9 times the number of fast food and convenience outlets within walking distance, respectively; schools located in African American neighborhoods had the lowest concentration of fast food restaurants and similar number of convenience stores as the white neighborhoods (Zenk & Powell, 2008). However, when median income was excluded from the model, African American neighborhoods had more convenience stores within walking distance from a school than the white neighborhoods, indicating that income explains the higher concentration of convenience stores around schools in African American neighborhoods (Zenk & Powell, 2008).

In summary, one in three children and adolescents eat at fast food restaurants in a given day. Most studies found consumption of fast food to increase as adolescents become older. Among middle school female adolescents, fast food consumption has increased over a five-year period. Fast food consumers had higher percent of energy intake than non-fast food consumers, and fast food consumption was associated with higher consumption of soft drinks and lower consumption of fruits and vegetables. In regards to gender and fast food consumption, studies have not shown consistent results. However, black adolescents and those from other race, like Hawaiian or Pacific Islander, American Indian or Native American and mixed heritage consumed fast food more frequently than white adolescents. Studies did not find consistent results regarding SES and fast food consumption, although few studies have indicated lower income female adolescents to consume fast food more frequently compared to higher income females. A concerning environmental trend has been the increased density of fast food restaurants within close proximity to schools, especially in schools located in racially diverse neighborhoods.

## School Food Environment and Substance Use among Adolescents

The literature review that follows includes a description of behavioral and environmental factors that have relevance in the lives of adolescents attending alternative high schools and are examined in this dissertation. More specifically, these factors are school food environment and substance use. An overview of the school food environment will be provided as it is an important and influential component in students' dietary choices. Substance use (cigarette, alcohol, and marijuana) is prevalent among adolescents and even more prevalent among at-risk youth.

### School Food Environment and its Influence on Children's and Adolescents' Diet Quality

Schools enroll close to 55 million students (USDE, 2005) where children spend the majority of their day and consume half of their total energy intake (Gleason, Suitor, 2001). Schools can be the most appropriate venue to help the nation's youth develop knowledge and positive attitudes toward healthy dietary behaviors. The foods available to students come from various sources and some are of questionable quality with respect to nutrients and energy. The two national food sources, the School Breakfast Program (SBP) and National School Lunch Program (NSLP) are required to meet a fourth and a third of the Recommended Dietary Allowances (RDA) for calories, protein, vitamin A, vitamin C, calcium and iron, respectively (USDA, 2001). Eighty three percent of all public and private schools participate in the NSLP, and on average 60% of students attending these schools participate in the program (Story, 2009). According to the nationally representative data, the School Nutrition Dietary Assessment (SNDA-III) conducted in 2004-2005, although 62% of public elementary schools participated in the NSLP, only 19% of middle schools, and 19% of high schools participated in the program (Gordon, Cohen, et al, 2009).

The increased availability of foods from sources other than the NSLP in middle and high schools is one of the reasons for the decline in the NSLP participation. These sources include a la carte programs, vending machines, school food stores, local food retailers and even food brought to school by school staff. A collection of foods sold at schools that are not part of the NSLP are termed “competitive foods,” and the schools participating in the NSLP have some restrictions regarding sales of competitive foods (IOM, 2007; O’Toole, Anderson, et al., 2007). Unfortunately, school foods other than the federally subsidized meals do not have to abide by the USDA nutrition guidelines, resulting in foods that are high in fat, sodium and added sugars (Story, Neumark-Sztainer, et al., 2002). Foods that provide less than 5% of the RDA for certain nutrients, are prohibited from being sold in food service areas during meal hours (Fox, Gordon, et al., 2009), but they can be sold in other areas inside the school.

Competitive foods are highly available in schools. Three out four elementary schools, 97% of middle schools, and 100% of high schools have at least one source of competitive foods (Fox, Gordon, et al., 2009). Although a la carte options are very limited in elementary schools, in middle and high schools their use is quite prevalent with more than 90% of schools allowing a la carte purchases during lunch time (Fox, Gordon, et al., 2009). A survey of district food service directors in California indicated that 95% of those responded sell fast food as a la carte foods which amounted to more than 40% of food sales (Craypo, Purcel, et al., 2002). Vending machines are another popular source of food in schools with the majority of them in middle (80%) and high schools (100%) than elementary schools (27%) (Fox, Gordon, et al., 2009). A study examining the fat and sugar contents of foods sold in stores of a large number of middle schools found 40% of all beverages to be soft drinks and 88.5% of the snacks to be high in fat (>5 g) and high in sugar (>20 g) (Wildey, Pampalone, et al., 2000). Another study

found 52% of school a la carte items to contain higher than recommended amounts of dietary fat (Harnack, Snyder, et al., 2000). Only 35% of items sold in a la carte and vending machines met the criteria for lower fat content in 20 Minnesota secondary schools (French, Story, et al., 2003).

The most popular competitive food items that were purchased by more than half of all students were desserts and snacks and any beverage other than milk and 100% fruit juice (46%) (Fox, Gordon, et al., 2009). Although juice drinks, including sports drinks, were more frequently consumed by middle school students (32%) than by high school students (26%), carbonated sodas were more frequently consumed by high school students (19%) than middle school students (14%) (Fox, Gordon, et al., 2009). Bottled water, on the other hand, was more frequently consumed by high school students (18%) as compared to only 2% of elementary school students (Fox, Gordon, et al., 2009). A study involving girls in an urban high school found 80% of them consuming carbonated beverages with only 20% consuming diet beverages (Wyshak, 2000). In another study conducted in middle-schools, students' sweetened-beverage consumption increased as the number of items they purchased from vending machines increased in a dose response manner (Wiecha, Finkelstein, et al., 2006).

The availability of competitive foods has a negative impact on the diet quality of adolescents. In a nationally representative study, consumption of competitive foods contributed to 13% of daily energy intake for all students and 15% of daily energy intake for high school students (Fox, Gordon, et al., 2009). Further, the daily energy contribution of low-nutrient and energy dense competitive foods was 10% for high school students (Fox, Gordon, et al., 2009). Findings from other local studies have shown that as adolescents became more exposed to additional food choices at school, their intake of more healthful food declined (Cullen & Zakeri, 2004; Kubik, Lytle, et al.,

2003 (a)). A longitudinal study conducted in middle schools showed that as students gained access to snack bar food, their consumption of fruit, vegetable and milk significantly decreased, and consumption of higher fat vegetables and sweetened beverages increased (Cullen & Zakeri, 2004). Also, middle school students in schools with a la carte programs had lower intakes of fruits and vegetables and higher intakes of fat and saturated fat as compared with students in schools without a la carte programs (Kubik, Lytle, et al., 2003).

Participation in the NSLP was also associated with consumption of competitive foods, with 9% higher consumption among those who did not participate in the school lunch program (Fox, Gordon, et al., 2009). A study conducted in middle schools, found one-third of 13 year old students who participated in school lunch program also purchased competitive foods, close to half of these students purchased sweetened beverages and salty snacks, and 38% of them purchased sugar added snacks (Templeton, Marlette, et al., 2005). Another study using a nationally representative sample of students indicated that students who participated in the NSLP consumed less energy from sugar-sweetened beverages than those who did not participate in the lunch program, and the energy contribution of these beverages was higher among middle and high school students (Briefel, Wilson, et al., 2009). Not surprisingly, students who consumed competitive foods had higher energy intake and 32% higher fat intake than students who consumed the traditional school lunch (Templeton, Marlette, et al., 2005; Fox, Gordon, et al., 2009). These findings strongly support the premise that competitive foods at schools displace participation in the NSLP as well as compromise the intake of more healthful foods.

The revenue stream that is generated through sales of competitive foods is the main incentive reported by food service directors and school staff for allowing these

foods in schools. Budgetary constraints have made school districts accountable to cover their costs, thus leading them to accept the more popular and less financially risky options of selling foods that appeal to students. These revenues are often used toward funding food service operations and school activities and purchasing of equipment used by students (Story, Kaphingst, et al., 2006). Thus, those who argue against eliminating competitive foods believe that availability of healthful alternatives will dramatically reduce sales (Fox, Meinen, et al., 2005), however studies have shown otherwise. A study that reduced prices of low fat items sold in vending machines has seen a proportionally higher incremental increase in sales without compromising profits (French, Story, et al., 1997). A secondary school environmental study that increased the availability of low fat foods in a la carte and vending machines and utilized student driven promotional activities to increase sales of healthier food alternatives has demonstrated a significant increase in sales of healthier items without compromising revenues (French, Story, et al., 2004). Additional food sources at schools increase eating and drinking opportunities for students. According to 2006 School Health Policies and Programs Study (SHPPS), in order support student activities, school related organizations, such as student clubs and sports teams, sold foods that were of low nutritive value (O'Toole, Anderson, et al., 2007). These activities were quite prevalent in high schools (84%) with 65% of them selling baked goods high in fat (O'Toole, Anderson, et al., 2007). However, another 21% of all schools sold foods that were low in fat, including fruits and vegetables and 100% fruit and vegetable juice (O'Toole, Anderson, et al., 2007). Another popular school practice is to use food or coupons by school teachers or staff as a reward for good behavior or performance, however all schools are making the effort to either prohibit (17%) or discourage (19%) this practice (O'Toole, Anderson, et al., 2007).

A revenue generating activity that holds schools bound for many years are contracts entered with large soft drink companies. These multi-million contracts termed "pouring rights" secure exclusive rights to beverage companies to sell and market their products in schools in return for sharing profits with the schools (Nestle, 2000). According to SHPPS 2000 data, fifty percent of districts have contracts with large beverage companies to sell their products at schools in return of a percentage of sales receipt (80% of schools) and cash or other donations (63% of schools) (Weschsler, Brener, 2001). The same study conducted in 2006 indicated that 57% of high schools had contracts with soft drink companies that gave them the exclusive rights to sell their beverages in their schools (O'Toole, Anderson, et al., 2007). Through these contracts, companies engage in aggressive marketing practices not only at schools but through any other venue where both children and school staff are involved, such as school buses, book covers, professional conferences, and funding of educational programs (Levine, 1999; Story, Kaphingst, et al., 2006). In 2006, more than one half of all schools allowed soft drink companies to advertise their products on vending machines. These activities enhance brand recognition that leads to increased preference and sales of these foods and beverages.

There is great discontent with the food environment at schools, because all members of society recognize the contribution of healthful diets in the development of children, especially in light of the current trends in overweight and obesity (Ogden, Carroll, et al., 2008). In a large survey of school principals in Minnesota, the majority of them indicated support for exclusive sales of healthful food items and for district or school-wide food and nutrition policies (French, Story, Fulkerson, 2002). Another study that surveyed middle school teachers in Minnesota indicated that the majority of teachers supported a healthy food environment at schools and preferred that sales of

candy and soft drinks and fast food for lunch be prohibited (Kubik, Lytle, Hannan, et al., 2002; Kubik, Lytle, Story, et al., 2005). Strong support for a healthful school environment was also indicated by parents of middle school students, who reported that schools should place a priority in students' healthful eating (Kubik, Lytle, Story, et al., 2005).

The school food environment has been guided by federal initiatives such as the Coordinated School Health Program developed in 1994 by the Centers for Disease Control (CDC) and the Child Nutrition WIC Reauthorization act of 2004 aiming to improve students' health and reduce childhood obesity through the development of school wellness policies, respectively (IOM, 2007). In addition, USDA has put forth guidelines for the availability of competitive foods at schools and for allowing local districts and schools to enforce stricter guidelines for sales of snacks and beverages (Story, Kaphingst, et al., 2006). While several states have taken the initiative to either develop comprehensive nutrition education policies or ban high fat snacks and soft drinks from all school venues (Story, Kaphingst, et al., 2006), overall the foods available at schools are still below nutritive standards. Thus, CDC in collaboration with the Institute of Medicine (IOM), have provided further recommendations on the nutrient quality of especially the competitive foods available at schools (IOM, 2007). Studies have shown that in schools with policies about vending machines, students purchased fewer snacks and soft drinks compared to students in schools without policies (Neumark-Sztainer, French, et al., 2005). The same effect was observed at schools that had closed campus policy on students' fast food restaurant use (Neumark-Sztainer, French, et al., 2005).

Given the many food sources and multiple players exerting their forces in determining the dietary intakes of students, it is not surprising that the food environment at schools does not uniformly protect the dietary needs of children and adolescents. An

integrated two-pronged approach that would focus on providing high nutritive foods at schools without compromising taste and classroom education to improve nutrition knowledge of the available foods is essential in order to develop awareness and a positive attitude toward healthier dietary practices.

Substance Use

Recent national data indicated that one half of adolescents have smoked cigarettes in their lifetime and one in five currently smokes (CDC-YRBSS 2008). The prevalence of current smoking is higher among males (21.3%) than females (18.7%) and highest among white (23.2%) followed by Hispanic (16.7%) and black (11.6%) students (CDC-YRBSS 2008). As expected, cigarette smoking increases by grade level (CDC-YRBSS 2008). Each day, about 3000 adolescents become daily smokers and the majority of adults tried their first cigarette during adolescence (USDHHS 2000). Alcohol consumption is even more prevalent than cigarette smoking with three out four adolescents having consumed alcohol before they finished high school. Forty-five percent of adolescents had one alcoholic drink on at least one day in the last month before the survey (CDC-YRBSS, 2008) with males (44.7%) and females (44.6%) consuming similar amounts (CDC-YRBSS, 2008). Hispanic (47.6%) and white students (47.3%) had similar frequency of alcoholic beverage consumption in the last month followed by black students (34.5%) (CDC-YRBSS, 2008). About 40% of adolescents have used alcohol by 8$^{th}$ grade and close to a third of 12$^{th}$ grade students have consumed alcohol during the last 30 days. (Johnston, O'Malley et al., 2008). Marijuana use is also prevalent with about 40% of adolescents having tried it in their lifetime and 18% of 12$^{th}$ grade students having used marijuana during the last 30 days (Johnston, O'Malley et al., 2008). Male high school students are the heaviest lifetime (42%) and

current marijuana users (22%) (CDC-YRBSS, 2008). Although substance use is prevalent among adolescents, a decline in prevalence has been observed for cigarette and alcohol use in the last two decades (CDC-YRBSS, 2008). From 1991 to 2007, current cigarette (at least 1 in the last 30 days) smoking declined by 20% and current alcohol use declined by 12%. On the other hand, current marijuana use has increased by 34%. However, current marijuana use has also declined after its peak of 26.7% in 1999 (CDC-YRBSS, 2008).

There are socioeconomic differences in the prevalence of substance use among adolescents. Studies examining associations between neighborhood and income inequalities and substance use found that living in environments with high inequalities increased the likelihood of using alcohol and marijuana among both young adolescents and adults (Galea, Ahern et al., 2007; Hill, Angel 2005). As adverse living conditions may pose additional stress, adolescents reported smoking and drinking to relieve stress and to forget their problems (Simantov, Schoen, et al., 2000). In a study that examined correlations between cigarette smoking and various socioeconomic indicators in middle and high school students, neighborhood education level was inversely associated with cigarette smoking (Scarinci, Robinson et al., 2001). Also, students who attended schools with high reduced/low cost lunch program participation were 5.86 times more likely to smoke than students in schools with low reduced/low cost lunch program participation (Scarinci, Robinson et al., 2001).

Covariation of health risk behaviors, including substance use has been found in studies with adolescents (Neumark-Sztainer, Story et al., 1997; Grunbaum, Lowry et al., 2001; Kvaavik, Andersen et al., 2004; Burke, Milligan et al., 1997; Donovan & Jessor 1985). Studies focusing on patterns of multiple substance use in adolescents have correlated cigarette smoking with alcohol and marijuana use (Burke, Milligan et al.,

1997; Paavola, Vartiainen et al., 2004; Everett, Warren, et al., 1999). A study that followed adolescents from grade 6 to grade 12 and divided the sample into quartiles of never, experimenter, quitter, and weekly smoker found a consistent and increasing pattern in the change to weekly smoking (Kelder, Perry, et al., 1994). For example, fewer students from being 'never' smokers converted to 'weekly' smokers than those who were in the experimenter, quitter, and weekly smoker categories (Kelder, Perry, et al., 1994). Also, as adolescents transition to young adulthood, their tobacco use and alcohol abuse increases as well (Harris, Gordon-Larsen et al, 2006).

Few studies that examined the link between substance use and eating behaviors in adolescents found smoking to be associated with greater total fat intake (Burke, Milligan et al., 1997), soft drink consumption (Kvaavik, Andersen et al., 2004), fast food usage (Larson, Story, et al., 2007), and lower consumption of fruits and vegetables (Larson, Story, et al., 2007; Wilson, Smith et al., 2005; Wilson & Nietert 2002; Neumark-Sztainer, Story, et al., 1996). Although clustering of health compromising behaviors including substance use does not imply that substance use causes the initiation of other health related risk behaviors, it may indicate that they share common socioenvironmental and psychological factors (DuRant, Smith, et al., 1999).

***'At-risk' youth and substance use***

As it has been mentioned in the previous section, adolescents who are at-risk have already been involved in risk behaviors that led to outcomes such as school failure or early pregnancy (Jessor, 1991). And although at-risk youth engage in behaviors of problem drinking, cigarette smoking or illicit drug use, the degree of engaging in these behaviors may define the level of 'at-risk' for adolescents (Jessor, 1991). Studies that examined covariation of cigarette smoking with either problem behaviors (early sexual

intercourse, alcohol use, delinquency, or illicit drug use) or health-compromising behaviors (unhealthy diets or lack of exercise) found significant covariation only with problem behaviors (Turbin, Jessor, et al., 2000), indicating that cigarette smoking and other measured 'at-risk' behaviors share common factors of occurrence. A study that followed 4327 students from 7th to 12th grade to assess correlations of smoking status found significant increase in risk behaviors in 12th grade between non-smokers vs. smokers at 7th grade; students who smoked in 7th grade were 5 times more likely to drop out of school, 2 times more likely to abuse alcohol, 6 times more likely to use marijuana, and 4 times more likely to engage in violent behavior (Ellickson, Tucker, et al., 2001). Using the same data set, in a cross-sectional study, the authors examined correlates of levels of violent behavior among 12 grade students (Ellickson, Saner, et al., 1997). Students who engaged in any violence in the past year were 1.4 to 1.6 times more likely to use cigarettes, alcohol, or marijuana weekly, and to drop out of school. Furthermore, those who engaged in multiple or persistent violent activities had even higher likelihood of engaging in other risk behavior activities; more than a half of students engaged in two health risk behaviors, including violence and one in five were involved in four or more health risk behaviors (Ellickson, Saner, et al., 1997). A longitudinal study that examined the impact of substance use on school drop out among 1392 adolescents between the ages of 16 through 18 years, found marijuana users to be 2.3 times more likely to drop out of high school than non users, after adjusting for multiple substance use including cigarettes, alcohol and illicit drug use (Bray, Zarkin, et al. 2000). Cigarette smokers were also 1.7 times more likely to drop out of school (Bray, Zarkin, et al. 2000). A cross-sectional study of 672 students in 12th grade found abound 6% lower probability of high school graduation for every 10% increase in the frequency of alcohol and marijuana use (Yamada, Kendix, et al., 1996). Daily or weekly cigarette, alcohol, or marijuana use was

strongly correlated with unhealthy eating behavior among a large sample of adolescents (Neumark-Sztainer, Story, et al., 1997). The same study also reported that students with high risk of school drop out had more than 4 times the likelihood of engaging in unhealthy eating behaviors (Neumark-Sztainer, Story, et al., 1997), indicating the clustering of health-compromising behaviors, such as unhealthy eating, substance use and high drop out rate. A nationally representative study found that substance use was predictive of truancy among 8$^{th}$ and 10$^{th}$ grade students (Henry, 2007). According to the conceptual framework of adolescent risk and protective factors proposed by Jessor, depression is one of the health-compromising outcomes of risk behaviors (Jessor, 1991). Consistent with this framework, Kubik and colleagues reported higher likelihood of elevated depressive symptoms with drug use, including monthly smoking and alcohol use, heavy drinking and inhalant use among a large sample of 7$^{th}$ grade girls; among boys only monthly alcohol and inhalant use were correlated with elevated depressive symptoms (Kubik, Lytle, et al., 2003).

In a study conducted in Texas among alternative high school students, being Hispanic and Black was protective of cigarette/alcohol and marijuana use (Grunbaum, Tortolero, et al., 2000). Given that substance use is prevalent among adolescents, especially among at-risk youth and that substance use clusters with other health compromising behaviors, examining the association between substance use and dietary practices among alternative high schools can assist in the development of comprehensive health related school interventions.

## Description of Alternative High Schools and Students Attending these Schools

As it has been noted at the beginning of this chapter, alternative high school students represent the sample of this research. Alternative high school students represent a group of youth who are at-risk of academic failure or have been expelled from their regular high schools due to behavioral problems. Thus, the reminder of this chapter provides a description of alternative high schools and the students that attend these schools.

### Alternative High Schools: What are they?

Many definitions have been provided as descriptions of alternative high schools reflecting their varied nature with respect to flexibility in structure, education, location, size and number and types of students enrolled. The idea of AHS was incepted in the 1960s, to satisfy the beliefs that students have diverse learning abilities, and a fair and equitable education system would be necessary to reach all students (Lehr, Moreau, et al., 2004). This premise has slightly evolved and today, according to the U.S Department of Education's definition, an alternative high school is "a public elementary/secondary school that 1) addresses needs of students that typically cannot be met in a regular school, 2) provides nontraditional education, 3) serves as an adjunct to a regular school, or 4) falls outside the categories of regular, special education, or vocational education" (U. S. Department of Education, 2003, p. 63). Within this definition, there is diversity in the programs offered by alternative high schools, from quite flexible with innovative curriculum that are voluntarily attended to the programs that are structured to cater to the educational, social and emotional needs of students who cannot succeed in traditional schools due to truancy, disciplinary issues or learning disabilities (Raywid, 1994). Alternative high schools are characterized as being small in

size, having a flexible structure, attending to individual student needs, and providing more student-teacher interaction (Aron, 2003).

In the last twenty years the number of alternative education programs has dramatically increased (Unruh, Bullis, et al., 2007). According to the survey of the Department of Education, in the academic year 2006-2007, there were more than 6638 public alternative school programs with an enrollment of more than half a million students (Hoffman, 2009). This demand continues to grow, often exceeding capacity to serve students (Kleiner, Porch, et al., 2002). In Minnesota, there has been a tremendous growth in the enrollment in alternative high schools; in the ten years between 1990/1991 and 2000/2001, enrollment has increased from 13,800 students to 152,361 students (Lehr, 2002). Alternative high schools have a particularly high concentration of minority and below poverty level students; sixty two percent of schools have more than 50% minorities and close to half (42%) have more than 20% of students below the poverty line (Kleiner, Porch, et al., 2002; USDE, 2003). While there are many types of alternative high schools that enroll K-12 students, the majority of districts (88-92%) enroll students in grades 9$^{th}$ through 12$^{th}$ (Kleiner, Porch, et al., 2002). Students either return to their "home" school after the remedial period or graduate from the alternative high schools, thus the enrollment period for each student is relatively short with a third of students staying for 7 months to a year and another 29% for a year through graduation (Lehr, Moreau, et al., 2004). Unfortunately, the nationally-representative studies that examined the school food environment have included only traditional public schools, thus information regarding the food environment in alternative high schools at a national level is not available (O'Toole, Anderson, et al., 2007; Fox, Gordon, et al., 2009). National efforts to change the food environment in schools in order to uniformly improve diet

quality and health outcomes for all youth should also include alternative high school students.

Alternative High School Students: Who are they?

Information on alternative high school students is fairly limited due to very few studies conducted with these students. The national 1998 Alternative High School Youth Risk Behavior Survey (ALT-YRBS) is the only national survey regarding these youth. The ALT-YRBS included a total of 8,918 students in grades 9-12 in the 50 states and the District of Columbia (Grunbaum, Kann, et al., 2000). A study compared health-related behaviors of alternative high school with traditional high school students using two nationally-representative studies, the 1998 ALT-YRBS and the 1997 Youth Risk Behavior Surveillance survey (YRBS) (Grunbaum, Lowry, et al., 2001). Although sample demographic distribution depends on study design and recruitment method, due to the national scope of the two studies, an attempt was made to compare demographic factors between the 1998 ALT-YRBS and 1997 YRBS studies. Age and grade levels of students attending alternative high schools were higher than students in traditional high schools; close to 60% of students in alternative high schools were 17 years and older compared to 42% of students in traditional high schools and the majority of students (62%) in alternative high schools were enrolled in grades 11-12 compared to 52% in traditional schools (Grunbaum, Lowry, et al., 2001). The racial distribution also differed between the two types of schools with 45% of students in alternative high schools being African American and Hispanic compared to only 22% in traditional high schools (Grunbaum, Lowry, et al., 2001). In a study with a smaller sample of alternative high school students, a little more than a third lived with a single parent, a fifth reported their

socioeconomic status as nearly poor and 70% had parents with high school education or less (Escobar-Chaves, Tortolero, et al., 2002).

Comparison of the two nationally-representative studies indicated that the only health behaviors that students in the two types of schools did not differ were in fruit and vegetable intake and in enrollment in a physical education class (Grunbaum, Lowry, et al., 2001). In both types of schools, about 71% of students ate less than 5 servings of fruits and vegetables per day (Grunbaum, Lowry, et al., 2001). Regarding health-risk behaviors, the study showed that among alternative high school students 70% currently used cigarettes, 65% used alcohol, and 54% used marijuana, while only 35%, 51%, and 26%, respectively currently used these substances among traditional high school students (Grunbaum, Lowery, et al., 2001). In the Safer Choices 2 study of 940 students attending alternative high schools, 27% used marijuana in the past 30 days (Tortolero, Markham, et al., 2008). Furthermore, student in alternative high schools were more likely than students in traditional high schools to engage in health-risk behaviors, including violence, tobacco, alcohol, and other drug use, sexual behaviors, dietary behaviors, and physical inactivity; one-third of alternative high school students engaged in seven or more of these behaviors compared to only 8.8% of students in traditional high schools (Grunbaum, Lowery, et al., 2001). As reported by key informants in alternative high schools in Minnesota, the most important issue facing students was substance use with tobacco being the most prevalent, followed by marijuana, and alcohol (Kubik, Lytle & Fulkerson, 2004).

To date, there have been few studies assessing dietary practices of alternative high school students and the food environment in alternative high schools. The two qualitative studies included focus groups of students and school administrators of alternative high schools located in Minnesota (Kubik, Lytle & Fulkerson, 2005; Kubik,

Lytle & Fulkerson, 2004). According to the school administrators, unhealthy eating habits were of the issues facing alternative high school students (Kubik, Lytle & Fulkerson, 2004). The research also indicated that the most important factors reported by students that influenced their food choices were cost, availability, and convenience. Students also reported being dissatisfied with the food at school, including the school lunch. As a result, they either skipped lunch or snacked on vending machine food or purchased foods from off campus sources (Kubik, Lytle & Fulkerson, 2005). The most frequent dietary practices were consumption of sodas and fast food, however they also stated that if healthful items were available in school vending machines or if the adults in their lives ate healthier, they would eat healthy as well (Kubik, Lytle & Fulkerson, 2005). According to the 2007 Minnesota Student Survey of Alternative Schools, 54% of students consumed 2 servings or less of either fruit, fruit juice or vegetable the day prior to the survey and 79% had 1-2 glasses or less of milk (33% had no milk); only 14% of the students had 5 or more daily servings of fruit juice, fruits and vegetables (2007 Minnesota Student Survey-ALC). In regards to sugar-sweetened beverages, 73% and 35% of students reported having 1-2 glasses or more of soda (27% had no soda) and sports drinks, respectively (2007 Minnesota Student Survey-ALC). Students attending alternative high schools were also less likely to engage in vigorous physical activity and participate in spots teams (Grunbaum, Lowery, et al., 2001). Using the same population examined in the present research, Kubik and colleagues found that 42% of students were overweight (Kubik, Davey et al., 2009).

Although there is limited awareness of the factors related to dietary practices of students attending alternative high schools, the information available underscores the importance of their food environment and emphasizes the impact of the social and physical environment in students' food choices and eating behaviors. Furthermore,

previous findings indicated that minority and low income youth are at higher risk of unhealthy dietary practices (Troiano, Briefel, et al., 2000; Miech, Kumanyika, et al., 2006; Harris, Gordon-Larsen, et al., 2006), experience higher rates of overweight (Ogden, Carroll, et al., 2006) and score the lowest in leading health indicators (Harris, Gordon-Larsen, et al., 2006) compared to non-minority high income youth. It is also important to note that while alternative high school students still attend high school, many of them are above the age of 18 years, and a number of them, despite their age may assume adult responsibilities such as supporting themselves financially, and caring for younger siblings or their own children. Thus, it is possible that they share characteristics of both older adolescents and young adults. Given the increase of the number of alternative high schools and the population of their students who are at-risk for various health outcomes, studies on the dietary practices of alternative high school students and the factors influencing their eating behaviors are urgently needed. These studies will guide health programming interventions in alternative school settings that will focus on improving health related outcomes of the students attending these schools.

**Chapter summary**

This chapter started by providing a broad overview of characteristics of adolescent development and their influence on behavior, especially eating behavior. Socioenvironmental factors and their impact on adolescent development were also described. A literature review on prevalence and correlates of dietary practices, especially as they relate to factors such as sociodemographic, school food environmental and substance use were provided. This chapter also described characteristics of alternative high schools and students attending these schools, since

prevalence of dietary practices and their associations with the above factors were examined in a group of students attending alternative high schools.

# Chapter 2. Research Purpose and Hypotheses, Conceptual Framework and Description of Study and Data Collection Methods

## Research Purpose

The purpose of this research is twofold: 1) to examine prevalence of selected dietary practices, substance use (cigarette, alcohol, and marijuana) and student reported eating and drinking opportunities during the school day among alternative high school students, and 2) to examine associations between the selected dietary practices and demographic factors, substance use and student eating and drinking opportunities. The dietary practices include consumption of regular soda, sports drinks, other-sugar sweetened beverages, high fat foods, fruits and vegetables, and fast food restaurant use. Findings from this research will contribute to the limited body of literature regarding dietary practices among alternative high school students and will guide the development of school-health programming that support healthy eating behavior among at-risk youth attending alternative high schools. The aims of this research have been addressed in three separate manuscripts. The specific objectives and hypotheses for each manuscript are listed below:

## Research Objectives and Hypotheses

Sociodemographic Differences in Selected Eating Practices Among Alternative High School Students (Manuscript 1)

*Research Objectives*

1. To explore prevalence of dietary practices, such as consumption of regular soda, sports drinks, other sugar-sweetened beverages, high fat foods, fruits and vegetables, and fast food restaurant use among alternative high school students.
2. To examine differences of dietary practices by gender, race/ethnicity, and socioeconomic status.

*Hypotheses*

1. There will be high prevalence in the consumption of all sugar-sweetened beverages, high fat foods, and fast food restaurant use and low prevalence in the consumption of fruits and vegetables. Compared to students attending traditional high schools, alternative high school students will more frequently consume regular soda, high fat foods, and use fast food restaurants more frequently; consumption of fruits and vegetables will be similar to students in traditional schools.
2. Higher consumption of sweetened beverages will be observed among black and male students than among white students and students in other race/ethnic groups, adjusted for SES and age.
3. There will be racial differences in dietary fat intake and fast food restaurant use, with black students having higher intakes than white students and students in other race/ethnic groups, adjusted for gender, age, and SES.
4. Fruit and vegetable intake will be lower than the recommended dietary guidelines for all students. Fruit and vegetable consumption will be lower among white than

black students and students in other race groups, adjusted for gender, age, and SES.

5. Students in lower socioeconomic status will have higher consumption of sugar-sweetened beverages and fast food restaurant use than students in higher socioeconomic status, adjusted for race/ethnicity, gender, and age.

Eating and drinking opportunities during the school day and associations with selected dietary practices in alternative high school students (Manuscript 2).

*Research Objectives*

1. To examine prevalence of student reported eating and drinking opportunities during the school day.
2. To assess correlations between eating and drinking opportunities and dietary practices, specifically sweetened beverages, high fat foods, fruits and vegetables and fast food restaurant use among alternative high school students. The study also examines the associations between student perceived availability of healthful school food and the same dietary practices.

*Hypotheses*

1. Higher eating and drinking opportunities during the school day will be associated with higher consumption of regular soda, sports drinks, other sugar-sweetened beverages, high fat food, and fast food restaurant use, and with lower consumption of fruits and vegetables.
2. Higher student perceived availability of healthful school food will be associated with lower consumption all sugar-sweetened beverages, high fat food, fast food restaurant use, and with higher fruit and vegetable intake.

Dietary practices and multi-substance use among students attending alternative high schools. Findings from the Team COOL pilot study (Manuscript 3)

*Research Objectives*

1. To examine prevalence of cigarette, alcohol, and marijuana use and prevalence of multi-substance use among alternative high school students.
2. To explore associations between each substance as well as multi-substance use and dietary practices, such as consumption of regular soda, sports drinks, other sugar-sweetened beverages, fruits and vegetables, and fast food restaurant use among alternative high school students.

*Hypotheses*

1. Higher use of cigarettes, alcohol, and marijuana will be associated with higher consumption of regular soda, other sugar-sweetened beverages, and high fat foods and lower consumption of fruits and vegetables.
2. Higher use of cigarettes will be associated with higher consumption of fast food restaurant use.
3. Higher use of multiple substances will be associated with higher consumption regular soda, other sugar-sweetened beverages, high fat foods, and fast food restaurant use and lower consumption of fruits and vegetables.

## Conceptual Framework

Urie Bronfenbrenner's ecological model guided the development of the conceptual framework of this dissertation. The objectives of this section are: 1) to highlight Urie Bronfenbrenner's ecological model, and 2) to discuss how this theory relates to demographic, school food environmental factors and substance use among youth.

### Ecological Model and Application of the Theory

Urie Bronfenbrenner's ecological model explains human behavior by environmental interconnections and interaction between individuals and environments (systems) and within systems (Bronfenbrenner, 1979). This interaction of systems with the individual denotes that human behavior influences and is being influenced by the social environment (McLeroy, Bibeau, et al., 1988). The ecological model is represented by nested circles or settings that define four levels of systems (microsystem, mesosystem, exosystem, macrosystem). The inner most level represents the person's immediate settings and her relations with these settings such as family, peers and school (Bronfenbrenner, 1979). In this setting the individual is an active participant engaging in activities, interpersonal relations in a particular material setting that contains the individual (Bronfenbrenner, 1977; Bronfenbrenner, 1979). The next level of system is called the mesosystem and is defined as the interactions between systems, such as family and school. The third system of the ecological model is the exosystem and is defined as a set of systems more distant to the individual, do not contain the individual and where the individual is not an active participant in the changes that occur in those systems. Examples of settings of the exosystem are media, district school councils, neighborhoods, and receipt of public assistance. The macrosystem "refers to the

overarching institutional patterns of the culture or subculture, such as the economic, social, educational, legal, and political systems, of which micro-, meso-, and exosystems are the concrete manifestations" (Bronfenbrenner, 1977). While there is the opportunity for the individual to reciprocally interact with her more proximal settings, the microsystem and the mesosystem, there is limited if any interaction with the exosystem and macrosystem. In the ecological model, as in the Social Cognitive Theory, reciprocal determinism is key in describing the interrelationship between behavior and environments; as the environment influences people's behavior, people can modify their environment as well (Story, Neumark-Sztainer, et al., 2002).

The Figure 1 is a diagrammatic depiction of the independent and dependent variables proposed in this research as they are guided by the ecological model. The overall focus of the research is to examine how demographic, environmental, and behavioral factors are related to dietary practices. Demographic factors such as age and gender are proximal factors that describe the individual. Gender differences have been observed in eating behaviors and use of substances. With respect to age, older adolescents use substances more frequently than younger adolescents and have more autonomy and financial means to make their own food purchasing decisions. In addition, older adolescents consume food away from home and with friends more frequently than younger adolescents. Race, although a factor proximal to the individual is closely related to cultural norms and beliefs that guide food-related behaviors (Kumanyika, 2008). Thus, race/ethnicity that defines cultural patterns is part of the macrosystem because it influences the other systems exosystem, mesosystem, and microsystem. Cultural norms around food and eating behaviors influence food preparation methods and ingredients, and food purchasing and eating venues. Studies have found excess availability of fast food establishments and limited availability of healthier foods, especially in urban,

racially diverse communities (Morland, Wing, et al., 2002). In contrast, more food choices and more access to lower cost foods were found in wealthier neighborhoods (Popkin, Duffey, et al, 2005). Often minority groups are more likely to be eligible for school free/low-cost lunch programs, and schools that enroll high percent of disadvantage minority students may lack policies that foster a healthy food environment (Kumnyika, 2008). Eligibility to participate in free/low-cost lunch program describes the students' socioeconomic status is included in the mesosystem because it is part of the school setting and the student can exercise the choice whether to participate or not. On the other hand, receipt of public assistance which also describes the students' socioeconomic status is part of the exosystem where the student is indirectly affected through the neighborhood and availability of healthful food choices

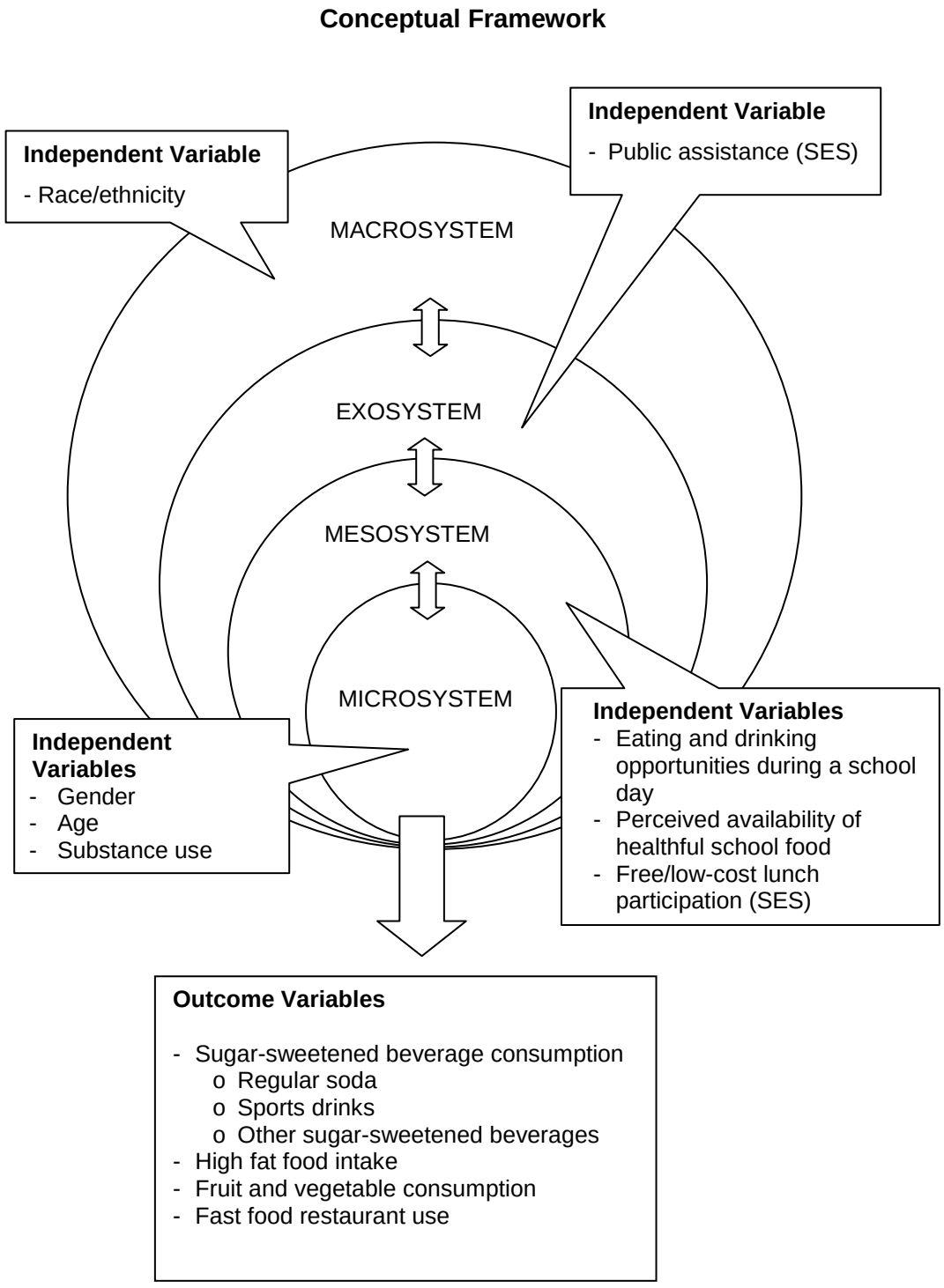
The school is part of the mesosystem and is one of the most proximal environments to children. School exerts its influence on students through learning, modeling, and peer support. The food choices available at school and school food policies and practices can be influential in shaping eating behaviors for students. As students transition from elementary to secondary school their eating and drinking opportunities increase and they acquire more freedom to obtain food from sources outside the school grounds. Open campus policies often encourage students to purchase food from nearby restaurants or convenience sources increasing the eating and drinking opportunities beyond the school meal plan. Furthermore, high density of fast food restaurants have been found in racially and socioeconomically diverse neighborhoods (Sallis & Glanz, 2006; Zenk & Powell, 2008; Block, Scribner et al., 2004), thus students in schools located in these neighborhoods have more choices for foods that contribute to poor diet quality. Studies that examined the neighborhood food environment found higher concentration of fast food and convenience stores within

walking distance from public secondary schools than in neighborhoods without schools (Austin, Melly et al., 2005; Zenk & Powell, 2008), and having a public high school versus a middle school in the neighborhood increased the number of fast food restaurants by 1.32 times (Zenk & Powell, 2008). The high concentration of fast food and convenience food sources within walking distance to schools and the open campus policies in high schools are examples of two environmental settings that work in concert to influence and encourage unhealthful eating behavior. Health and nutrition interventions can influence students' eating and health behavior and attitudes and in turn empower them to change their food environment.

Substance use is prevalent among adolescents and especially among at-risk youth (CDC-YRBSS, 2008; Grunbaum, Lowry et al., 2001). Studies also show that living in neighborhoods with higher income inequalities increases the likelihood to use alcohol and marijuana (Galea, Ahern et al., 2007; Hill, Agel 2005). Also, students who attended schools with high reduced/low cost lunch program participation were 5.86 times more likely to smoke than students in schools with low reduced/low cost lunch program participation (Scarinci, Robinson et al., 2001). Studies found covariation of substance use indicating that adolescents who smoke cigarettes also use alcohol and marijuana (Burke, Milligan et al., 1997; Paavola, Vartiainen et al., 2004; Everett, Warren, et al., 1999). Covariation of substance use with unhealthy eating patterns has also been observed among adolescents (Neumark-Sztainer, Story et al., 1997; Kvaavik, Andersen et al., 2004; Larson, Story, et al., 2007). Given the strong evidence of the link between socioenvironmental factors and substance use and the covariations of substance use with poor diet quality, it is clear that students attending alternative high schools are at high risk of engaging in substance use and having poor quality diets.

The construct of reciprocal determinism that is a part of Bronfenbrenner's ecological model where individuals and environments influence one another is essential in designing interventions that focus on changing adolescent behaviors through changes in the school environment. As the school becomes more influential through health and nutrition policies and through the food that is available to students, the students can influence the school food environment through organized efforts and councils. Student dietary beliefs and attitudes in turn can influence family, peers and the school food environment. Therefore, the concept of reciprocal determinism emphasizes the importance of involving and gaining acceptance of the immediate players, such as students and school staff in making sustainable environmental changes.

**Figure 1. Personal, behavioral and environmental influences on dietary behaviors of students attending alternative high schools**



## Description of Study and Data Collection Methods

This section of the chapter provides a brief description of the Team COOL (Controlling Overweight and Obesity for Life) pilot study and a description of the study design as it pertains to the dissertation. Student recruitment and data collection methods as well as measures used in this research are also described.

### The Team COOL Pilot Study

Data for this research has been drawn from Team COOL (Controlling Overweight and Obesity for Life) pilot, a two-year, school-based, multi-component, obesity prevention trial that aimed at evaluating the acceptability and feasibility of a health and physical activity intervention in alternative high schools to either promote weight loss or prevent further weight gain (Principal Investigator: Dr. Marti Kubik). The study was funded by the National Institutes of Health (NIH). The Team COOL pilot study is a group randomized trial where schools were randomized to treatment condition (three intervention and three control schools) in the greater Minneapolis/St. Paul Metropolitan area. The study started in the fall of 2006 and continued until spring of 2008. A convenience sample of six alternative high schools located in the Twin Cities metropolitan area was recruited after previously expressing interest in participating in the Team COOL pilot study. The six schools were matched in pairs according to school size and location. After baseline measurements, randomization to condition occurred from within each of three matched pairs. The control schools were given a monetary incentive for their participation in measurements. A letter and other informational material about the study were sent to school principals and were followed by a phone call by the study's principal investigator who answered questions and invited them to participate in the study. Two more student measurements were conducted; one immediately following the

intervention, and another one 12 months after the baseline measurement, for a total of three measurements. Student measurements consisted of student survey, student height and weight measures, physical activity monitor (actigraph) distribution to a subset of students, and student physical activity record (3DPAR) survey to students who received the activity monitor; 3DPAR was administered only in measurement times 1 and 2. All study procedures were approved by the University of Minnesota's Institutional Review Board Human Subjects Committee. Additional details about the study design are described by Kubik and colleagues (Kubik, Davey, et al., 2009).

## Study Design for Dissertation Research

This research used a cross-sectional design of the baseline data collected in the fall of 2006 before the start of the intervention and before randomization of schools to intervention and control conditions. The cross-sectional nature of the study design is appropriate for examining associations between the independent and dependent variable of interest at the population level. A cross-sectional study design is deemed appropriate for this study, to explore associations of dietary behaviors with personal, behavioral and school food environmental factors, since knowledge of these factors is very limited among students attending alternative high schools in the United States.

## Student Recruitment and Sample Description

All students attending the six alternative high schools were eligible for participation. Team COOL pilot study staff, after prior permission from the school principal, visited the schools one to two weeks prior to measurement day to invite students to participate in measurements. The study and measurement procedures were described and parental consents were distributed to students who were under the age of

18 years. Any questions or concerns were addressed during that visit. Confidentiality of the data was expressed to students. A list of study generated identification numbers with no links to personal identifiers were created and randomly assigned to each student participant at the time of survey administration, after signed consents were received.

Based on student enrollment records and average attendance rates for each school, a total of 406 students were eligible to participate at baseline, and 145 students participated by completing the student survey and having their height and weight measured. Student enrollment across the six schools varied from 27 to 145 students (mean: 102 students). Among participants, 52% were male and 63% were younger than 18 years (Mean: 17.2; Range: 14.0 to 19.9). There was a high percentage of minority students (mean=64%: range: 31% to 96%) and students receiving free/low-cost lunch (mean=61%: range: 40% to 96%).The racial/ethnic distribution was as follows: 39% white, 32% black, and 29% other. The 'other' racial/ethnic category included the following groups: American Indian or Alaskan Native (1%); Asian, including Cambodian, Hmong, Korean, Laotian, and Vietnamese (6%); Hispanic or Latino (9%); multi-ethnic non-Hispanic (10%); other (3%).

The participation rate across schools was 36% (range: 18% to 100%). This rate is considered relatively low compared to other school studies with adolescents. However, attendance in alternative high schools is quite variable, therefore the study participation rate was derived by multiplying the prior year's attendance rate with a school's 2006-2007 student enrollment (MDE 2007). Using the average adjusted attendance of 68 students (range: 16 to 107), the participation rate across schools was 36% (range: 18% to 100%) (Please see Table 2.1 for a school-level participation rate). We cannot assume that the demographic distribution of the students attended was the same as the students

enrolled, therefore using the student enrolled data to derive the school demographic distribution was considered a more suitable approach.

The gender distribution of Team COOL sample was very similar to the students enrolled in 2006-2007 school year. However, Team COOL sampled a lower percentage of Black students and a higher percentage of other minorities as compared to the school enrollment (Table 2.2). However, overall percent of minority students were similar for Team COOL sample and overall school enrollment.

Table 2.1 Team COOL student survey participation rate

| School ID | Student enrollment as of 10/1/06 | Average attendance rate (2005-2006) | Adjusted daily attendance No. of students | Team COOL survey participation | Team COOL survey participation rate |
|---|---|---|---|---|---|
| A | 72 | 89.9 % | 65 | 20 | 31 % |
| B | 117 | 75.6 % | 88 | 22 | 25 % |
| C | 27 | 60.2 % | 16 | 16 | 100 % |
| D | 113 | 48.3 % | 54 | 37 | 69 % |
| E | 142 | 53.5 % | 76 | 14 | 18 % |
| F | 142 | 75.5 % | 107 | 36 | 34 % |
| Total | 613 | 66.2 % | 406 | 145 | 36 % |

Table 2.2 Student distribution by gender, race/ethnicity and free/reduced lunch participation

| | | School ID | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Team COOL overall rate | Overall rate * | A | B | C | D | E | F |
| Gender (%) | | | | | | | | |
| Male | 52% | 51% | 57% | 53% | 55% | 53% | 45% | 51% |
| Female | 48% | 49% | 43% | 47% | 41% | 47% | 55% | 49% |
| Race/ethnicity (%) | | | | | | | | |
| White | 38% | 39% | 64% | 7% | 4% | 72% | 16% | 54% |
| Black | 32% | 42% | 17% | 72% | 81% | 13% | 63% | 24% |
| Other | 29% | 19% | 19% | 21% | 15% | 15% | 21% | 12% |
| Free/reduced lunch (%) | 60% | 56% | 44% | 85% | 96% | 46% | 52% | 40% |

* Overall rate was calculated using student enrollment data as of 10/1/06

Data collection methods

*Student Measurements*

This research used only items from the student survey for the assessment of the associations between student dietary practices and demographic, school-food environmental factors and substance use. Student participation in measurements was voluntary and was open to all students who were present at school in the measurement day. Surveys and height and weight measures were administered by trained study staff. Prior to survey administration, study staff introduced the study and measurement procedures and let the students know that participation was voluntary and responses were confidential; students reviewed and signed a student consent form. Staff collected all student consent forms and signed parental consent forms from students who were under the age of 18 years and chose to participate in measurements. The Team COOL survey was a self-administered paper and pencil survey and measured demographic, personal, behavioral and school-related social-environmental factors associated with dietary and physical activity practices of adolescents. It took the students about 30 - 40 minutes to complete the surveys.

*Key Informant Interviews*

The information collected from the key informants was not used in the quantitative part of this research, instead it was included in the discussion of the second study to provide a school level perspective of the school food related policies and practices. Key informant interviews were conducted with a principal, assistant principal or a health counselor of each of the six schools, after interviews were scheduled by the study principal investigator. The interview took place prior to randomization to treatment

condition. A trained interviewer conducted the interviews in person following a semi-structured interview guided by a Team COOL standardized form. A school staff consent form was signed by the interviewee indicating agreement to participate. After the conclusion of the interview the school informant received a $10.00 gift certificate. The questions in the key informant interview addressed topics pertaining to the school food environment and availability of various food and beverage sources such as school breakfast and lunch program, school stores, snack and beverage vending, whether the students could have access to neighborhood food sources during the school day and school food practices and policies. Forms were reviewed for completeness and were edited following the interview.

## Measures

This section describes the measures that have been used in the three studies included in this dissertation. All the dependent and independent variables are depicted in the conceptual framework this research (See Figure 1, page 71)

### *Dependent variables*

***Regular soda consumption.*** Participants were asked to report their consumption over the past month with the following question: “Over the past MONTH how many times did you drink regular soda pop (not diet)?

***Sports drink consumption.*** Participants were asked to report their consumption over the past month with the following question: “Over the past MONTH how many times did you drink sports drinks like Gatorade or Powerade?

***Other sugar-sweetened beverage consumption*.** Participants were asked to report their consumption over the past month with the following question: “Over the past MONTH how many times did you drink sweetened beverages like kool-aid, fruit drinks, lemonade or energy drinks (like Red Bull)? For each beverage question the response categories were the same. Ten response categories were: 1) Never, 2) Less than once a WEEK, 3)1-2 times a WEEK, 4)3-4 times a WEEK, 5) 5-6 times a WEEK, 6)1 time a DAY, 7) 2 times a DAY, 8) 3 times a DAY, 9) 4 times a DAY, and 10) 5 or more times a DAY.

***High fat food intake.*** A previously validated 17-item fat screener developed by Block and colleagues (2000) was used to assess high fat food intake. Students were asked, “Think about your eating habits over the past year. About how often do you eat each of the following foods?” Examples of high fat food items included various meats, hot dogs, fried chicken, pizza, whole milk and cheese, French fries, and doughnuts. Five response categories ranged from ‘1 time a month or less’ to ‘5 or more times a week.’ The data were recoded to represent times a week and modeled as a continuous variable (Mean: 26.1; Range: 4.25-64.5). The Cronbach’s alpha for the study sample was 0.89. Students whose responses were greater than 3 standard deviations (SD) from the mean were excluded from the analysis (n=2). Higher values indicate more servings a week of high fat food consumption.

***Fruit and vegetable intake.*** Intake of fruits and vegetables was assessed with a previously validated 6-item fruit and vegetable screener (Field, Colditz, et al.,1998). Students were asked: “Think about your usual eating habits over the past year. About how often do you eat each of the following foods and beverages?” The items included 100% fruit juice, fruits, vegetables, green salad, potatoes excluding French fries, and carrots. Six response categories ranged from ‘Less than once a week’ to ‘5 or more

times a day.' Data were recoded as daily servings and modeled as a continuous variable (Mean: 3.6; Range: 0-24). The Cronbach's alpha for the study sample was 0.85. Students whose responses were greater than 3 SDs from the mean were excluded from the analysis (n=2). Higher values indicate more servings a day of fruit and vegetable consumption.

***Fast food restaurant use.*** Frequency of fast food restaurant use was assessed with the question, "Outside of the school day, during a normal week (including weekend days), how many times do you eat or drink something from a fast food restaurant, like McDonald's, Taco Bell or Pizza Hut?" Six response categories ranged from 'Never' to 'More than 7 times.' The data were recoded to represent times per week and modeled as a continuous variable (Mean: 2.8; Range: 0-8). Higher values indicate more times a week of eating or drinking something from a fast food restaurant.

*Independent Variables*

***Student eating and drinking opportunities during the school day scale.*** A 12-item scale was adapted from a previously tested scale used by Kubik and colleagues (Kubik, Lytle, et al., 2005).

Students responded to the question "During a normal school week, how many days per week do you…." Some of the items relating to eating and drinking opportunities included 'Get lunch at a fast food restaurant?', 'Get lunch at a convenience store, gas station or concession stand?', 'Get food from a school vending machine or school store?', 'Eat in the hallways at school', 'Eat in the classrooms at school', 'Get food as an incentive or reward from school staff', 'Eat "free food" brought to school by school staff.' For each item, six response categories represented number of days per week students had the eating and drinking opportunities and ranged from 0 to 5 days. The mean scale score

was 16.8 (SD=10.3); Range: 0 to 57. Items were summed, with a higher score indicating more eating and drinking opportunities. The Cronbach's alpha was 0.82.

***Perceived Availability of Healthful School Food Scale.*** A six-item scale was adopted from French and colleagues (French, Story, et al., 2004). Students responded to the question "How strongly do you agree with the following statements"? The six-items included in the question were 'There is often healthy food for sale at my school', 'I can usually get fresh fruit at my school', 'I can usually get fresh vegetables at my school', 'The healthy food sold at my school tastes bad', 'It would be hard for me to buy tasty, healthy food at my school', 'My friends usually eat healthy foods at school.' Items were scored on a five-point Likert-type scale, with responses ranging from 1=strongly agree to 5=strongly disagree. The mean score was 17.2 (SD=4.1; Range: 8 to 27). Four items were recoded so that higher scores indicate a healthier food response. The Cronbach's alpha was 0.71.

***Substance use.*** A single item adopted from the Youth Risk Behavior Surveillance System (YRBSS) was used to measure frequency of each substance (cigarette, alcohol, and marijuana use) during the past year. The measure demonstrated good reliability (Brenner, Kann, et al., 2002) and has been used in other studies with adolescents (Larson, Story, et. al., 2007). The response categories were 'never', 'a few times', 'monthly', 'weekly', or 'daily.' Categories were collapsed to 'Never', 'Frequent, but not daily use', and 'Daily use' to describe only frequency of substance use. However, for the analysis examining associations between frequency of each substance and dietary practices, each substance was used as a continuous variable. To create the single multi-substance use variable, the original responses of each substance were first dichotomized to 'never' or 'ever' having used each substance during the past year. A four-category multi-substance use variable was then created by summing the newly

created dichotomized substance variables (cigarette, alcohol, and marijuana). The four categories representing multi-substance use in the past year included: 1) never used any substance, 2) used any one substance, 3) used any two substances, and 4) used all three substances.

***Demographic Characteristics.*** Gender, age, race/ethnicity and socioeconomic status (SES) were included in the models as potential confounders. Age and gender were obtained from school records; age was modeled as a continuous variable. Participants self-reported their race/ethnicity in response to a single item on the survey. "Do you think of yourself as…. (You may choose more than one) American Indian or Alaskan Native, Asian (including Cambodian, Hmong, Korean, Laotian, and Vietnamese), Black or African American, Hispanic or Latino, White, and Other." To ensure adequate sample size for analyses, the categories were combined into White, Black and other. The 'other' racial/ethnic category included the following groups: American Indian or Alaskan Native; Asian, including Cambodian, Hmong, Korean, Laotian, and Vietnamese; Hispanic or Latino; multi-ethnic non-Hispanic; other. SES was measured with the question "Do you get free/low-cost lunches at school?" (n=135). Response categories were 'Yes', 'No', and 'I don't know.' If the response was missing or 'I don't know,' the question 'Does your family get public assistance (welfare, food stamps or other assistance?) was used (n=8). A 'Yes' response indicated lower SES and a 'No' response indicated higher SES.

**Personal Involvement in the Team COOL Study**

I have been involved with the Team COOL pilot study since the spring of 2006 and have participated in every phase of the intervention including the formative research phase. More specifically, I was one of the team members who organized the student focus groups, developed the student focus group questionnaire, and conducted the focus group interviews prior to health curriculum development of the intervention. I have developed and reviewed various modules of the health curriculum. I organized the student measurement procedures and trained the study volunteers on protocols and skills development for the entire student measurement process. I organized the tools and materials for the measurements and administered student measurements. I reviewed and edited student surveys and physical activity surveys. During the intervention phase, I organized and prepared food items and other components for the classroom health curriculum and presided in physical activity classes. I also participated in the delivery of the classroom health curriculum. Along with the other study members, I organized and administered the school wide events to provide opportunities for students to try healthier snack alternatives and be more physically active. I was the liaison between Team COOL and community businesses and negotiated donations of food products for students participating in health and physical activity classes and in school wide events.

# Chapter 3. Manuscript 1: Sociodemographic Differences in Selected Eating Practices among Alternative High School Students

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## INTRODUCTION

Despite considerable evidence that diet is a major factor in the development of chronic disease (1,2) and organized national efforts to widely disseminate recommended dietary guidelines for a healthier lifestyle (3,4), the diets of most adolescents are low in fruits and vegetables and high in dietary fat, saturated fat, sweetened beverages and fast foods (5-7). Furthermore, unhealthy dietary habits coincide with the increase in overweight and obesity among adolescents and young adults (8,9). Among adolescents, dietary practices differ across gender, race/ethnicity, and socioeconomic status (SES) (10-12) however, findings from previous studies are not always consistent. In general, consumption of total fat and sweetened beverages has been found to be highest among black and male adolescents, and consumption of fruits and vegetables has been found to be lowest among white and male adolescents (10,12). Low SES was often associated with higher consumption of fat, and sugary beverages but lower consumption of fruits and vegetables (10,12).

Almost all studies assessing the dietary practices among adolescents have targeted students attending traditional public or private high schools (10,13,14), however, not all youth are captured in these studies. Youth at risk of academic failure often attend alternative high schools (AHS), but relatively few studies have examined dietary practices of AHS students (15,16). Alternative high schools utilize a non-traditional teaching approach for students who are at risk of school failure, have behavioral problems or have been suspended or expelled from regular high schools (17). According to the Department of Education, for the 2003-2004 academic year, there were 4,788 public alternative school programs in the U.S. with an enrollment of 533,948 students (18). Among alternative high schools, roughly two-thirds (62%) of schools enroll more

than 50% minorities and close to one-half enroll greater than 20% of students below the poverty line (19). Importantly, minority and low income youth are at higher risk of unhealthy dietary practices (6,20,21), experience higher rates of overweight (22) and score the lowest in leading health indicators (21) compared to non-minority high income youth. Limited information is available about the weight status of AHS students. Using the same population examined in the present study, Kubik and colleagues found that 42% of students were overweight; more than one-half of females were overweight (23). Health programming interventions focusing on improving diet and physical activity have the potential to greatly impact the weight status of AHS students.

Findings from the 1998 Alternative High School Youth Risk Behavior Surveillance Survey indicated a higher prevalence of risk behaviors, including violence-related injuries, risky sexual behavior, substance use and suicidal behaviors, and greater than 20% prevalence of multiple risk behaviors among AHS students as compared to students attending regular high schools (15). Students in both traditional and alternative high schools reported low consumption of fruits and vegetables, with only 28% of AHS students and 29% of traditional high school students consuming ≥ 5 servings of fruits and vegetables a day (15). Other dietary practices, such as consumption of sugar-sweetened beverages, high fat foods and fast food restaurant use have not been assessed in AHS students. To date, limited research has focused on understanding determinants of dietary practices among students attending AHS and interventions targeting the dietary practices of AHS students have not been conducted.

This study examined selected dietary practices of a sample of students attending alternative high schools. Dietary practices included sugar-sweetened beverage consumption, high fat food intake, intake of fruits and vegetables and fast food restaurant use. The study also assessed the association between dietary practices and

demographic characteristics that included gender, race/ethnicity and SES. The findings of this study will advance knowledge regarding the dietary practices of AHS students and contribute to the development of school health programming in the alternative school setting that supports student development of healthy eating behaviors.

## METHODS

### Study Design

The current study utilized a cross-sectional design. Data for this study were collected as part of the Team COOL (Controlling Overweight and Obesity for Life) pilot study, an alternative school-based, multi-component diet and physical activity intervention trial to promote healthy weight loss or prevent excess weight gain among AHS students. This study utilized baseline data collected in fall 2006 prior to randomization of schools to intervention and control conditions.

### School and Student Sample

A convenience sample of four urban and two suburban alternative high schools in the Minneapolis/St. Paul metropolitan area participated in the study. Across all schools, enrollment ranged from 27 to 142 students (mean: 102 students). There was a high percentage of minority students (mean=64%; range=31% to 96%) and students receiving free/low-cost lunch (mean=61%; range=40% to 96%). All students enrolled in the schools were eligible to complete a survey and have their height/weight measured. Prior to scheduled measurement, study staff visited the schools to describe the measurement procedures, invite students to participate in the study and distribute parental consent forms to students who were younger than 18 years. Trained study staff administered the measurements after collecting student assents and parental consents

from those younger than 18 years. The self-administered student survey measured demographic, personal, behavioral and school-related social-environmental factors associated with dietary and physical activity practices of adolescents. Students who completed the survey and had their height and weight measured received a $5.00 gift card. All study procedures were approved by the University of Minnesota's Institutional Review Board Human Subjects Committee.

Across the six schools, a total of 145 students participated in the baseline data collection. Due to the variable nature of student attendance in alternative high schools, the study participation rate was derived by multiplying the prior year's attendance rate with a school's 2006-2007 student enrollment (24). Using the average adjusted attendance of 68 students (range: 16 to 107), the participation rate across schools was 36% (range: 18% to 100%).

**Measures**

The following dependent and independent variables were examined in this study.

**Dependent Variables**

**Regular soda, sports drinks and other sugar-sweetened beverage consumption**. Regular soda, sports drinks and other sugar-sweetened beverages (fruit drinks, lemonade or energy drinks) were assessed by asking participants to report frequency of consumption of each type of beverage over the past month. Ten response categories ranged from 'Never' to '5 or more times a day.' For each beverage, the response options were dichotomized using the median value. The following categories were created: Regular soda: ≤ 3-4 times a week and ≥ 5-6 times a week; sports drinks: less than once a week and ≥ 1-2 times a week; other sugar-sweetened beverages: ≤ 1-2 times a week and ≥ 3-4 times a week.

**Fast food restaurant use**. Frequency of fast food restaurant use was measured with the question, “Outside of the school day, during a normal week (including weekend days), how many times do you eat or drink something from a fast food restaurant, like McDonald’s, Taco Bell or Pizza Hut?” Six response categories ranged from ‘Never’ to ‘More than 7 times.’ Responses were dichotomized to ≤ 1-2 times and ≥ 3-4 times using the median value.

**High fat food intake.** A previously validated 17-item fat screener developed by Block and colleagues was used to assess high fat food intake (25). Students were asked, “Think about your eating habits over the past year. About how often do you eat each of the following foods?” Examples of high fat food items included various meats, hot dogs, fried chicken, pizza, whole milk and cheese, French fries, and doughnuts. Five response categories ranged from ‘1 time a month or less’ to ‘5 or more times a week.’ A fat score was created by summing the responses of each question and modeling it as a continuous variable. The score ranged from 17 to 73 (Mean score: 43.6). Higher scores indicate a higher fat intake. The Cronbach’s α for the study sample was 0.87. Students whose responses were greater than 3 standard deviations (SD) from the mean were excluded from the analysis (n=2).

**Fruit and vegetable intake.** Intake of fruits and vegetables was assessed with a previously validated 6-item fruit and vegetable screener (26). Students were asked: “Think about your usual eating habits over the past year. About how often do you eat each of the following foods and beverages?” Fruit and beverage items included 100% fruit juice, fruits, vegetables, green salad, potatoes excluding French fries, and carrots. Six response categories ranged from ‘Less than once a week’ to ‘5 or more times a day.’ Data were recorded as daily servings and modeled as a continuous variable. The

Cronbach's α for the study sample was 0.85. Students whose responses were greater than 3 SDs from the mean were excluded from the analysis (n=2).

**Independent Variables**

Independent variables included gender, race/ethnicity and socioeconomic status (SES). Student gender was obtained from school records. Students were asked to report their race/ethnicity with the question: "Do you think of yourself as…. (You may choose more than one) American Indian or Alaskan Native, Asian (including Cambodian, Hmong, Korean, Laotian, and Vietnamese), Black or African American, Hispanic or Latino, White, and Other." To ensure adequate sample size for analyses, the categories were collapsed to White, Black and other. The 'other' racial/ethnic category included the following groups: American Indian or Alaskan Native (1%); Asian, including Cambodian, Hmong, Korean, Laotian, and Vietnamese (6%); Hispanic or Latino (9%); multi-ethnic non-Hispanic (10%); other (3%). For most students, SES was measured with the question "Do you get free/low-cost lunches at school?" (n=135). Response categories were 'Yes', 'No', and 'I don't know.' If the response was missing or 'I don't know,' the question 'Does your family get public assistance (welfare, food stamps or other assistance?) was used (n=8). A 'Yes' response indicated lower SES and a 'No' response indicated higher SES. Student age, modeled as a continuous variable, was included in all the models to assess significance; it was calculated from students' date of birth.

**Statistical Analysis**

Descriptive statistics were calculated for each dependent variable. Mixed model analysis of variance was used to examine associations between students' dietary practices and demographic variables in separate analyses for each dependent variable.

The school variable was included in the model as a random effect, accounting for the additional component of variance associated with a cluster sampling design where observations from students from the same schools may be correlated (27). PROC MIXED and PROC GLIMMIX procedures were utilized for continuous and categorical outcome variables, respectively. The final multivariate models included all three independent variables and were controlled for student age. Analyses were conducted using SAS statistical software, version 9.1, 2006, SAS Institute, Cary, NC, USA).

## RESULTS

Among students, 52% were male and 63% were younger than 18 years (Mean age: 17.26 years; range: 14.06 to 19.81 years). The racial/ethnic distribution was as follows: White 39%; Black 32%; other 29%. Sixty four percent of students were categorized as lower SES. Regular soda was consumed more than five to six times per week by more than one-half of the students (Table 3.1). Similarly, well over one-half of students consumed sports drinks and other sugar-sweetened beverages ≥1-2 times a week and ≥ 3-4 times a week, respectively (Table 3.1). Higher SES students had higher consumption of regular soda than lower SES students (OR: 2.36, p=0.027). Consumption of sports drinks ≥ 1-2 times a week was higher among black than white students (OR: 2.6, p=0.04) and consumption of other sugar-sweetened beverages ≥ 3-4 times per week was higher among black than white students (OR: 2.94, p=0.037).

One-half of the students reported eating or drinking something from a fast food restaurant at least 3-4 times a week (Table 3.1). In the adjusted model, black students were more likely than white students to eat or drink something from a fast food restaurant ≥ 3-4 times a week (OR: 3.64, p=0.007) (Table 3.2). Also, females were more

likely than males to consume regular soda (OR: 1.80; p=0.099) and to eat or drink something from a fast food restaurant (OR: 1.99, p=0.065).

The mean fat score for all students was 43.6 (SD=10.8) representing an estimated fat intake of >35% of calories (Table 3.3). Black students consumed high fat foods more frequently than white students (p=0.016) (Table 3.4). Twenty three percent of students consumed five or more daily servings of fruits and vegetables (males: 22%; females: 26%) with an average daily intake of 3.6 servings. In the multivariate analysis, no significant differences were observed in fruit and vegetable intake by gender, race/ethnicity or SES (data not shown).

## DISCUSSION

This study examined differences in consumption of sugar-sweetened beverages, high fat foods, fruits and vegetables and fast food restaurant use by gender, race/ethnicity and SES among students attending alternative high schools. Similar to general adolescent populations, the AHS students reported high consumption of sugar-sweetened beverages, high fat foods and low consumption of fruits and vegetables (6,10,28,29). However, a higher percentage of the AHS students consumed high fat foods and reported more frequent fast food restaurant use, and a lower percentage consumed ≥ 5 daily servings of fruits and vegetables, as compared to findings from previous studies with youth in the general US population (10,29,30). In this population of AHS students, only 23% consumed five or more daily servings of fruits and vegetables as compared to 29% of students attending traditional high schools (15).

Unlike previous studies, regular soda consumption was significantly higher among higher SES than lower SES students (12). A study that examined demographic differences of dietary behaviors among 3,201 adolescents between the ages of 11 and

20 years found high consumption of sugar added beverages among youth in low SES, as it was measured by a three-category scale of family income (12). The difference in the assessment of SES between our study and other studies may have contributed to the different outcome in the association of SES and dietary practices. In this study, females reported consuming regular soda almost twice as frequently as males, contrary to most studies indicating higher soft drink consumption among males (31,32). Although the observed association was not statistically significant at the less than 0.05 level, this finding is worthy of further investigation.

Black students had higher consumption of sports drinks and other sugar-sweetened beverages than white students, which is similar to other studies that found higher sweetened beverage consumption among black than other adolescents (12,33). There are individual and socio-economic factors characteristic of adolescents attending alternative high schools that may contribute to high consumption of sugar-sweetened beverages. According to a national study by Miech and colleagues (20), energy from sugar-sweetened beverage consumption among adolescents was significantly associated with higher poverty and older age (15-17 years); both of these factors are common among students in the present study. Consumption of sugar-sweetened beverages among youth is of great concern. National data suggest a 123% increase in the mean consumption of soft drinks among all children ages 6-17 years between 1977 and 1998 (34). This increase in soda consumption parallels the increase in childhood overweight and obesity (8,35).

Similar to other studies, black students in our study frequented fast food restaurants more often than all other students (6,29,36-39). Also, females frequented fast food restaurants twice as often as males; other studies have found mixed results in regards to gender and fast food restaurant use (29,36,40). In a study of black adults,

women and those in the youngest age group (20-39 years) reported a higher frequency of fast food restaurant use than males and participants in all other age groups (39). Since more than one-third of students in our study were older than 18 years, it is likely that they share similar behavioral patterns with young adults, including more financial independence. High fat food consumption was significantly higher among black students than white students. In addition, the black students' mean fat score of almost 50, which represents fat intake as a percent of daily calories, indicates a high fat intake of >35% of energy from fat (25,41).

Fast food consumption is strongly correlated with consumption of total fat, saturated fat, carbohydrates, and added sugars (40). While purchasing food at a fast food restaurant does not necessarily imply eating a high fat food item, according to previous findings, hamburgers and French fries top the list in terms of sales volume in fast food restaurants (42). This finding has been further supported by the significant positive association of frequency of fast food restaurant use and high fat food intake among adolescents (29,43). In a study by French and colleagues, fast food restaurant use of three days or more a week was positively associated with adolescent consumption of high fat foods and soft drinks and negatively associated with fruits and vegetables (29). In this study, more frequent fast food restaurant use and high fat food consumption among black students may point to the excess availability of fast food establishments and the limited availability of healthier foods, especially in urban, racially diverse communities (44).

A major finding that emerges from this study is that black students reported higher consumption of sugar-sweetened beverages, high fat foods and fast food restaurant use than all other students. Unhealthy dietary practices among black youth is of great concern considering the higher rates of overweight and obesity among this

group, as compared to all other youth (22). Although the diets of most adolescents can be improved, our findings emphasize that minorities, in particular will greatly benefit from nutrition education and health programming that focuses on fostering a school environment that promotes availability of healthy food alternatives.

In this study, the low percentage of AHS students that consumed five or more daily servings of fruits and vegetables was similar to findings from the Youth Risk Behavior Surveillance Survey 2005 representing adolescents in the general population (45). According to the 2005 Dietary Guidelines for Americans, 9 servings (4.5 cups) of fruits and vegetables a day are recommended for a reference 2000 calorie diet (46). Considering the 3.6 servings of fruits and vegetables consumed a day by AHS students in this study, even fewer students would meet the new dietary recommendations of fruits and vegetables. Since there were no demographic differences in the consumption of fruits and vegetables, all students would equally benefit from innovative ways to increase consumption of these foods.

The strengths and limitations of this research should be considered when interpreting the results. Strengths of this study included a diverse sample of adolescents with respect to gender, race/ethnicity and SES and the use of measures that have been previously tested in other adolescent populations. This study is one of the few studies to report dietary practices by gender, race/ethnicity and SES among alternative high school students. Even though the student participation rate was 36%, the demographic distribution of our sample closely resembled the study schools (male= 51%; black=42%, white=39%; low SES=56%). Limitations included the cross-sectional nature of the study that only considers the associations between demographic variables and dietary practices rather than a directional or causal path. Although the demographic distribution of our sample resembles national data of AHS students (15,19), it included only students

in the Twin Cities area of Minnesota, thus limiting the generalizability of the findings. The six-item questionnaire used to measure fruit and vegetable consumption assesses usual intake over the past year. As compared with the 24-hour dietary recalls, the six-item questionnaire underestimated the prevalence of fruit and vegetable intake among urban adolescents; however it performed equally to the Harvard Food Frequency Questionnaire (26). Although dietary practices may differ among racial groups, non-white and non-black groups were categorized as other due to the small sample size. Finally, students who decided not to participate may differ from the ones who participated in regard to demographic factors and dietary practices.

## CONCLUSION

The findings of this study indicated that students attending alternative high schools report many unhealthy dietary practices, with black students reporting higher consumption of sugar-sweetened beverages, high fat foods and fast food restaurant use than students of other races. Unhealthy dietary practices are strongly correlated with an increased incidence of chronic disease and overweight that are prevalent among minorities. It is essential for nutrition and health professionals to target their efforts, especially to female and minority youth, by providing innovative ways to increase intake of healthier foods and to adopt healthier lifestyles.

Alternative high schools provide access to many minority and low income youth and are especially suited as a setting to implement health promotion programs that reach high risk populations of youth. Larger scale studies with alternative high school youth are needed to confirm these findings.

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Table 3.1 Sociodemographic characteristics of alternative high school students by beverage and fast food restaurant use [a]

| | Regular Soda | | Sports Drinks | | Other Sugar-sweetened Beverages | | Fast Food Restaurant Use | |
|---|---|---|---|---|---|---|---|---|
| | times/week [b] | | times/week [b] | | times/week [b, c] | | times/week [b] | |
| | ≤ 3-4 | ≥ 5-6 | < 1 | ≥ 1-2 | ≤ 1-2 | ≥ 3-4 | ≤ 1-2 | ≥ 3-4 |
| | **n (%)** | **n (%)** | **n (%)** | **n (%)** | **n (%)** | **n (%)** | **n (%)** | **n (%)** |
| **Total** | 65 (45%) | 79 (55%) | 57 (39%) | 88 (61%) | 52 (36%) | 92 (64%) | 70 (50%) | 71 (50%) |
| **Gender** | n= 144 | | n=145 | | n=144 | | n=141 | |
| Female | 27 (42%) | 42 (53%) | 31 (54%) | 38 (43%) | 25 (48%) | 44 (48%) | 28 (40%) | 40 (56%) |
| Male | 38 (58%) | 37 (47%) | 26 (46%) | 50 (57%) | 27 (52%) | 48 (52%) | 42 (60%) | 31 (44%) |
| **Race/Ethnicity** | n=144 | | n=145 | | n=144 | | n=141 | |
| Black | 19 (29%) | 27 (34%) | 16 (28%) | 30 (34%) | 8 (15%) | 38 (41%) | 16 (23%) | 29 (41%) |
| Other | 20 (31%) | 21 (27%) | 14 (25%) | 28 (32%) | 20 (38%) | 22 (24%) | 20 (29%) | 20 (28%) |
| White | 26 (40%) | 31 (39%) | 27 (47%) | 30 (34%) | 34 (46%) | 32 (35%) | 34 (49%) | 22 (31%) |
| **SES** | n=142 | | n=143 | | n=142 | | n=139 | |
| Higher | 18 (28%) | 34 (44%) | 18 (32%) | 34 (40%) | 22 (43%) | 29 (32%) | 25 (36%) | 27 (39%) |
| Lower | 47 (72%) | 43 (56%) | 39 (68%) | 52 (60%) | 29 (57%) | 62 (68%) | 44 (64%) | 43 (61%) |

[a] Sample size varies across models due to missing values.
[b] Responses were dichotomized using a median value.
[c] Other sugar-sweetened beverages included kool-aid, fruit drinks, lemonade or energy drinks (i.e. Red Bull).

Table 3.2 Multivariate associations between sociodemographic characteristics and beverage, and fast food restaurant use [a] of alternative high school students

| | **Regular Soda (n=142)** ≥ 5-6 times/week | | | **Sports Drinks (n=143)** ≥ 1-2 times/week | | | **Other Sugar-sweetened Beverages [b] (n=142)** ≥ 3-4 times/week | | | **Fast Food Restaurant Use (n=139)** ≥ 3-4 times/week | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | OR | 95% CI | p-value | OR | 95% CI | p-value | OR | 95% CI | p-value | OR | 95% CI | p-value |
| **Gender** | | | | | | | | | | | | |
| Female | 1.80 | (0.89, 3.64) | 0.099 | 0.71 | (0.35, 1.47) | 0.362 | 1.02 | (0.48, 2.15 | 0.945 | 1.99 | (0.95, 4.14) | 0.065 |
| Male | 1.0 | (reference) | | 1.0 | (reference) | | 1.0 | (reference) | | 1.0 | (reference) | |
| **Race/ Ethnicity** | | | | | | | | | | | | |
| Black | 1.54 | (0.64, 3.66) | 0.323 [c] | 2.67 | (1.02, 6.97) | 0.044 [c] | 2.94 | (1.06, 8.13) | 0.037 [c] | 3.64 | (1.42, 9.34) | 0.007[c] |
| Other | 1.01 | (0.42, 2.40) | 0.975 | 2.33 | (0.93, 5.82) | 0.068 | 0.72 | (0.30, 1.73) | 0.472 | 1.54 | (0.62, 3.79) | 0.343 |
| White | 1.0 | (reference) | | 1.0 | (reference) | | 1.0 | (reference) | | 1.0 | (reference) | |
| **SES** | | | | | | | | | | | | |
| Higher | 2.36 | (1.10, 5.05) | 0.027 | 1.48 | (0.67, 3.25) | 0.325 | 0.67 | (0.30, 1.47) | 0.318 | 1.57 | (0.71, 3.46) | 0.260 |
| Lower | 1.0 | (reference) | | 1.0 | (reference) | | 1.0 | (reference) | | 1.0 | (reference) | |

Note: OR=Odds Ratios, CI=Confidence Interval. OR and CI are adjusted for age

[a] Sample size varies across models due to missing values.

[b] Other sugar-sweetened beverages included kool-aid, fruit drinks, lemonade or energy drinks (like Red Bull).

[c] Global F-test for race/ethnicity (2 df): Regular soda p=0.545; Sports drinks p=0.080; Sugar-sweetened beverages p=0.025; Fast food restaurant use p=0.025

Table 3.3 Sociodemographic characteristics of alternative high school students by high fat food and fruit and vegetable intake

| | High Fat Food Intake (Fat Score) [a] | | Fruit and Vegetable Intake (Daily Servings) | |
|---|---|---|---|---|
| | **n (%)** | **Mean Score (SD)** | **n (%)** | **Mean Score (SD)** |
| **Gender** | | | | |
| Female | 68 (48%) | 43.5 (10.6) | 68 (48%) | 3.6 (4.1) |
| Male | 75 (53%) | 43.7 (11.1) | 75 (52%) | 3.5 (4.2) |
| **Race/Ethnicity** | | | | |
| Black | 45 (31%) | 48.5 (9.9) | 46 (32%) | 3.6 (4.5) |
| Other | 41 (29%) | 39.9(9.7) | 40 (28%) | 3.4 (3.4) |
| White | 57 (40%) | 42.4 (9.9) | 57 (40%) | 3.6 (4.3) |
| **SES** | | | | |
| Higher | 51 (36%) | 43.8 (10.5) | 50 (35%) | 3.3 (3.8) |
| Lower | 90 (64%) | 43.6 (11.1) | 91 (65%) | 3.7 (4.4) |

[a] Total Sample: Mean fat score=43.65 (SD 10.83); Median fat score: 43 Fat score range: 17 - 73. Response categories: once per month or less, 2–3 times per month, 1–2 times per week, 3–4 times per week, or 5 or more times per week. The categories were scored 1, 2, 3, 4, or 5. The score can be divided in categories representing fat intake as a percent of daily calories. For categories that were scored 0, 1, 2, 3, or 4, a score of ≥15 represents high fat intake (> 35% calories) (25).

Table 3.4 Multivariate associations between sociodemographic characteristics and high fat food intake of alternative high school students

| | High Fat Food Intake Fat Score * (n=141) | |
|---|---|---|
| | **LS Means (SE)** [a] | **p-value** |
| **Gender** | | |
| Female | 43.2 (1.5) | 0.613 |
| Male | 43.9 (1.4) | |
| **Race/Ethnicity** | | |
| Black | 48.2 (1.8) | 0.016 [b] |
| Other | 40.0 (1.8) | 0.256 |
| White | 42.5 (1.6) | |
| **SES** | | |
| Higher | 44.5 (1.7) | 0.465 |
| Lower | 43.0 (1.3) | |

*Total Sample: Mean fat score=43.65 (SD 10.83); Median fat score: 43 Fat score range: 17 - 73. Response categories: once per month or less, 2–3 times per month, 1–2 times per week, 3–4 times per week, or 5 or more times per week. The categories were scored 1, 2, 3, 4, or 5. The score can be divided in categories representing fat intake as a percent of daily calories. For categories that were scored 0, 1, 2, 3, or 4, a score of ≥15 represents high fat intake (> 35% calories) (25).

[a] LS Means and standard errors are adjusted for age

[b] Global F-test: p=0.002

# Chapter 4. Manuscript 2: Eating and drinking opportunities during the school day and associations with selected dietary practices in alternative high school students

## INTRODUCTION

In the United States over 95% of children are enrolled in school where they spend a large part of their day and consume up to half of their total daily energy intake (Gleason & Suitor, 2001). Thus, schools are uniquely positioned to have a positive impact on young people's dietary intake by increasing the availability and promotion of healthful foods and beverages. Research shows that food availability is one of the strongest correlates of food choice among adolescents and its impact continues through young adulthood (Neumark-Sztainer, Wall, Perry, Story, 2003; Arcan, Neumark-Sztainer et al, 2007). Schools provide a wide range of eating and drinking opportunities for students. Federally-regulated meal programs are a major source of food at school but according to national data, student participation in the national school lunch program (NSLP) declines by 27% from elementary to high school as foods from venues, such as a la carte programs, snack bars, vending machines, and school stores, defined as competitive foods, become more available (Gordon, Fox et al., 2007). According to recent data, consumption of competitive foods from any source was 9% higher among NSLP nonparticipants as compared to NSLP participants (Fox, Gordon et al., 2009). Furthermore, competitive foods are not subject to the same nutrition guidelines that apply to foods served in the federally-reimbursable meals. As a result, students have access to foods that are often high in fat, sodium and added sugars (Story, Neumark-Sztainer, et al., 2002; French, Story, Fulkerson et al., 2003; Harnack, Snyder et al, 2000; Templeton, Marlette et al., 2005). In addition, school policies, such as open campus, where students are allowed to leave school during lunch, can result in students purchasing food from nearby convenient stores and fast food establishments (Neumark-Sztainer, French, et al., 2005), further increasing intake of high fat foods, since French

fries and hamburgers are the most frequently sold items in fast foods restaurants (French, Harnack et al., 2000).

There are few studies examining associations between competitive foods at schools and students' dietary practices. A longitudinal study by Cullen and colleagues (2004) found that as elementary school students transitioned to middle school and gained access to snack bar foods, their consumption of fruit, vegetable and milk significantly decreased and consumption of higher fat vegetables and sweetened beverages increased. In middle schools, a la carte offerings were inversely associated with student intake of fruits and vegetables and positively associated with total and saturated fat intake (Kubik, Lytle, et al., 2003). In high school, student consumption of competitive foods increased as these foods became more available (Fox, Gordon et al., 2009; Neumark-Sztainer, French et al., 2005).

Most school-based studies assessing the school food environment and dietary practices of students have done so in traditional high schools. There is limited knowledge about eating and drinking opportunities in schools that enroll youth attending alternative high schools (AHS). In the United States, students who are at risk of academic failure (Lehr, 2004) often enroll in AHS. Nationwide, there are more than 6600 public alternative school programs with an enrollment of more than half a million students (Hoffman, 2009). The majority of AHS are located in urban districts and they enroll more minorities and students of lower socioeconomic status (Kleiner B, Porch et al., 2002). Studies with adolescents in traditional high schools have indicated a significant link between race and socioeconomic status and dietary intakes. (Neumark-Sztainer, Story et al., 2002; Xie B, Gilliland et al., 2003). A recent study using the same population examined in the present study found that black students attending AHS reported higher consumption of sweetened beverages and high fat foods, and higher

frequency of fast food restaurant use as compared to white students (Arcan, Kubik et al., in press). Only two studies to date have examined the food environment in AHS (Kubik, Lytle et al., 2004; Kubik, Lytle et al., 2005). Results from a focus group survey of AHS students found that students were dissatisfied with the food at school, including the school lunch. As a result they either skipped lunch or snacked on vending machine food or purchased foods from off campus sources (Kubik, Lytle et al., 2005).

The aim of this study was to examine the prevalence of eating and drinking opportunities during the school day and to assess correlations between eating and drinking opportunities and dietary practices, specifically sweetened beverages, high fat foods, fruits and vegetables and fast food restaurant use among AHS students. The study also examined the associations between student perceived availability of healthful school food and the same dietary practices. This study will add to the limited body of literature on dietary practices associated with the food environment in AHS and could aid in the development of school food policies and practices in AHS that support student development of healthy eating behaviors.

## METHODS

### Study Design

The current study used a cross-sectional design. Students were participants in the Team COOL (Controlling Overweight and Obesity for Life) pilot study, a multi-component diet and physical activity intervention trial to promote healthy weight loss or prevent excess weight gain. Six alternative public high schools (four urban and two suburban) in the St. Paul- Minneapolis metropolitan area were contacted and agreed to participate. Data were collected in fall 2006 before schools were randomized to

intervention and control conditions. Additional details about the study design are described elsewhere (Kubik, Davey, et al., 2009).

**Study Population**

Student enrollment across the six schools varied from 27 to 142 students (mean: 102 students). There was a high percentage of minority students (mean=64%: range: 31% to 96%) and students receiving free/low-cost lunch (mean=61%: range: 40% to 96%). All students enrolled in the schools were eligible to participate in study measurements, which included a survey and height/weight measures. Prior to scheduled measurements, study staff visited the schools to describe the measurement procedures and to invite the students to participate. Students who were younger than 18 years were given parental consent forms. On the day of measurement, trained study staff collected assents from all students and signed parental consents from those younger than 18 years old. The students completed a survey related to demographic, personal, behavioral and school-related social-environmental factors associated with dietary and physical activity practices of the students. Students who completed the survey and had their height and weight measured received a $5.00 gift card. All study procedures were approved by the University of Minnesota's Institutional Review Board Human Subjects Committee.

Across the six schools, a total of 145 students completed the baseline survey. Due to the variable nature of student attendance in alternative high schools, the study participation rate was derived by multiplying the prior year's attendance rate with a school's 2006-2007 student enrollment (MDE 2007). Using the average adjusted attendance of 68 students (range: 16 to 107), the participation rate across schools was 36% (range: 18% to 100%).

## Measures

### Dependent Variables

**Regular soda, sports drinks and other sugar-sweetened beverage consumption**. Regular soda, sports drinks and other sugar-sweetened beverages (kool-aid, fruit drinks, lemonade or energy drinks) were assessed by asking participants to report their frequency of consumption of each type of beverage over the past month. Ten response categories ranged from 'Never' to '5 or more times a day.' The data were recoded as times per week and modeled as a continuous variable. The mean consumption in times per week and range for each beverage were as follows: Regular soda: Mean=10.5; Sports drinks: Mean=4.5; Other sugar-sweetened beverages: Mean=7.5; range for all beverages were 0-35. Higher values indicate more beverage consumption per week.

**High fat food intake.** A previously validated 17-item fat screener developed by Block and colleagues (2000) was used to assess high fat food intake. Students were asked, "Think about your eating habits over the past year. About how often do you eat each of the following foods?" Examples of high fat food items included various meats, hot dogs, fried chicken, pizza, whole milk and cheese, French fries, and doughnuts. Five response categories ranged from '1 time a month or less' to '5 or more times a week.' The data were recoded to represent times per week and modeled as a continuous variable (Mean: 26.1; Range: 4.25 to 64.5). The Cronbach's alpha for the study sample was 0.89. Students whose responses were greater than 3 standard deviations (SD) from the mean were excluded from the analysis (n=2). Higher values indicate more servings per week of high fat food.

**Fruit and vegetable intake.** Intake of fruits and vegetables was assessed with a previously validated 6-item fruit and vegetable screener (Field, Colditz, et al., 1998). Students were asked: “Think about your usual eating habits over the past year. About how often do you eat each of the following foods and beverages?” The items included 100% fruit juice, fruits, vegetables, green salad, potatoes excluding French fries, and carrots. Six response categories ranged from ‘Less than once a week’ to ‘5 or more times a day.’ Data were recoded as daily servings and modeled as a continuous variable (Mean: 3.6; Range: 0 to 24). The Cronbach’s alpha for the study sample was 0.85. Students whose responses were greater than 3 SDs from the mean were excluded from the analysis (n=2). Higher values indicate more servings per day of fruits and vegetables.

**Fast food restaurant use***.* Frequency of fast food restaurant use was assessed with the question, “Outside of the school day, during a normal week (including weekend days), how many times do you eat or drink something from a fast food restaurant, like McDonald’s, Taco Bell or Pizza Hut?” Six response categories ranged from ‘Never’ to ‘More than 7 times.’ The data were recoded to represent times per week and modeled as a continuous variable (Mean: 2.8; Range: 0 to 8). Higher values indicate more visits to a fast food restaurant.

**Independent Variables**

Responses to items on the student survey were used to develop two scales to measure: 1) eating and drinking opportunities during the school day and; 2) student perceived availability of healthful school food. The items that were included in each scale were selected based on their conceptual agreement. In each scale responses to items that were negatively correlated were reverse coded. A Cronbach’s alpha was calculated

for each scale. Means and variances for each scale were also calculated. The scale items are listed in Tables 4.1 and 4.2.

**Student eating and drinking opportunities during the school day scale.** The 12-item scale was adapted from a previously tested scale used by Kubik and colleagues (2005). (See Table 4.1). For each item, six response categories represented days per week and ranged from 0 to 5 days. The mean scale score was 16.8 (SD=10.3); Range: 0 to 57. Items were summed, with a higher score indicating more eating and drinking opportunities. The Cronbach's alpha was 0.82.

**Perceived Availability of Healthful School Food Scale.** A six-item scale was adopted from French and colleagues (2004). (See Table 4.2). Items were scored on a five-point Likert-type scale, with responses ranging from 1=strongly agree to 5=strongly disagree. The mean score was 17.2 (SD=4.1; Range: 8 to 27). Four items were recoded so that higher scores indicate a healthier food response. The Cronbach's alpha was 0.71.

**Demographic Characteristics.** Gender, age, race/ethnicity and socioeconomic status (SES) were included in the models as potential confounders. Age and gender were obtained from school records; age was modeled as a continuous variable. Students were asked to report their race/ethnicity with the question: "Do you think of yourself as…. (You may choose more than one) American Indian or Alaskan Native, Asian (including Cambodian, Hmong, Korean, Laotian, and Vietnamese), Black or African American, Hispanic or Latino, White, and Other." To ensure adequate sample size for analyses, the categories were combined into White, Black and other. The 'other' racial/ethnic category included the following groups: American Indian or Alaskan Native (1%); Asian, including Cambodian, Hmong, Korean, Laotian, and Vietnamese (6%); Hispanic or Latino (9%); multi-ethnic non-Hispanic (10%); other (3%). SES was measured with the question "Do you get free/low-cost lunches at school?" (n=135).

Response categories were ‘Yes’, ‘No’, and ‘I don’t know.’ If the response was missing or ‘I don’t know,’ the question ‘Does your family get public assistance (welfare, food stamps or other assistance?) was used (n=8). A ‘Yes’ response indicated lower SES and a ‘No’ response indicated higher SES.

**Statistical Analysis**

Descriptive statistics and mixed model analysis of variance were used to assess the association between students’ dietary practices and the two scales representing eating and drinking opportunities and student perception of the healthfulness of school food. Continuous dependent variables (student intake of all three sweetened beverages and fruits and vegetables) were positively skewed with Gaussian distributions, therefore the models were appropriately adjusted with square root transformations and statistics from these models were used to determine statistical significance. However, mean servings were generated and reported on the natural scale (untransformed) as they are easier to interpret. The school variable was included in the model as a random effect, accounting for the additional component of variance associated with a cluster sampling design where observations from students within the same schools may be correlated (Murray 1998). PROC MIXED procedures were utilized since the outcome variables were continuous. The final multivariate models included the two scales as independent variables, dietary practices as the dependent variables, and models were adjusted for the potential confounders of gender, age, race/ethnicity, and SES. Age and gender-adjusted body mass index percentile, calculated from measured height (cm) and weight (kg) was tested as a potential confounder; it was not included in the final model, because it did not significantly change the associations between the scales and the outcome

variables. The level of significance was set at $p < 0.05$. Analyses were conducted using SAS statistical software, version 9.1 (SAS Institute, Cary, NC, USA).

## RESULTS

Among participants, 52% were male and 63% were younger than 18 years (Mean: 17.2; Range: 14.0 to 19.9). The racial/ethnic distribution was as follows: 39% white, 32% black, and 29% other. Sixty percent of students were in the lower SES category. Table 4.1 and 4.2 present the items included in each scale and frequency of responses. The most frequent eating and drinking opportunities were getting lunch at a fast food restaurant (76%), drinking (74%) and eating (70%) in the classroom, and drinking in the school hallways (70%). While more than one-half of students believed that they can usually get fresh fruits at school, only one-third reported the same for fresh vegetables. Nearly one-half of the students did not perceive their friends to be eating healthful foods at school.

Table 4.3 presents the results of the multivariate models between each dietary practice and the eating and drinking opportunities and student perception of healthful food availability. There were significant positive associations between the frequency of eating and drinking opportunities and consumption of regular soda ($p=0.0002$), sports drinks ($p<0.0001$), other sugar-sweetened beverages ($p=0.020$), high fat foods ($p=0.0001$), and fast food restaurant use ($p<0.0001$). There were also trends for an inverse association between student perceived availability of healthful foods at school scale and consumption of other sugar-sweetened beverages ($p=0.056$), and a positive association with sports drink consumption ($p<0.085$). There were no significant associations between either scale and fruit and vegetable consumption.

## DISCUSSION

The goals of the present study were to examine prevalence of eating and drinking opportunities during the school day and to assess whether frequency of eating and drinking opportunities was associated with selected dietary practices among students attending alternative high schools. Our results indicate that having access to multiple eating and drinking opportunities at school is significantly associated with increased consumption of all sugar-sweetened beverages, high fat foods and fast food restaurant use, but it is not associated with fruit and vegetable consumption. These findings suggest that the food environment during the school day may be linked to students' dietary intakes and provide support for school policies that limit access to high calorie, low nutrition foods. The results of this study also add to an increasing body of research that supports a link between the school food environment, and students' dietary practices (Kubik, Lytle, et al., 2003; Neumark-Sztainer, French, et al., 2005; O'Toole, Anderson et al., 2007; Snelling, Korba et al., 2007).

Although all six study schools participated in the National School Lunch and School Breakfast Programs, students frequently accessed other food venues during the school day. The current study indicated that during a school week, 76% of the students ate lunch at fast food restaurants, 59% bought lunch at convenience stores, and 55% bought food from vending machines, while studies in traditional high schools found only 18%, 8%, and 43% of students engaging in these food practices, respectively (Neumark-Sztainer, French, Hannan, 2005). Interviews with key informants from the schools in this study, such as principals, health coordinators or health teachers, revealed that in five out six schools, staff brought food to students and one half of schools allowed students to leave school during lunch.

Previous research has shown that students in schools with open campus policies were more likely to eat lunch at a fast food restaurant or a convenience store during the week; student food purchases from vending machines were lower in schools with policies about the types of foods sold in vending machines (Neumark-Sztainer, French, Hannan et al., 2005). Availability of competitive foods at school is also associated with lower NSLP participation (Gordon, Fox et al., 2007), indicating that availability and access to competitive food sources may encourage students to forgo the school provided meals for other less nutritious sources (Probart, McDonnell, et al., 2006). According to national data, in high school, only a third of NSLP participants had competitive foods as compared to almost half of non-NSLP participants (Gordon, Fox et al., 2007). Having competitive foods available can also diminish the efforts to promote healthful eating through health education and can lead to mixed messages to students (O'Toole, Anderson, et al., 2007), since foods sold in vending and school stores are high in sugar and fat (Wechsler, Brener et al., 2001; French, Story et al., 2004).

Although the association between student perception of the availability of healthful foods at school and consumption of sports drinks and other sugar-sweetened beverages was marginally significant, the direction of the association deserves attention. Students' perceptions of healthful school food availability was positively associated with consumption of sports drinks and inversely associated with sweetened beverages, suggesting that students consider sports drinks a healthy option. Despite their health-conscious image, sports drinks, such as Gatorade, are high in energy, added sugars and sodium; the usual 20 oz bottle (2.5 servings) contains 250 kilocalories. According to data from the School Health Policies and Programs Study (SHPPS) 2006, 75% of all high schools students could purchase sports drinks from vending machines, schools stores or snack bars (O'Toole, Anderson et al., 2007). Health and nutrition interventions aiming to

change the school food environment will need to address perceptions of both the students and staff about the healthfulness of foods and beverages currently consumed.

The school food environment has been of concern to parents and school staff (French, Story, et al., 2002; Kubik, Lytle, et al., 2002; Kubik, Lytle, et al., 2005), especially in light of the overweight and obesity epidemic among youth (Ogden et al., 2008 ). In 2004, the US Congress passed a law (PL 108-265) requiring each educational agency participating in the federal school meals program to establish a local school wellness policy by school year 2006 (http://www.fns.usda.gov/tn/Healthy/Wellnesspolicy.html). Furthermore, the Institute of Medicine (IOM) has made recommendations on the nutrient quality of competitive foods sold at schools (IOM, 2007). Findings from the SHPPS 2006 have supported some progress toward a healthier school food environment (O'Toole, Anderson 2007), including higher participation in the NSLP and lower a la carte sales (Wojcicki, Heyman 2006). Consistent with findings describing the food environment in traditional high schools, our results indicate that the general food environment in AHS does not support healthy dietary practices for students. Unfortunately, the SHPPS 2006 did not include alternative high schools (Kyle, Brener et al., 2007). Therefore, there are no national data available about the food environment in alternative high schools, despite the high enrollment of low income and minority youth who are vulnerable to obesity and related health outcomes (Kumanyika. 2008).

There are strengths as well as limitations to this study. The strengths included a diverse sample of adolescents with respect to gender, race/ethnicity and SES and the use of measures that have been previously tested in other adolescent populations. This study is the first to examine associations between the frequency of drinking and eating opportunities during the school day and dietary practices among alternative high school

students. Even though the student participation rate was 36%, the demographic distribution of our sample closely resembles the demographic characteristics of AHS students in our study (male= 51%; black=42%, white=39%; low SES=56%). One of the study limitations could be that students who decided not to participate in the study may differ from the ones who participated in regard to demographic factors and dietary practices. The cross-sectional nature of the study only considers the associations between variables rather than causation. The six-item questionnaire used to measure fruit and vegetable consumption assesses usual intake over the past year. Previous research has shown that compared with 24-hour dietary recalls, the six-item questionnaire may underestimate the prevalence of fruit and vegetable intake among urban adolescents but it performed equally as compared to the Harvard Food Frequency Questionnaire (Field, Colditz, et al., 1998).

## CONCLUSION

Although, the increasing rate of overweight and obesity affects all youth, unhealthy dietary practices among minority and low-SES youth are of great concern considering the high rates of overweight and obesity among minority youth and those living below the poverty line (Ogden, Carroll, et al., 2006; Meich, Kumanyika, et al., 2006). Our findings indicated that the AHS students, like students in traditional high schools, are exposed to a school environment that does not support healthful dietary practices. These findings emphasize the need for nutrition and health interventions in AHS that aim to modify the overall food environment in order to foster healthy eating. In addition to increasing the availability of healthier foods and beverages in vending machines and school stores, emphasis should be placed on implementing closed-

campus policies and policies to improve the quality of the school meals in order to encourage higher student participation in these programs.

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Table 4.1 Frequency of responses to items used in a scale representing eating and drinking opportunities during a school day among alternative high school students.

| | | Days/week (%) | | | |
|---|---|---|---|---|---|
| | **Scale Items** [ab] | **0** | **1 – 2** | **3 - 4** | **5** |
| **Eating and drinking opportunities** [c] **Cronbach's α: 0.82** | During a normal school week, how many days per week do you…. | | | | |
| | 1. Get lunch at a fast food restaurant? | 24% | 44% | 24% | 8% |
| | 2. Get lunch at a convenience store, gas station or concession stand? | 41% | 38% | 15% | 6% |
| | 3. Bring lunch from home | 84% | 13% | 3% | 0% |
| | 4. Get food from a school vending machine or school store? | 45% | 31% | 19% | 6% |
| | 5. Get drinks from a school vending machine or school store? | 38% | 29% | 24% | 9% |
| | 6. Get food/drinks from a vending machine not at school? | 66% | 21% | 10% | 3% |
| | 7. Eat in the hallways at school | 45% | 22% | 23% | 10% |
| | 8. Eat in the classrooms at school | 30% | 32% | 23% | 15% |
| | 9. Drink in the hallways at school | 30% | 20% | 28% | 22% |
| | 10. Drink in the classrooms at school | 26% | 18% | 34% | 23% |
| | 11. Get food as an incentive or reward from school staff | 75% | 19% | 4% | 2% |
| | 12. Eat "free food" brought to school by school staff | 84% | 10% | 2% | 5% |

[a] Score= sum of responses

[b] The 12-item scale was adapted from a previously tested scale used by Kubik, Lytle, et al., 2005.

[c] Responses range from 0 – 5; higher score indicates more frequent eating and drinking opportunities. Score range: 0 - 57 (Mean score=16.8, SD=10.3). Include any food sources other than the national school breakfast and lunch programs.

Table 4.2 Frequency of responses to items used in a scale representing perceived availability of healthful school food among alternative high school students

| | Scale Items [a] | Disagree/ Strongly Disagree | Neither Agree nor Disagree | Strongly Agree/ Agree |
|---|---|---|---|---|
| **Perceived Availability of Healthful School Food [b]** **Cronbach's α : 0.71** | How strongly do you agree with the following statements? | | | |
| | 1. There is often healthy food for sale at my school. | 33% | 38% | 29% |
| | 2. I can usually get fresh fruit at my school. | 26% | 22% | 52% |
| | 3. I can usually get fresh vegetables at my school. | 37% | 29% | 34% |
| | 4. The healthy food sold at my school tastes bad. | 22% | 48% | 30% |
| | 5. It would be hard for me to buy tasty, healthy food at my school. | 27% | 36% | 37% |
| | 6. My friends usually eat healthy foods at school | 44% | 45% | 11% |

[a] Score= sum of responses

[b] Responses range from 1 – 5; Four items were recoded so that a higher score indicates a higher perceived availability of healthful foods. Score range: 8 – 27 (Mean score=17.2, SD=4.1)

Table 4.3 Multivariate associations between the scales representing eating and drinking opportunities during the school day and perceived availability of healthful school food and selected dietary practices among alternative high school students [a]

| | Eating and Drinking Opportunities [b] | | | Perceived Availability of Healthful School Food | | | |
|---|---|---|---|---|---|---|---|
| Dietary Practices | Estimate (b) [c] | 95% CI [d] | p-value [e] | Estimate (b) [e] | 95% CI [d] | p-value [e] | $R^2$ |
| Regular Soda times/week (n=142) | 0.24 | (0.08, 0.39) | 0.0002 | - 0.07 | (-0.48, 0.33) | 0.636 | 0.19 |
| Sports Drinks times/week (n=143) | 0.24 | (0.13, 0.35) | <.0001 | 0.29 | (-0.0004, 0.58) | 0.085 | 0.29 |
| Other Sweetened Beverages [f] times/week (n=142) | 0.18 | (0.04, 0.31) | 0.020 | - 0.32 | (-0.68, 0.02) | 0.056 | 0.30 |
| High Fat Foods servings/week (n=141) | 0.36 | (0.17, 0.54) | 0.0002 | - 0.43 | (-0.93, 0.07) | 0.095 | 0.30 |
| Fruits and Vegetables servings/day (n=141) | 0.06 | (-0.004, 0.13) | 0.101 | 0.17 | (-0.006, 0.35) | 0.139 | 0.11 |
| Fast Food Restaurant Use times/week (n=139) | 0.08 | (0.06, 0.10) | <0.0001 | 0.005 | (-0.05, 0.06) | 0.874 | 0.38 |

[a] Sample size varies across models due to missing values.
[b] Include any eating and drinking opportunities during the school day other than the national school breakfast and lunch programs.
[c] Each model include the two scales and is adjusted for gender, age, race/ethnicity and socioeconomic status. $R^2$ for base model range from 0.01 for fruits and vegetables to 0.15 for other sugar-sweetened beverages.
[d] CI: Confidence Interval
[e] The square-root transformed outcome variables are used to determine the p-values.
[f] Sweetened beverages include kool-aid, fruit drinks, lemonade or energy drinks (i.e. Red Bull).

# Chapter 5. Manuscript 3: Dietary practices and multi-substance use among students attending alternative high schools. Findings from the Team COOL pilot study

## INTRODUCTION

Substance use and poor dietary practices are prevalent among adolescents (CDC-YRBS 2008; Johnston, O'Malley et al., 2008). Substance abuse is strongly correlated with violent behavior, weapon carrying in school, motor vehicle accidents, unwanted pregnancy, and HIV (Draus, Santos et al., 2008; Englund, Egeland et al., 2008; Orr, James et al, 2008; Rudatsikira, Muula et al., 2008; Muula, Rudatsikira et al., 2008; Melzer-Lange 1998), which are the leading causes of morbidity and mortality in youth. Recent national data indicated that one half of adolescents have smoked cigarettes in their lifetime and one in five currently smokes (CDC-YRBS 2008). Each day, about 3000 adolescents become daily smokers and the majority of adults tried their first cigarette during adolescence (USDHHS 2000). Alcohol consumption is even more prevalent than cigarette smoking with three out four adolescents having consumed alcohol before they finished high school and close to 40% have done so by $8^{th}$ grade; close to a third of $12^{th}$ grade students have consumed alcohol during the last 30 days. About 40% of adolescents have tried marijuana in their lifetime and 18% of $12^{th}$ grade students have used marijuana during the last 30 days (Johnston, O'Malley et al., 2008).

The majority of adolescents do not have diets that follow the Dietary Guidelines for Americans; close to 80% of adolescents do not consume the daily recommended servings of fruits and vegetables and one third consume regular soda at least one time a day (CDC-YRBS 2008). Substance abuse, tobacco use and nutrition and overweight are three of the twenty eight focus areas that are addressed by Healthy People 2010 agenda to reach the goal of increasing quality and years of healthy life (USHHS 2000). For adolescents, to achieve improved health and longevity and to develop comprehensive

health education programs, examining the correlates of substance use and dietary practices is essential.

Observational studies have often found covariation of health risk behaviors among both adolescents (Neumark-Sztainer, Story et al., 1997; Grunbaum, Lowry et al., 2001; Pronk, Anderson et al., 2004; Kvaavik, Andersen et al., 2004; Donovan & Jessor 1985) and adults (Pronk, Anderson et al., 2004; Pronk, Wing 1994; Fine, Philogene et al., 2004; Schuit, van Loon et al, 2002). Studies that focused on health behaviors indicated that the strongest covariation is often observed for problem behaviors such as drug and substance use, criminal behavior, alcohol abuse and sexual behavior, collectively termed “syndrome” of problem behaviors among adolescents (Jessor, 1991; Donovan, Jessor, et al., 1993). Patterns of multiple substance use in adolescents have significantly related cigarette smoking with alcohol and marijuana use (Burke, Milligan et al., 1997; Paavola, Vartiainen et al., 2004; Everett, Warren, et al., 1999).

However, scientific evidence also supports moderate covariation for non-problem but health compromising behaviors, such as eating, physical activity, and safety behaviors (Jessor, 1991; Donovan, Jessor, et al., 1993). Factor analysis that guided the identification of clusters of behaviors among a large sample of adolescents indicated that adolescents engaging in risk-seeking behaviors, such as tobacco, alcohol and marijuana use had almost twice the odds ratio of unhealthy eating defined as less than daily intake of dairy, fruit or fruit juice, vegetables, more than once daily of soft drinks, chips, and other sugar-sweetened snacks (Neumark-Sztainer, Story, et al., 1997). Smoking was associated with greater fat (Burke, Milligan et al., 1997), soft drinks (Kvaavik, Andersen et al., 2004), and fast food intake (Larson, Story, et al., 2007), and with lower consumption of fruits and vegetables (Wilson DB, Smith et al. 2005; Wilson & Nietert 2002; Neumark-Sztainer, Story, et al., 1996; Larson, Story, et al., 2007); alcohol was

also associated with fat intake (Burke, Milligan et al., 1997). Poor dietary habits can compound the effect of substance use, since poor diet and substance use are independent risk factors for chronic diseases, such as atherosclerosis and some cancers (Schlecht, Franco, et al., 1999; Feskanich, Ziegler et al., 2000; Weisburger 2000).

There are socioeconomic (SES) differences in the prevalence of substance use among adolescents. Studies examining associations between neighborhood and income inequalities and substance use found that living in environments with high inequalities increased the likelihood of using alcohol and marijuana among both adolescents and adults (Galea, Ahern et al., 2007; Hill, Agel 2005). In a study that examined correlations between cigarette smoking and various SES indicators in middle and high school students, neighborhood education level was inversely associated with cigarette smoking, and students who attended schools with high reduced/low cost lunch program participation were 5.86 times more likely to smoke than students in schools with low reduced/low cost lunch program participation (Scarinci, Robinson et al., 2001). Evidence also supports that minority and low income youth are at higher risk of adverse dietary practices, such as fat intake and fast food usage (Troiano PR, Briefel et al., 2000; Harris MK, Gordon-Larsen et al., 2006), and experience higher rates of overweight (Ogden, Carroll, et al., 2006; Miech, Kumanyika et al., 2006) compared to non-minority high income youth.

Youth who experience the outcomes of engaging in risk behaviors and health-compromising behaviors, such as poor dietary practices, substance use, delinquency, truancy, dropout, driving after drinking, and unprotected sexual intercourse are labeled ‘at-risk’ (Jessor, 1991). Studies reported that at-risk youth who use substances are more likely to be involved in violent behavior, drop-out of school, truancy, and engage in multiple health behaviors (Henry, 2007; Ellickson, Tucker, et al., 2001; Ellickson, Saner,

et al., 1997; Bray, Zarkin, et al. 2000). A study that followed 4327 students from 7th to 12th grade found that students who smoked in 7th grade were 5 times more likely to drop out of school, 2 times more likely to abuse alcohol, 6 times more likely to use marijuana, and 4 times more likely to engage in violent behavior in 12th grade (Ellickson, Tucker, et al., 2001). A cross-sectional study of 672 students in 12th grade found a 6% lower probability of high school graduation for every 10% increase in the frequency of alcohol and marijuana use (Yamada, Kendix, et al., 1996).

One group of adolescents who are at-risk of dropping out of school and are likely to be involved in risk behaviors leading to immediate negative health and social outcomes are students who attend alternative high schools. A nationally representative study has shown that higher percentage of alternative high schools students currently smoked cigarettes, used alcohol and marijuana and drove under the influence of alcohol than traditional high school students (Grunbaum, Lowry et al., 2001). The same study compared the prevalence of health-related behaviors that result in unintentional injury and violence, substance use, sexual behaviors, dietary behaviors, and physical activity between traditional and alternative high school students and found 30% of alternative high school students to engage in seven or more risk behaviors as compared to only 9% of traditional high school students (Grunbaum, Lowry et al., 2001). Alternative high schools are more common in urban districts, and they enroll youth who are at-risk for academic failure (Kleiner, Porch et al., 2002). Roughly two-thirds (62%) of the alternative high schools enroll more than 50% of minorities and close to one-half enroll greater than 20% of students below the poverty line (Kleiner, Porch et al., 2002).

Few studies have examined substance use in alternative high schools (Brener, Wilson 2001; Grunbaum, Kann et al., 2000; Denny, Clark et al., 2003; MN Student survey-ALC, 2007), and most studies assessing correlations between substance use

and dietary behaviors have been conducted in traditional schools (Larson, Story, et al., 2007; Burke, Milligan et al., 1997; Neumark-Sztainer, Story et al., 1997). Given the high prevalence of substance use among youth and evidence of covariation of substance use with other health risk behaviors, the goals of this study are: 1) to examine prevalence of cigarette, alcohol, and marijuana use and prevalence of multi-substance use among alternative high school students; 2) to assess correlations between each substance and dietary practices, such as consumption of regular soda, sports drinks, other-sugar sweetened beverages, fruits and vegetables, and fast food restaurant use; and 3) to assess correlations between multi-substance use and the same dietary practices.

## METHODS

### Study Design and Sample

The present study used a cross-sectional design. The study used baseline data that were drawn from the Team COOL (Controlling Overweight and Obesity for Life) pilot study, a multi-component diet and physical activity intervention trial to promote healthy weight loss or prevent excess weight gain among AHS students. Six alternative public high schools (four urban and two suburban) in the St. Paul-Minneapolis metropolitan area were contacted and agreed to participate. The data were collected in fall 2006 before schools were randomized to intervention and control conditions. Additional details about the study design are described elsewhere (Kubik, Davey, et al., 2009).

Student enrollment across schools varied from 27 to 142 students (mean: 102 students). All students enrolled in the schools were eligible and were invited to participate in study measurements. A few days prior to scheduled measurements, study staff visited the schools to describe the measurement procedures and to invite the

students to participate. Students who were younger than 18 years were given parental consent forms. On the day of measurement, trained study staff collected assents from all students and signed parental consents from those younger than 18 years old. The students completed a survey that took about 30 to 40 minutes and measured demographic, personal, behavioral and school-related social-environmental factors associated with dietary and physical activity practices. The students who completed the survey had their height/weight measured. Students who completed the measurements received a $5 gift card. Across the six schools, a total of 145 students participated in the baseline data collection. There was a high percentage of minority students (mean=64%: range=31% to 96%) and students receiving free/low-cost lunch (mean=61%: range=40% to 96%). All study procedures were approved by the University of Minnesota's Institutional Review Board Human Subjects Committee.

Due to the variable nature of student attendance in alternative high schools, the study participation rate was derived by multiplying the prior year's attendance rate with the schools' 2006-2007 student enrollment (MDE 2007). Using the estimated average adjusted enrollment of 68 students (range: 16 to 107), the participation rate across schools was 36% (range: 18% to 100%).

## Measures

The following dependent and independent variables were examined in this study.

### Dependent Variables

**Regular soda, sports drinks and other sugar-sweetened beverage consumption**. Regular soda, sports drinks and other sugar-sweetened beverages (kool-aid, fruit drinks, lemonade or energy drinks) were assessed by asking participants to report frequency of consumption of each type of beverage over the past month. Ten

response categories ranged from ‘Never’ to ‘5 or more times a day.’ The data were recoded as times per week and modeled as a continuous variable. The mean consumption in times per week and range for each beverage were as follows: Regular soda: Mean: 10.5 (Range: 0–35); Sports drinks: Mean: 4.5 (Range: 0-35); Other sugar-sweetened beverages: Mean: 7.5 (Range: 0-35). Higher values indicate more times per week a beverage was consumed.

**High fat food intake.** A previously validated 17-item fat screener developed by Block and colleagues (2000) was used to assess high fat food intake. Students were asked, “Think about your eating habits over the past year. About how often do you eat each of the following foods?” Examples of high fat food items included various meats, hot dogs, fried chicken, pizza, whole milk and cheese, French fries, and doughnuts. Five response categories ranged from ‘1 time a month or less’ to ‘5 or more times a week.’ The data were recoded to represent times a week and modeled as a continuous variable (Mean: 26.1; Range: 4.25-64.5). The Cronbach’s alpha for the study sample was 0.89. Students whose responses were greater than 3 standard deviations (SD) from the mean were excluded from the analysis (n=2). Higher values indicate more servings a week of high fat food consumption.

**Fruit and vegetable intake.** Intake of fruits and vegetables was assessed with a previously validated 6-item fruit and vegetable screener (Field, Colditz, et al.,1998). Students were asked: “Think about your usual eating habits over the past year. About how often do you eat each of the following foods and beverages?” The items included 100% fruit juice, fruits, vegetables, green salad, potatoes excluding French fries, and carrots. Six response categories ranged from ‘Less than once a week’ to ‘5 or more times a day.’ Data were recoded as daily servings and modeled as a continuous variable (Mean: 3.6; Range: 0-24). The Cronbach’s alpha for the study sample was 0.85.

Students whose responses were greater than 3 SDs from the mean were excluded from the analysis (n=2). Higher values indicate more servings a day of fruit and vegetable consumption.

**Fast food restaurant use**. Frequency of fast food restaurant use was assessed with the question, "Outside of the school day, during a normal week (including weekend days), how many times do you eat or drink something from a fast food restaurant, like McDonald's, Taco Bell or Pizza Hut?" Six response categories ranged from 'Never' to 'More than 7 times.' The data were recoded to represent times per week and modeled as a continuous variable (Mean: 2.8; Range: 0-8). Higher values indicate more times a week of eating or drinking something from a fast food restaurant.

**Independent Variables**

**Substance Use.** A single item adopted from the Youth Risk Behavior Surveillance System (YRBSS) was used to measure frequency of each substance (cigarette, alcohol, and marijuana use) during the past year. The measure demonstrated good reliability (Brener, Kann, et al., 2002) and has been used in other studies with adolescents (Larson, Story, et. al., 2007). The response categories were 'never', 'a few times', 'monthly', 'weekly', or 'daily.' Categories were collapsed to 'Never', 'Frequent, but not daily use', and 'Daily use' to describe only frequency of substance use. However, for the analysis examining associations between frequency of each substance and dietary practices, each substance was used as a continuous variable. To create the single multi-substance use variable, the original responses of each substance were first dichotomized to 'never' or 'ever' having used each substance during the past year. A four-category multi-substance use variable was then created by summing the newly created dichotomized substance use variables (cigarette, alcohol, and marijuana). The

four categories representing multi-substance use in the past year included: 1) never used any substance, 2) used any one substance, 3) used any two substances, and 4) used all three substances.

**Demographic Characteristics.** Gender, age, race/ethnicity and socioeconomic status (SES) were included in the models as potential confounders. Age and gender were obtained from school records; age was modeled as a continuous variable. Race/ethnicity was assessed with the questions: “Do you think of yourself as…. (You may choose more than one) a) American Indian or Alaskan Native, b) Asian (including Cambodian, Hmong, Korean, Laotian, and Vietnamese), c) Black or African American, d) Hispanic or Latino, e) White, and f) Other.” To ensure adequate sample size for analyses, the categories were collapsed to White, Black and other. The ‘other’ racial/ethnic category included the following groups: American Indian or Alaskan Native (1%); Asian, including Cambodian, Hmong, Korean, Laotian, and Vietnamese (6%); Hispanic or Latino (9%); multi-ethnic non-Hispanic (10%); other (3%). For most students, SES was measured with the question “Do you get free/low-cost lunches at school?” (n=135). Response categories were ‘Yes’, ‘No’, and ‘I don’t know.’ If the response was missing or ‘I don’t know,’ the question ‘Does your family get public assistance (welfare, food stamps or other assistance?) was used (n=8). A ‘Yes’ response indicated lower SES and a ‘No’ response indicated higher SES.

**Statistical Analysis**

Descriptive statistics were used to assess the frequency of cigarette smoking, alcohol and marijuana use and the frequency of multi-substance use by demographic characteristics in our sample of alternative high school students. Chi-square and t-tests were used to test bivariate associations between substance use and demographic

characteristics. Mixed model analysis of variance was used to assess the association between each substance and dietary practices of alternative high school students; dietary practices included consumption of regular soda, sports drinks, sugar-sweetened beverages, fruits and vegetables and fast food restaurant use. Mixed model analysis of variance was also used to examine associations between multi-substance use (four-category variable) and dietary practices. Separate analyses were conducted for each dietary practice, but each analysis controlled for gender, race/ethnicity, age, and SES. Since student intake of all three sweetened beverages and fruits and vegetables were positively skewed, they were square root transformed in all mixed model analyses when determining statistical significance. The square-root transformed variables were approximately Gaussian distributed, thus the p-values using the transformed variables were more accurate since they are dependent on the tails of the distribution. However, for ease of interpretation, the presentation of mean servings were generated on the natural scale (untransformed). The school variable was included in the model as a random effect, accounting for the additional component of variance associated with a cluster sampling design where observations from students from the same schools may be correlated (Murray 1998). PROC MIXED procedures were utilized since the outcome variables were continuous. The level of significance was set at $p < 0.05$.

## RESULTS

Table 1 shows frequencies of each substance use by demographic characteristics. Overall, among the students in this study, the most frequently used substance on a daily basis was cigarettes (36%) followed by marijuana (13%) and alcohol (3%). Females and males had equal daily use of cigarettes (36%) and marijuana

(13%). White students and those in higher SES had higher daily consumption of each substance. Table 2 depicts frequency of multi-substance use by demographic characteristics. Overall, 79% of the students used at least one substance and almost one third used all three substances in the past year.

Table 3 presents the results of the multivariate models between each substance use variable and each dietary practice, adjusted for potential confounders. Cigarette smoking was positively associated with consumption of regular soda (p=0.019), high fat foods (p=0.037), and fast food restaurant use (p=0.002). Alcohol use (p=0.005) and marijuana use (p=0.035) were positively associated with high fat food consumption. All other estimated associations were statistically non-significant at the $p< 0.05$.

Table 4 presents adjusted means of dietary practices by multi-substance use categories. Multi-substance use was significantly associated with high fat food intake. Students who used all three substances over the past year had an additional 11 servings of high fat food per week than students who never used any substance. Also, those who used any one substance or any two substances had 12 and 7 additional weekly servings of high fat foods, respectively, compared to those who never used any substance (p-value for trend=0.002). Regular soda consumption and multiple substance use were marginally positively associated (p=0.058). Specifically, students reported an additional 5.4 times a week of regular soda consumption between those who used all three substances and those who did not use any substance in the past year (p-value for trend=0.008). There were no significant associations between categories of multiple substance use and fruit and vegetable intake.

## DISCUSSION

The aim of this study was to examine frequency of use of cigarettes, alcohol and marijuana and frequency of multi-substance use and the associations between each substance as well as multi-substance use and dietary practices among alternative high school students. Our results show that cigarette smoking was the most frequent substance used daily with both males and females having equal frequency of each substance. Cigarette, alcohol and marijuana use were each associated with higher consumption of high fat foods, and cigarette smoking was associated with higher consumption of regular soda and fast food restaurant use as well. Students who used multiple substances had progressively higher consumption of high fat foods. The high frequency of substance use and the link with unhealthful dietary practices indicate that comprehensive health interventions may be beneficial in this group of at-risk youth.

Cigarette smoking at least monthly was higher in our sample (48%) than among students attending traditional high schools (22%) (Larson, Story et al., 2007). Daily smoking was also more prevalent among our students (36%) compared to traditional high school students (14%) (Larson, Story et al., 2007) and students that participated in national studies (10%) (Johnston, O'Malley, et al., 2008). Daily marijuana use among our students was twice as high (13%) as among traditional high school students participating in national surveys (6%) (Johnston, O'Malley, et al., 2008). On the other hand, annual frequency of alcohol consumption in this sample (59%) was similar to national surveillance data (61%) (Johnston, O'Malley, et al., 2008). The high prevalence of substance use that was found in this study was also observed in other studies of alternative high school students (Grunbaum, Kann et al., 2000; Denny, Clark et al., 2003; MN Student Survey-ALC, 2007). According to the 2007 Minnesota Student Survey Alternative High Schools, in the past 30 days, frequency of any use of cigarette, alcohol

or marijuana was 61%, 57%, and 47%, respectively (MN Student survey-ALC, 2007). Among students attending traditional high schools in Minnesota, during the last 30 days, the rate of cigarette, alcohol, and marijuana consumption was 25%, 47%, and 20%, respectively (MN Student survey, 2007). Overall, our findings indicated that the students in this study smoked cigarettes and used marijuana more frequently compared to high school students participating in national studies.

Direct comparison of the frequency of multiple substance use that was found in our study cannot be made with other data, since previous studies have defined multiple substance use differently or only focused on examining use of individual substances among adolescents (Benedict, Evans et al., 1999). A previous study that examined nutrition-related behaviors and categories of substance use (high-risk, conventional, and abstainers) among 400 adolescents from an urban school district found 55% of 11-12 graders to be in high-risk substance use category that included multiple substance use of PCP, heroin, crack/cocaine, frequent of cigarette or alcohol, frequency of marijuana use, and high frequency of multiple illicit drug use (Benedict, Evans et al., 1999). A study of 2,789 young adolescents from East London found about 7% to be regular users of two or more substances including cigarettes and alcohol (Viner, Haines, et al., 2006).

Our results support the covariation of health-compromising behaviors as was indicated by the high prevalence of multi-substance use and associations with higher fat food intake among the students in this study. Also, the association between cigarette smoking and consumption of regular soda, high fat food, and fast food restaurant use that was found in our study is in agreement with other studies involving adolescents (Burke, Milligan et al., 1997; Subar, Harlan et .al., 1990; Larson, Story et al., 2007; Kvaavik, Andersen et al, 2005). A study of a large racially and socioeconomically diverse group of adolescents found that those who smoked had higher soda and fast food

consumption (Larson, Story et al., 2007). In a separate analysis for each substance, our study also found associations between alcohol and marijuana use and high fat food intake. A study using data from a statewide survey also found use of cigarette, alcohol, and marijuana to be individually associated with having an unhealthy diet among middle and high school students (Neumark-Sztainer, Story et al., 1997).

Studies on adolescents have found associations between cigarette use and lower consumption of fruits and vegetables (Larson, Story et al., 2007; Wilson, Smith et al., 2005; Wilson, Nietert 2002; Neumark-Sztainer, Story et al., 1996) and higher consumption of fast food (Larson, Story et al., 2007). The study by Benedict et al, of 400 adolescents from an urban school district found the high-risk substance users compared non-users or conventional users to eat with family less frequently, eat lunch less frequently, eat at school less frequently, and eat with friends more frequently; they were also more likely to eat at convenience stores and fast food restaurants (Benedict, Evans et al., 1999). Our findings did not support the association between substance use and frequency of fast food restaurant use and fruit and vegetable consumption, which may partly be due to measurement differences of dietary behaviors and substance use between the studies. In this study, the 6-item questionnaire was used to measure usual intake of fruits and vegetables over the past year. Compared with the 24-hour dietary recalls, the 6-item questionnaire performed equally to the Harvard Food Frequency Questionnaire (Field, Colditz, et al., 1998); however the lack of variability in fruit and vegetable intake by the students in our study and the relative small sample may not have been sufficient to detect significant differences in dietary practices by each category of substance use. Larger studies with alternative high school students are needed in order to confirm differences in dietary intakes by different levels of multiple substance use.

One of the strengths of this study was its diverse sample of adolescents with respect to gender, race/ethnicity and SES. The measures of dietary practices and substance use have been previously tested in other adolescent populations. This study is the first one to examine associations between categories of multiple substance use and dietary practices among alternative high school students. Although the student participation rate was 36%, which is lower than rates seen in studies with traditional school students, the demographic distribution of our sample closely resembles the demographic characteristics of alternative high school students in our study schools (male= 51%; black=42%, white=39%; low SES=56%). One of the limitations may be that students who decided not to participate may differ from the ones who participated in regard to demographic factors and dietary practices. The study utilized a cross-sectional analysis that only considers the associations between predictor and outcome variables. Participants in this study represented only the Twin Cities area of Minnesota, which limits the generalizability of the findings.

## CONCLUSION

This study demonstrated the high prevalence of substance use and its association with unhealthful dietary practices among alternative high school students. Consistent with findings from the few other studies with alternative high school students, our findings support the high rate of co-occurrence of health risk behaviors and emphasize the need for comprehensive health interventions in this group of students. Behavioral risk factors that contribute to chronic disease begin in adolescence and continue into young adulthood (Kelder, Perry, et al., 1994; Kvaavik, Andersen et al., 2004; Lien, Lytle et al., 2001; Cullen, Koehly et al., 1999; Harris, Gordon-Larsen et al., 2006), indicating that the age of initiation significantly predicts substance use and

frequency later in life. For example, consistent positive associations have been observed between alcohol use in adolescence and smoking in young adulthood and between younger age of smoking initiation and increased smoking frequency in young adulthood (Paavola, Vartiainen et al., 2004; Everett, Warren, et al., 1999). As many of health-risk behaviors, including violence-related behaviors are more prevalent among alternative high school students (Escobar-Chaves et al., 2002; Grunbaum, Kann et al., 2000) compared to traditional high school students, comprehensive health interventions that focus on improving dietary practices and reducing substance use could positively influence violence-related behaviors among these students. Larger studies with AHS students are needed to confirm the current findings and to further examine socioenvironmental factors that have been suggested by previous studies as possible contributing and protecting factors for substance use among adolescents, such as neighborhood income inequality, neighborhood education, parental education and parental support (Scarinci, Robinson et al., 2002; Simantov, Schoen et al., 2000; Johnston, O'Malley et al., 2008; Grunbaum, Tortolero et al., 2000).

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Table 5.1 Frequency of substance use among alternative high school students by demographic characteristics in the past 12 months (n=145)[1]

| | Cigarette Smoking | | | Alcohol Use | | | Marijuana Use | | |
|---|---|---|---|---|---|---|---|---|---|
| Demographic Characteristics | Never | Frequent, but not daily use | Daily use | Never | Frequent, but not daily use | Daily use | Never | Frequent, but not daily use | Daily use |
| Total (N=145) | 60 (42%) | 32 (22%) | 52 (36%) | 60 (42%) | 80 (55%) | 4 (3%) | 74 (51%) | 52 (36%) | 19 (13%) |
| Gender | | (n=144) | | | (n=144) | | | (n=145) | |
| Male | 33 (44%) | 15 (20%) | 27 (36%) | 29 (39%) | 43 (57%) | 3 (4%) | 38 (50%) | 28 (37%) | 10 (13%) |
| Female | 27 (39%) | 17 (25%) | 25 (36%) | 31 (45%) | 37 (54%) | 1 (1%) | 36 (52%) | 24 (35%) | 9 (13%) |
| Race | | (n=144) | | | (n=144) | | | (n=145) | |
| Black | 26 (58%) | 11 (24%) | 8 (18%) | 27 (60%) | 17 (38%) | 1 (2%) | 24 (52%) | 14 (30%) | 8 (14%) |
| White | 16 (28%) | 11 (19%) | 30 (53%) | 16 (28%) | 39 (68%) | 2 (4%) | 28 (49%) | 21 (37%) | 8 (17%) |
| Other | 18 (43%) | 10 (24%) | 14 (33%) | 17 (41%) | 24 (57%) | 1 (2%) | 22 (52%) | 17 (40%) | 3 (7%) |
| SES | | (n=142) | | | (n=142) | | | (n=143) | |
| Higher | 16 (31%) | 11 (22%) | 24 (47%) | 17 (33%) | 32 (63%) | 2 (4%) | 24 (46%) | 20 (38%) | 8 (15%) |
| Lower | 42 (46%) | 21 (23%) | 28 (31%) | 41 (45%) | 48 (53%) | 2 (2%) | 48 (53%) | 32 (35%) | 11 (12%) |
| Age | | (n=144) | | | (n=144) | | | (n=145) | |
| Mean (SD) | 16.9 (1.3) | 17.4 (1.1) | 17.4 (0.97) | 16.8 (1.2) | 17.5 (1.0) | 17.7 (0.63) | 17.1 (1.2) | 17.4 (1.0) | 17.1 (1.2) |

[1] Cases in each analysis ranged from 142-145 due to incidental missing data.

'Frequent but not daily use' indicate those who reported using a substance at least few times in the past 12 months but less often than daily; 'daily use' indicate those who reported using a substance daily.

Table 5.2 Multi-substance use among alternative high school students by demographic characteristics in the past 12 months

| | Number of Substances Used in the Past 12 Months* | | | | |
|---|---|---|---|---|---|
| Demographic Characteristics | Never Used Any | Used any one | Used any two | Used all three | P-Value [a] |
| Total (n=145) | 31 (21%) | 33 (23%) | 37 (26%) | 44 (30%) | |
| Gender | | | | | |
| Male (n=76) | 17 (22%) | 18 (24%) | 15 (20%) | 26 (34%) | 0.389 |
| Female (n=69) | 14 (20%) | 15 (22%) | 22 (32%) | 18 (26%) | |
| Race/Ethnicity | | | | | |
| White (n=57) | 8 (14%) | 10 (18%) | 16 (28%) | 23 (40%) | 0.095 |
| Black (n=46) | 14 (31%) | 12 (26%) | 13 (28%) | 7 (15%) | |
| Other (n=42) | 9 (22%) | 11 (26%) | 8 (19%) | 14 (33%) | |
| SES | | | | | |
| Higher (n=52) | 9 (17%) | 8 (15%) | 16 (31%) | 19 (37%) | 0.251 |
| Lower (n=91) | 20 (22%) | 25 (27%) | 21 (23%) | 25 (28%) | |
| Age (n=145) Mean (SD) | 16.7 (1.3) | 17.1 (1.2) | 17.3 (1.1) | 17.6 (1.0) | 0.032 |

* Substances include cigarette smoking, alcohol, and marijuana use in the last 12 months. Never used indicate those who never used any of the three substances in the last 12 months; used only one, those that used any one substance; used any two, those that use any two substances; used all three, those that used all three substances in the last 12 months.

[a] $\chi^2$ test of independence of substance use and demographic characteristics.

Table 5.3 Multivariate associations between each substance and selected dietary practices in alternative high school students in the past 12 months

| Substance use in the past 12 months [a] | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Dietary Intake | Cigarette Smoking (n=144) | | | Alcohol Use (n=144) | | | Marijuana Use (n=145) | | |
| | Estimate (b) | 95% CI | p-value | Estimate (b) | 95% CI | p-value | Estimate (b) | 95% CI | p-value |
| Regular soda times/wk | 1.22 | (0.25, 2.2) | 0.019 | 0.79 | (-0.78,2.39) | 0.295 | 1.05 | (-0.14,2.25) | 0.093 |
| Sports drinks times/wk | -0.08 | (-0.79,0.63) | 0.972 | 0.03 | (-1.12,1.20) | 0.847 | -0.41 | (-1.28,0.45) | 0.838 |
| Other sugar-sweetened bev. times/wk | 0.77 | (- 0.05,1.61) | 0.071 | 1.34 | (0.02,2.67) | 0.079 | -0.08 | (-1.10,0.94) | 0.893 |
| Fast food restaurant times/wk | 0.26 | (0.09,0.42) | 0.002 | 0.18 | (-0.09,0.46) | 0.194 | 0.10 | (-0.10,0.30) | 0.329 |
| High fat foods servings/wk | 1.24 | (0.07,2.41) | 0.037 | 2.61 | (0.76,4.45) | 0.005 | 1.51 | (0.10,2.92) | 0.035 |
| Fruits/vegetables servings/day | 0.11 | (-0.30,0.53) | 0.498 | -0.33 | (-1.00,0.33) | 0.463 | -0.32 | (-0.82,0.18) | 0.287 |

[a] All estimates are adjusted for age, gender, race, and SES

Table 5.4 Mean dietary practices among alternative high school students by category of multi-substance use

| Dietary Practices | Number of Substances Used in the Past 12 Months * | | | | | |
|---|---|---|---|---|---|---|
| | Never Used Mean (SE) n=31 | Used any one Mean (SE) n=33 | Used any two Mean (SE) n=37 | Used all three Mean (SE) n=44 | P Value ± | $R^2$ |
| Regular soda times/wk | 7.15 (1.8) | 7.42 (1.7) | 12.08 (1.6) | 12.59 (1.5) | 0.058 | 0.15 |
| Sports drinks times/wk | 2.99 (1.7) | 4.26 (1.6) | 6.00 (1.5) | 2.27 (1.4) | 0.307 | 0.19 |
| Other sugar-sweetened bev. † times/wk | 5.01 (1.8) | 7.28 (1.8) | 8.44 (1.7) | 8.34 (1.6) | 0.400 | 0.28 |
| Fast food restaurant times/wk | 2.05 (0.33) | 3.04 (0.3) | 2.93 (0.2) | 2.92 (0.2) | 0.113 | 0.18 |
| High fat foods servings/wk | 18.23 (2.2) [a] | 30.07 (2.1) [b] | 25.41 (2.0) [b] | 29.17 (1.9) [b] | 0.0003 | 0.29 |
| Fruits/vegetables servings/day | 2.94 (0.8) | 3.82 (0.8) | 4.21 (0.7) | 2.98 (0.7) | 0.728 | 0.10 |

Note: The total sample size: 145. Sample size may vary across models due to missing responses. Mean values were adjusted for gender, race/ethnicity, SES, and age. $R^2$ for base model ranges from 0.01 for fruits and vegetables to 0.19 for other sugar-sweetened beverages.

* Substances include cigarette smoking, alcohol, and marijuana use in the last 12 months. Never used indicate those who never used any of the three substances in the last 12 months; used only one, those that used any one substance; used any two, those that use any two substances; used all three, those that used all three substances in the last 12 months.

† Include kool-aid, fruit drinks, lemonade or energy drinks (like Red Bull).

± P value represents testing for differences in adjusted means of dietary practices by categories of multiple substance use (df=3).

[ab] Different superscripts indicate statistically significant differences between mean dietary practices by category of substance use.

# Chapter 6. Results, Discussion and Implications for Future Research

This chapter provides a brief presentation and discussion of the major findings of each of the three studies, included in Chapters 3, 4, and 5. It also includes strengths and limitations of the overall research. The chapter ends with recommendations for potential future research, implications for public health practice and policies, and overall conclusion.

## Overview of the Research

The aim of this dissertation was to examine intake of selected dietary practices and associations between these dietary practices and student reported demographic, behavioral, and school food environmental factors among a sample of 145 students attending six alternative high schools (4 urban, 2 suburban) in the St. Paul- Minneapolis metropolitan area of Minnesota. Dietary practices included consumption of regular soda, sports drinks, other sugar-sweetened beverages, high fat foods, fruits and vegetables and frequency of fast food restaurant usage. Bronfenbrenner's ecological model (Bronfenbrenner, 1979) provided the theoretical framework for this research. The baseline data used in this research is part of Team COOL (Controlling Overweight and Obesity for Life) pilot study, a multi-component diet and physical activity intervention trial to promote healthy weight loss or prevent excess weight gain. This research used a cross-sectional design of data collected in Fall 2006. The Team COOL pilot study was funded by a grant from the National Institutes of Health (NIH).

The findings of this research are presented in three individual studies in chapters 3, 4, and 5. The three studies are guided by Bronfenbrenner's ecological model, a

health behavior theory that explains human behavior by environmental interconnections and interactions between individuals and environments (Bronfenbrenner, 1979). The conceptual framework for this dissertation depicting the factors examined in each of the three individual studies is shown in Figure 1 (page 71). Students attending alternative high schools are an at-risk group of youth for poor health behaviors and obesity, but little is known about their dietary practices and their food environment at school.

Chapter 3 describes the study that examines associations between selected dietary practices and demographic characteristics including gender, race/ethnicity and socioeconomic status (SES) of alternative high school students. Although findings from previous studies regarding associations between demographic factors and dietary practices have not always been consistent, a few studies with adolescents have shown dietary differences across gender, race/ethnicity, and socioeconomic status (SES) (Neumark-Sztainer, Story, et al., 2002; Neumark-Sztainer, Story, et al., 1996; Xie, Gilliland, et al., 2003). In two-thirds of alternative high schools, more than one half of the students are minorities and in close to one-half of the schools more than 20% of the students live below the poverty line (Kleiner, Porch, 2002). Given the unique mix of students in alternative high schools, exploring dietary practices by gender, race and SES is essential in order to develop targeted messages and health programming that will meet the unique needs of this population.

Chapter 4 examines associations between student reported eating and drinking opportunities during the school day and student dietary practices. This study also looks at associations between student perceptions of the healthfulness of the school food and student dietary practices. To date, the research conducted in traditional high schools has shown that availability of competitive foods, and food related practices and policies have been linked to students' dietary intake (Kubik, Lytle, Hannan et al., 2003; Neumark-

Sztainer, French, Hannan et al., 2005; O'Toole, Anderson et al., 2007; Snelling, Korba et al., 2007). However, limited data is available about the food environment in alternative high schools, in spite of the high rates of overweight and obesity among minority youth and those living below the poverty line (Ogden, Carroll, et al., 2006; Meich, Kumanyika, et al., 2006). In order to improve the quality of the foods offered at school, it is imperative to examine the school food environment in alternative high schools.

Chapter 5 presents the study that describes frequency of individual substance use, such as cigarette smoking, alcohol and marijuana use and the frequency of using multiple substances among alternative high school students. This study also examines associations between frequency of individual substance use as well as frequency of using multiple substances and selected dietary practices. Few previous studies have reported alternative high school students engaging in multiple health risk behaviors (Grunbaum, Kann et al., 2000) including substance use (Brener, Wilson 2001; Denny, Clark et al., 2003). Although a few studies have assessed correlations between substance use and dietary behaviors in traditional high schools (Larson, Story, et al., 2007; Burke, Milligan et al., 1997; Neumark-Sztainer, Story et al., 1997), the same correlations have not been examined in alternative high school students. Since there is often a covariation of health risk behaviors (Jessor, 1991), examining a cluster of behaviors, such as dietary practices and substance use, will allow for the development of comprehensive programs that will address multiple health risk behaviors among alternative high school students. The remainder of this chapter discusses the results of each of the three studies as well as study limitations and future research directions.

**Study 1. Sociodemographic differences in selected eating practices among alternative high school students**

The study in Chapter 3 examines the frequency of sugar-sweetened beverages, high fat foods, fruits and vegetables, and frequency of fast food restaurant use and assesses differences in consumption by gender, race/ethnicity and SES among students attending alternative high schools. Racial differences were observed for sugar-sweetened beverages, high fat foods, and frequency of fast food restaurant use. The most interesting finding of this study was that black students had significantly higher consumption than whites of sports drinks ($p=0.044$), other sugar-sweetened beverages ($p=0.037$), high fat foods ($p=0.016$), and frequency of fast food restaurant use ($p<0.007$). Compared to the general US population of adolescents, this sample of alternative high school students reported higher consumption of high fat foods, fast food restaurant use and lower consumption of ≥5 daily servings of fruits and vegetables (Neumark-Sztainer, Story, et al., 2002; French, Story, et al., 2001). Another important finding was that females consume regular soda (OR=1.8; $p=0.099$) and visit a fast food restaurant (OR=1.99; $p=0.065$) more frequently than males in an association that was marginally significant at $p< 0.05$.

Although the present finding that black youth consumed sugar-sweetened beverages more frequently than other adolescents in this study is consistent with the results from previous studies (Storey, Forshee et al., 2004; Xie, Gilliland, et al., 2003), the finding of higher consumption of regular soda and fast food restaurant use among females than males is in contrast with finding from previous work that found mixed results (French, Story, et al., 2001; Paeratakul, Ferdinand, et al., 2003; Bowman, Gortmaker, et al, 2004; Larson, Neumark-Sztainer, et al., 2008). In most studies to date, regular soda consumption was measured by combining all sugar-sweetened beverages, preventing the distinction between the different types of these beverages. However, in

this study the different sugar-sweetened beverages were assessed separately as regular soda, sports drinks and other sugar-sweetened beverages allowing for more detailed description of their associations with demographic factors. In today's digital era, the food and beverage industry utilizes sophisticated and innovative data collection and behavioral tracking methods in order to segment their population and more effectively target their promotional activities to specific subgroups of youth (Chester & Montgomery, 2007). Furthermore, the sports drinks industry forecasts a 33% increase in global consumption by 2012 (Drake, 2008). As industry marketing efforts become more segmented, assessment of the consumption of different types of sugar-sweetened beverages by different groups of youth will be essential in order to effectively design appropriately targeted health and nutrition intervention studies. In this study, the sample size (n=145) allowed assessment of only dietary practices by each demographic group; a larger study with alternative high school students will enable a more detailed demographic stratification of the data providing a better understanding of consumption patterns within subgroups of youth.

In this present study, intake of fruits and vegetables was not significantly associated with gender, race/ethnicity, or SES, which is contrary to other studies with adolescents (Neumark-Sztainer, Story et al., 2002; Xie, Gilliland et al., 2003). In general, previous studies have found males and white adolescents to have the lowest consumption of fruits or vegetables compared to females and youth from other racial groups (Neumark-Sztainer, Story et al., 2002; Xie, Gilliland et al., 2003). With respect to SES, previous studies have shown higher intake of fruits or vegetables among higher income groups, but the associations were not always statistically significant (Neumark-Sztainer, Story et al., 2002; Xie, Gilliland et al., 2003). Methodological differences may account for the lack of demographic differences in fruit and vegetable intake between the

current study and previous studies. In other studies, fruit and vegetable consumption was measured with various other methods including the Youth/Adolescent Questionnaire (YAQ), a semi-quantitative food frequency questionnaire for adolescents, and a 28-item short food frequency (Larson, Neumark-Sztainer, et al., 2008; Lien, Lytle, et al., 2001; Field, Colditz,et al., 1998). In the current study, usual intake of fruits and vegetables over the past year was measured with a previously validated 6-item fruit and vegetable Behavioral Risk Factor Surveillance System questionnaire developed by Field and colleagues (1998).The past-year version of the 6-item fruit and vegetable screener was compared with 24-hour dietary recalls and with four other questionnaires in assessing fruit and vegetable intake in 102 students attending urban high schools (Field, Golditz et al., 1998). Although all questionnaires underestimated the prevalence of fruit and vegetable intake, the 6-item fruit and vegetable screener performed comparably to the Harvard Food Frequency Questionnaire (27-item fruit/vegetable semi-quantitative questionnaire) and had high positive predictive value, correctly classifying those meeting the goal of consuming > 5 daily serving of fruits and vegetables (Field, Golditz et al., 1998). The screener also demonstrated good internal consistency in both this study (Cronbach's alpha=0.85) and in a study of 3,878 middle school students (Cronbach's alpha=0.75) (Birnbaum, Lytle et al., 2002). Although brief dietary assessment tools are appropriate in assessing usual food intake and evaluating dietary behavior change from an intervention, given the relatively small sample size in this study and possibly the limited variability in fruit and vegetable intake, the 6-item fruit and vegetable screener may not have captured the variation in intakes between the different demographic groups.

**Study 2. Eating and drinking opportunities during the school day and associations with selected dietary practices in alternative high school students.**

To our knowledge, this study is one of the first to examine student reported eating and drinking opportunities, other than the national breakfast and lunch programs, during the school day (i.e. fast food restaurants, convenience stores, school vending, eating/drinking in classrooms, receiving food as an incentive or reward) and associations with selected dietary practices in students attending alternative high schools. The present study also examines the association between student perceptions of the healthfulness of the school food and the same dietary practices. Findings in this study indicate that the 12-item eating and drinking opportunities scale is significantly associated with increased consumption of regular soda ($p=0.0002$), sports drinks ($p<0.0001$), other sugar-sweetened beverages ($p=0.02$), high fat foods ($p=0.0002$) and frequency of fast food restaurant use ($p<0.0001$), but it is not associated with fruit and vegetable consumption. Previous studies in traditional schools have already demonstrated the link between the school food environment (i.e availability of competitive foods and school food related practices and policies) and student dietary practices (Kubik, Lytle, Hannan et al., 2003; Neumark-Sztainer, French, Hannan et al., 2005; O'Toole, Anderson et al., 2007; Snelling, Korba et al., 2007). The current study demonstrates that student reported access and use of school eating and drinking opportunities are positively linked to student intakes and emphasizes the important role of the school food environment in the dietary choices of alternative high school students.

Despite the marginal statistical significance of the associations between the 6-item scale representing student perceptions of the availability of healthful food at school and consumption of sports drinks and other sugar-sweetened beverages, the direction of the associations is worth noting. The associations indicate that as students perceive the food environment at school to be healthy, their consumption of sports drinks increases,

whereas their consumption of other sugar-sweetened beverages deceases. Based on these associations, it is possible that the students consider sports drinks as healthful options and other sugar-sweetened beverages as unhealthful. Since perception of the quality of the food is often associated with satisfaction and usage (Meyer, Conklin 1998), these findings have important implications for interventions because despite their health-conscious image, sports drinks, such as Gatorade, are high in energy, added sugars, and sodium. Thus, school environmental interventions seeking to increase the availability of more healthful foods and beverages must be coupled with efforts to address knowledge of the nutrient content of popular foods and beverages.

In the present study, the questions used to measure student dietary practices assessed intake throughout the day, and the frequency of fast food restaurant use was assessed for outside the school day. On the other hand, the eating and drinking opportunities scale measured these food sources and practices during the school day. Thus, the positive associations found in this study between the scale representing eating and drinking opportunities during the school day and dietary practices may denote that the school food environment as reported by the students is likely to be associated with student intake in school and after school. Future studies will need to assess how the changes made to the school food environment impact student intakes during and after the school day (Neumark-Sztainer, French, et al., 2005).

The estimated variation (R-squared) in the dietary practices for each model explained by the two scales, representing the school food environment and dietary outcomes, adjusted for demographic factors, ranged from 11% for fruit and vegetable intake to 38% for fast food restaurant use. The additional variation in the dietary practices explained by the two scales only ranged from 3% for fruit and vegetable intake to 24% for fast food restaurant use. The statistical test for the improvement of fit

indicated that the two scales improved the fit significantly for all models with the exception of fruit and vegetable intake.

The scale representing eating and drinking opportunities during the school day also includes two items relating to classroom food practices of school staff; these items include foods offered as an incentive or reward and “free food” brought to school by school staff. Therefore, the positive associations between the eating and drinking opportunities scale that includes the two items, with sugar-sweetened beverages, high fat foods and fast food restaurant use also emphasizes the importance to include school staff in school-based interventions and to address their food knowledge and eating practices as well. A previous study that surveyed middle school teachers found that although the majority of them supported a healthy food environment for students, they had less than optimal eating behaviors and the foods they used in the classroom as an incentive or reward were high in sugar and fat (Kubik, Lytle et al., 2002). In addition, school wide food practices as reported by middle school teachers were associated with increased student weight (Kubik, Lytle et al., 2005). Therefore, school-based nutrition interventions can be more effective in achieving sustainability of environmental changes if school teachers and staff also participate.

Overall, the results of this study revealed that alternative high school students, similar to students in traditional high schools, use many food and beverage sources during the school day and these eating and drinking opportunities are strongly linked to their overall unhealthful dietary practices. Also, this study adds to the empirical evidence produced by other environment-behavior studies in schools and lends support for an ecological description of the link between student reported school food environment and overall dietary practices.

**Study 3. Dietary practices and multi-substance use in students attending alternative high schools. Findings from the Team COOL pilot study.**

As substance use is among the most prevalent health risk behaviors among adolescents (CDC-YRBS 2007; Johnston, O'Malley et al., 2008) and among at-risk youth attending alternative high schools (Grunbaum, Kann et al., 2000; MN Student survey-ALC, 2007), the focus of this study was to examine prevalence of individual substances (i.e. cigarette, alcohol, and marijuana) as well as prevalence of multi-substance use and their association with selected dietary practices among a group of alternative high school students. Previous studies have found covariation of health compromising behaviors (Pronk, Anderson et al., 2004; Neumark-Sztainer, Story et al., 1997), including associations between substance use and unhealthful eating patterns (Neumark-Sztainer, Story et al., 1997). One national study that compared risk behaviors between alternative high school and traditional high school students have found 20% higher prevalence of engaging in multiple health risk behaviors among alternative high school students (Grunbaum, Lowry et al., 2001).

The main findings from this study were that daily use of cigarettes was the most frequent substance (36%) and males and females had similar daily use of cigarettes (36%) and marijuana (13%). Cigarette smoking was significantly positively associated with consumption of regular soda (p=0.019), high fat foods (p=0.037), and fast food restaurant use (p=0.002). Alcohol (p=0.005) and marijuana use (p=0.035) were significantly positively associated with high fat food intake. Multi-substance use was significantly associated with high fat food intake (p-value for trend=0.002). Regular soda consumption and multi-substance use were marginally (p=0.058) associated in this data set. The estimated variation (R-squared) in the dietary practices for each model explained by multiple substance use, adjusted for demographic factors, ranged from 10% for fruit and vegetable intake to 29% for high fat food intake. The additional

variation in the dietary practices explained by multiple substance use ranged from 2% for other sugar-sweetened beverages and fruit and vegetable intake to 11% for high fat food intake.

There is limited research regarding substance use among youth in alternative high schools, and to our knowledge, this study is the first to report on associations between substance use and dietary practices. The results of this study indeed support previous findings of the higher prevalence of cigarette smoking at least monthly or daily among alternative high school students as compared to students in traditional high schools (Larson, Story et al., 2007). Daily marijuana use by our students was twice as high (13%) as national surveillance data on high school students (6%) (Johnston, O'Malley, et al., 2008). The significant associations between multi-substance use and intake of regular soda and high fat food raises concerns of the co-occurrence of health compromising behaviors and point to the importance of comprehensive health interventions with alternative high school students. An attempt was made to assess the overall impact of substance use on diet quality by treating the six dietary behavior outcomes as correlated outcomes within individual and standardizing them, thus creating an overall diet quality variable which represents a measure of unhealthful diet; all sugar-sweetened beverages, high fat food, and fast food restaurant use represent an unhealthful diet and consumption of fruits and vegetables represent a healthful diet which was reverse coded. The correlation matrix between the components (dietary practices) of the diet quality revealed highest correlations between sports drinks and other sugar-sweetened beverages (0.595) and between fast food restaurant use and high fat food intake (0.658). Consumption of fruits and vegetables were negatively correlated with sports drinks, other sugar-sweetened beverages, high fat food, and fast food restaurant use. The multivariate analysis that was conducted between overall diet

quality and multi-substance use adjusting for demographic variables, revealed a significant association (p=0.010), indicating that multi-substance use is associated with the overall diet quality averaged over the six components of the unhealthful diet. The least squares means and differences indicate that the category of 'no substance use' is inversely associated with a diet quality (-0.224) indicating that never having used any substance is related to a healthful diet. On the other hand, any other category of multi-substance use is related to an unhealthful diet quality (0.02 to 0.10). Larger-scale studies in alternative high schools are needed in order to confirm the results and to provide higher statistical power to examine gender and ethnic differences in the associations between substance use and outcome variables.

**Summary of Major Findings**

The alternative high school students in this study reported high consumption of sugar-sweetened beverages, high fat foods, frequency of fast food restaurant use, and low consumption of fruits and vegetables. A compelling finding is the higher frequency of consumption of other sugar-sweetened beverages, high fat foods and fast food restaurant use among black students than all other students, and the higher consumption of sports drinks among black than white students.

The student reported school food environment, a 12-item scale, indicates that students are exposed to a variety of food sources and practices during the school day. During the week, the most frequent eating and drinking opportunities are getting lunch at a fast food restaurant (76%), drinking (74%) and eating (70%) in the classroom, and drinking in the school hallways (70%). Also, the school food environment is significantly associated with students' dietary practices. On average, with an increase of one additional day of eating and drinking opportunities, there is an increase in consumption

of each of sugar-sweetened beverages, high fat foods and frequency of fast food restaurant use. No association is found between eating and drinking opportunities and consumption of fruits and vegetables.

The students in this study frequently use cigarettes, alcohol and marijuana. One-half or more of the students used each of the substances and close to a third of the students simultaneously used all three substances at least few times in the past year. Students who smoke cigarettes have higher consumption of regular soda, high fat food and higher frequency of fast food restaurant use. Use of each of the three substances is associated with higher consumption of high fat foods. Overall, the students in the six study schools do not engage in healthful dietary behaviors and are exposed to a school food environment that provides numerous eating and drinking opportunities during the school day. The students also frequently use substances, such as cigarettes, alcohol and marijuana.

**Strengths and Limitations**

This study is one of the few to report dietary practices and to examine associations with demographic and school food environmental factors and substance use among alternative high school students. It also includes a diverse sample of adolescents with respect to gender, race/ethnicity, and SES. The measures used in this study have been previously tested in other adolescent populations. Although the relatively low participation rate of 36% would be considered a limitation, given the nature of the schools that include inconsistent student attendance, the demographic distribution of our sample closely resembles the study schools (male= 51%; black=42%, white=39%; low SES=56%).

Limitations include the cross-sectional nature of the study that considers only the associations between the explanatory variables and dietary practices rather than a directional or causal path. The study includes only students in the Twin Cities area of Minnesota, thus limiting the generalizability of the findings. The small sample size did not allow further examination of dietary practices among racial groups such as Hispanic, American Indian or Alaskan native, and Asian; as a result the non-white and non-black groups were categorized as other.

The usual consumption of fruits and vegetables was measured by the six-item questionnaire fruit and vegetable screener used in the Behavioral Risk Factor Surveillance system in the United States. Previous validation studies have shown that as compared with the 24-hour dietary recalls, the six-item questionnaire underestimated the prevalence of fruit and vegetable intake among urban adolescents, but it performed equally to the Harvard Food Frequency Questionnaire (Field, Golditz et al., 1998). Finally, students who decided not to participate may differ from the ones who participated in regard to demographic factors and dietary practices. Students who did not participate may be absent from school more often than the others and may represent a group of students with higher frequency of multiple health related risk behaviors. Nevertheless, even with the students who participated in this study, the findings support the need for further heath and nutrition interventions in alternative high schools.

**Potential Future Research**

The findings of this research add to the limited information available regarding the dietary practices of alternative high school students. The observed significant associations between student demographics, behaviors and school food environmental

factors reported by students provide the base for larger, more comprehensive interventions that target the food environment at schools as well as individual-level eating behaviors in alternative high schools. In addition, national surveys measuring the school food environment in alternative high schools, and their students' socioenvironmental, personal and behavioral characteristics are needed in order to examine differences from youth attending traditional high schools and to inform health intervention programs.

In order to more accurately assess the diets and the environmental factors that influence the dietary practices of alternative high school students, accurate and specific measures are needed. Formative research with alternative high school students will inform the development of culturally appropriate food frequency questionnaires and psychometrics that specifically measure the social environment, food environment including student and family eating practices, school food environment, food related behaviors and beliefs, and other youth related behaviors. For example, if the goal of an intervention is to reduce the availability of sugar-sweetened beverages in school, how much effect will the intervention have on student intake of sugar-sweetened beverages if students are accustomed to drinking these beverages at home and can purchase them before coming to school? Thus, information regarding the students' food environment and habits outside the school day are important in order to appropriately tailor nutrition messages and to develop school policies that will maximize efforts to establish a healthful school environment.

Interventions attempting to change the types of foods offered in schools require valid and reliable measures of the school food environment, as well as student dietary intakes during the school day. To date, the school food environment has been evaluated in large national studies and in smaller health/nutrition interventions. Large national

surveillance studies have mainly used school administrator and food service questionnaires. All these methods are subject to usual bias including response and recall bias. Smaller scale and school nutrition intervention studies utilized a variety of methods such as direct observation of food and beverage inventory by study experts and sales data. The accuracy of the assessment of the school food environment can be further improved by collecting sales receipts from automated registrars for a la carte foods and sales data for vending machines (Fulkerson, French, et al., 2004). To improve student-level dietary intake data during the school day, especially intake of competitive foods, student diet records of school eating practices may be used. Student food records will allow for differentiation between foods and beverages consumed during and after school and will be used to assess correlations with school food and beverage availability and examine nutrient contributions of foods and beverages obtained at school.

Implementation of health and nutrition policies that guide the nutrient quality of foods and beverages offered at school are essential to assure sustainability of environmental changes that support healthful behaviors. In the last few years, important strides have been made to support a healthier food environment in schools; in 2006 the national Wellness Policy (PL 108-265) took effect in all schools participating in the federal school meals programs and the Institute of Medicine made recommendations on the nutrient quality of competitive foods sold at schools. Studies evaluating the food environment in traditional schools have shown some progress toward a healthier food environment (O'Toole, Anderson 2007). Evaluation of school policy developments and their impact on student diets will require standardized and specific measures. Recently a standardized food policy classification system has been developed to monitor changes in 11 policy areas including national meal plans and competitive foods (Mâsse, Frosh et

al., 2007). In addition, it is also imperative to address school policies that increase student access to additional eating and drinking sources such as open campus or using food as an incentive or reward and develop standardized measures to evaluate policy changes in these areas.

As reported by the alternative high school students in this study, the quality of their food intake and the food environment of the six study schools needs improvement. Alternative high schools are well positioned to foster a healthful food environment due to their relative small size and a flexible teaching approach that attends to the special needs of their students. Thus, these schools can be models for healthy living by adopting a culture that consistently reinforces healthful eating behaviors and physical activity. In order to foster a healthy living culture, an integrated approach to school nutrition environment is necessary where health and nutrition knowledge acquired in the classroom is reinforced by the availability of healthful food and healthy eating practices by school staff. The results of this research have strongly demonstrated that the multiple food opportunities available to students were associated with unhealthful eating behavior, thus implementation of a healthful nutrition environment will require following health and nutrition policies including restricting access to competitive foods to students, maintaining a closed-campus policy during lunch, establishing nutritional guidelines for foods offered to students by staff and during special events, and providing healthful and high quality foods during meals. Allowing students to eat or drink in the classroom must be prohibited and only foods obtained at school should be allowed in school premises. Ideally, the schools should emphasize participation on the SBP and NSLP as the main sources of food during the day. However, without any data on the nutritional content and quality of the school meals in alternative high schools, restricting students to eating the national reimbursable meals may prove counter productive. Although these policies may

appear difficult to implement, given the current adolescent eating behaviors, an ecological approach to food environmental change may contribute to the sustainability of the school nutrition environment and to normative behavior of healthful eating. The efforts to change the food environment will foster interaction of the students with their school and their families regarding the food environment as well as interaction of the school with families in a reciprocal relationship that will contribute to the positive student development and possibly extend to food environmental changes beyond the school grounds.

**Implications for Public Health Nutrition Practice and Policies**

Although the findings of this research are based on a relatively small group of alternative high school students, they provide significant insight on their dietary practices and the eating and drinking opportunities during the school day. These results provide the base for larger, multi-site studies that will have important health and nutrition policy implications for alternative high schools. The students in this study reported higher consumption of sugar-sweetened beverages, high fat foods, and fast food restaurant use than adolescent in the general population (French, Story, et al., 2001; Troiano, Briefel, et al., 2000; Neumark-Sztainer, Story, et al., 2002). In addition, the food environment in the six study schools does not foster healthful dietary practices, as students reported having multiple eating and drinking opportunities during the day, including having lunch off-campus and eating and drinking in the classrooms. Despite these results, there are no national data available about the diets of alternative high school students and the food environment in alternative high schools, despite increased awareness that low income and minority youth are less likely to have a healthful diet and are vulnerable to obesity

and related health outcomes (Kumanyika, 2008; Popkin, Duffey, et al., 2005). Currently there are more than 6,500 alternative high schools in the United States enrolling more than a million ethnically and socioeconomically diverse group of youth (Hoffman 2009; Kleiner 2002). The results of this study will increase awareness about the dietary practices of alternative high school students and will highlight the need of conducting national surveys in alternative high schools to assess the school food environment and school policies and practices (Gordon, Cohen, et al., 2009; O'Toole, Anderson, et al., 2007).

The benefits of participating in national surveys are multiple. Regularly measuring the school food environment, including nutrient content of the NSLP and SBP meals, availability of competitive foods, and student nutrient intakes will provide a measure of progress with respect to school wellness policy implementations and changes in school food environment. Participating in national surveys will also serve as a motivational tool for school staff and students to implement health and wellness policies that will improve the food environment in their schools. Having national data available on alternative high schools and their students will raise awareness about the nutritional needs and health issues specific to this group of students and possibly target policies that will improve the nutritional environment of these schools and their surrounding communities. Having data available for each school and district will also enable public health professionals and educators to implement classroom health curriculum and health and nutrition interventions that will address the specific needs of youth attending alternative high schools.

## Conclusions

The findings of this research lend support for significant associations between demographic, behavioral and school related food environmental factors and selected dietary practices among alternative high school students. The results also indicate that alternative high school students report many unhealthful dietary practices with black students reporting higher consumption of sugar-sweetened beverages, high fat foods and fast food restaurant use than students of other races. In addition, the significant associations between student-reported school food environmental factors and selected unhealthful dietary practices provide support for the important role of schools in adolescents' dietary behaviors. The high prevalence of multi-substance use and significant associations with regular soda and high fat foods suggest the co-occurrence of unhealthful behaviors and support the need for comprehensive health interventions in alternative high schools. Alternative high schools are especially suited to implement health promotion programs that target minority and low income as well as at-risk youth for school drop out and health compromising behaviors.

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## APPENDIX A: Student Survey


# Student Survey

Team COOL Study

University of Minnesota


## Instructions

**This survey asks about your eating and physical activity habits in and out of school. Please answer every question carefully. There are no right or wrong answers. We just want to know what is true for you. If something is unclear or you have a question, please ask one of the Team COOL staff.**

**Your name will not be on the survey, so no one will know who you are. Please be as honest as you can with your answers. Your help with the project is greatly appreciated.**

- **Please mark your answers with a pencil**
- **Make dark marks that fill the circle**
- **Erase cleanly any answer you want to change**

# Thanks for Your Time!

# LET'S START WITH SOME GENERAL QUESTIONS ABOUT YOU . . .

**1. How old are you?**

| | | | | | | |
|---|---|---|---|---|---|---|
| 1❍ | 14 or younger | 4❍ | 17 | 7❍ | 20 | 30 |
| 2❍ | 15 | 5❍ | 18 | 8❍ | 21 or older | |
| 3❍ | 16 | 6❍ | 19 | | | |

**2. What is your grade in school right now?**

| | | | | | | |
|---|---|---|---|---|---|---|
| 1❍ | 7th | 3❍ | 9th | 5❍ | 11th | 31 |
| 2❍ | 8th | 4❍ | 10th | 6❍ | 12th | |

**3. Are you a…**

1❍ Male 2❍ Female 32

**4. Do you think of yourself as … (You may chose more than one.)** 33-38

1❍ American Indian or Alaskan Native
2❍ Asian (including Cambodian, Hmong, Korean, Laotian, Vietnamese)
3❍ Black or African American
4❍ Hispanic or Latino
5❍ White
6❍ Other

**5. How far in school did your mother (stepmother or female guardian) go? Indicate the highest level.** 39

1❍ Did not finish high school
2❍ Finished high school or got a GED
3❍ Did some college or training after high school
4❍ Finished college
5❍ Master's degree or PhD
6❍ I don't know

**6. Does your mother (stepmother or female guardian) …** 40

1❍ Work full-time for pay
2❍ Work part-time for pay
3❍ Not work for pay
4❍ I don't know

**7. How far in school did your father (stepfather or male guardian) go? Indicate the highest level.** 41

1❍ Did not finish high school
2❍ Finished high school or got a GED
3❍ Did some college or training after high school
4❍ Finished college
5❍ Master's degree or PhD
6❍ I don't know

**8. Does your father (stepfather or male guardian) …**

1❍ Work full-time for pay
2❍ Work part-time for pay
3❍ Not work for pay
4❍ I don't know

42

**9. Do you get free or low-cost lunches at school?**

1❍ Yes
2❍ No
3❍ I don't know

43

**10. Does your family get public assistance (welfare, food stamps or other assistance)?**

1❍ Yes
2❍ No
3❍ I don't know

44

**11. Whom do you live with most of the time? (Mark only one answer)**

1❍ Mother and father together
2❍ Mother and father equally, at separate houses
3❍ Parent and step parent
4❍ Mother mostly
5❍ Father mostly
6❍ Grandparent
7❍ Other relative
8❍ Foster parent
9❍ An adult or adults I am not related to
10❍ Friends or others my age
11❍ No one. I live alone

45

**12. During the school year, how many hours <u>per week</u> do you usually work for pay?**

1❍ 0 hours
2❍ 1-9 hours
3❍ 10-19 hours
4❍ 20-29 hours
5❍ 30-39 hours
6❍ 40 hours
7❍ More than 40 hours

46

# ABOUT SCHOOL . . .

**13. How do you feel about going to school?**

1❍ I like school very much
2❍ I like school quite a bit
3❍ I like school a little
4❍ I don't like school very much
5❍ I hate school

47

**14. During the last <u>30 days</u>, how often have you skipped or cut full days of school?**

1❍ Never
2❍ Once or twice
3❍ 3 to 5 times
4❍ 6 to 10 times
5❍ More than 10 times

48

# ABOUT WHEN & WHERE YOU EAT . . .

**15. During the PAST WEEK, how many <u>days</u> did you eat BREAKFAST?** 49

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1❍ | Never | 3❍ | 2 days | 5❍ | 4 days | 7❍ | 6 days |
| 2❍ | 1 day | 4❍ | 3 days | 6❍ | 5 days | 8❍ | Every day |

**16. During the PAST WEEK, how many <u>days</u> did you eat LUNCH?** 50

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1❍ | Never | 3❍ | 2 days | 5❍ | 4 days | 7❍ | 6 days |
| 2❍ | 1 day | 4❍ | 3 days | 6❍ | 5 days | 8❍ | Every day |

**17. During the PAST WEEK, how many <u>days</u> did you eat DINNER?** 51

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1❍ | Never | 3❍ | 2 days | 5❍ | 4 days | 7❍ | 6 days |
| 2❍ | 1 day | 4❍ | 3 days | 6❍ | 5 days | 8❍ | Every day |

**18. During the PAST WEEK, how many <u>days</u> did all, or most of the people you live with eat dinner together?** 52

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1❍ | Never | 3❍ | 2 days | 5❍ | 4 days | 7❍ | 6 days |
| 2❍ | 1 day | 4❍ | 3 days | 6❍ | 5 days | 8❍ | Every day |

**19. During the PAST WEEK, how many <u>times a day</u> did you usually snack in between meals?** 53

| | | | | | |
|---|---|---|---|---|---|
| 1❍ | None | 3❍ | 2 times a day | 5❍ | 4 times a day |
| 2❍ | 1 time a day | 4❍ | 3 times a day | 6❍ | More than 4 times a day |

**20. During a <u>NORMAL SCHOOL WEEK</u>, how many days per week do you …**
*(Circle one answer for each item)*

| | Days Per Week | | | | | | |
|---|---|---|---|---|---|---|---|
| a. Get the school breakfast | 0 | 1 | 2 | 3 | 4 | 5 | 54 |
| b. Get the school lunch | 0 | 1 | 2 | 3 | 4 | 5 | 55 |
| c. Get lunch at a fast food restaurant | 0 | 1 | 2 | 3 | 4 | 5 | 56 |
| d. Get lunch at a convenience store, gas station or concession stand | 0 | 1 | 2 | 3 | 4 | 5 | 57 |
| e. Bring lunch from home | 0 | 1 | 2 | 3 | 4 | 5 | 58 |
| f. Get food from a school vending machine or school store | 0 | 1 | 2 | 3 | 4 | 5 | 59 |
| g. Get drinks from a school vending machine or school store | 0 | 1 | 2 | 3 | 4 | 5 | 60 |
| h. Get food/drinks from a vending machine not at school | 0 | 1 | 2 | 3 | 4 | 5 | 61 |
| i. Eat in the hallways at school | 0 | 1 | 2 | 3 | 4 | 5 | 62 |
| j. Eat in the classrooms at school | 0 | 1 | 2 | 3 | 4 | 5 | 63 |
| k. Drink in the hallways at school | 0 | 1 | 2 | 3 | 4 | 5 | 64 |
| l. Drink in the classrooms at school | 0 | 1 | 2 | 3 | 4 | 5 | 65 |
| m. Get food as an incentive or reward from school staff | 0 | 1 | 2 | 3 | 4 | 5 | 66 |
| n. Eat "free food" brought to school by school staff | 0 | 1 | 2 | 3 | 4 | 5 | 67 |
| o. Not eat any food during the school day | 0 | 1 | 2 | 3 | 4 | 5 | 68 |

**21. At school, how healthy do you think the food and drinks are that you get …**
*(Mark one answer for each item)*

| | Not at all healthy | A little healthy | Somewhat healthy | Mostly healthy | Very healthy | Not offered at my school | |
|---|---|---|---|---|---|---|---|
| a. From school vending machines? | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 6❍ | 69 |
| b. From the school store? | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 6❍ | 70 |
| c. As part of school breakfast? | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 6❍ | 71 |
| d. As part of school lunch? | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 6❍ | 72 |
| e. From school staff? | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 6❍ | 73 |

**How strongly do you agree with the following statements? (*Mark one answer for each item*)**

| | Strongly Agree | Agree | Neither Agree Nor Disagree | Disagree | Strongly Disagree | |
|---|---|---|---|---|---|---|
| 22. There is often healthy food for sale at my school | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 74 |
| 23. I can usually get fresh fruit at my school. | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 75 |
| 24. Most students at my school eat the school breakfast. | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 76 |
| 25. If available, I plan to eat fruit at school during the next week. | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 77 |
| 26. If available, I plan to eat vegetables at school during the next week. | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 78 |
| 27. I can usually get fresh vegetables at my school. | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 79 |
| 28. The healthy food sold at my school tastes bad. | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 80 |
| 29. I plan to buy fewer high fat foods for lunch and snacks during the next week while at school. | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 81 |
| 30. It would be hard for me to buy tasty, healthy food at my school. | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 82 |
| 31. Most students at my school eat the school lunch. | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 83 |
| 32. I think I should eat more fruits and vegetables. | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 84 |
| 33. I plan to drink less soda pop at school during the next week. | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 85 |
| 34. Healthy eating is <u>not</u> important to me. | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 86 |
| 35. My friends usually eat healthy foods at school. | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 87 |

**36. Outside of the school day, during a NORMAL WEEK (including weekend days), how many times do you eat or drink something from a fast food restaurant, like McDonald's, Taco Bell or Pizza Hut?** 88

1❍ Never
2❍ 1-2 times
3❍ 3-4 times
4❍ 5-6 times
5❍ 7 times
6❍ More than 7 times

**37. Outside of the school day, during a NORMAL WEEK (including weekend days), how many times do you eat or drink something from a convenience store or gas station?**

89

1 ○ Never
2 ○ 1-2 times
3 ○ 3-4 times
4 ○ 5-6 times
5 ○ 7 times
6 ○ More than 7 times

**38. Outside of the school day, during a NORMAL WEEK (including weekend days), how many times do you eat or drink something from a vending machine?**

90

1 ○ Never
2 ○ 1-2 times
3 ○ 3-4 times
4 ○ 5-6 times
5 ○ 7 times
6 ○ More than 7 times

# ABOUT WHAT YOU EAT & DRINK . . .

**39. Think about your usual eating habits over the PAST YEAR. About how often do you eat each of the following foods and beverages? Remember to count foods and beverages you ate and drank at home, school, restaurants or anywhere else. (*Mark one answer for each question*).**

| | Times over the **PAST YEAR** | | | | | | |
|---|---|---|---|---|---|---|---|
| | Less than once a **week** | 1-2 times a **week** | 3-6 times a **week** | 1-2 times a **day** | 3-4 times a **day** | 5 or more times a **day** | |
| a. Drink 100% fruit juice, such as orange or apple juice? | 1 ○ | 2 ○ | 3 ○ | 4 ○ | 5 ○ | 6 ○ | 91 |
| b. Eat fruit (not counting juice)? | 1 ○ | 2 ○ | 3 ○ | 4 ○ | 5 ○ | 6 ○ | 92 |
| c. Eat green salad? | 1 ○ | 2 ○ | 3 ○ | 4 ○ | 5 ○ | 6 ○ | 93 |
| d. Eat potatoes (not including French fries, fried potatoes or potato chips)? | 1 ○ | 2 ○ | 3 ○ | 4 ○ | 5 ○ | 6 ○ | 94 |
| e. Eat carrots? | 1 ○ | 2 ○ | 3 ○ | 4 ○ | 5 ○ | 6 ○ | 95 |
| f. Eat vegetables (not counting carrots, potatoes, or salad)? | 1 ○ | 2 ○ | 3 ○ | 4 ○ | 5 ○ | 6 ○ | 96 |

**40. Over the past MONTH, how many times did you drink regular soda pop (not diet)?**

97

1 ○ Never
2 ○ Less than once a WEEK
3 ○ 1-2 times a WEEK
4 ○ 3-4 times a WEEK
5 ○ 5-6 times a WEEK
6 ○ 1 time a DAY
7 ○ 2 times a DAY
8 ○ 3 times a DAY
9 ○ 4 times a DAY
10 ○ 5 or more times a DAY

**41. Over the past MONTH, how many times did you drink diet soda or other unsweetened drinks like unsweetened tea?**

98

1 ○ Never
2 ○ Less than once a WEEK
3 ○ 1-2 times a WEEK
4 ○ 3-4 times a WEEK
5 ○ 5-6 times a WEEK
6 ○ 1 time a DAY
7 ○ 2 times a DAY
8 ○ 3 times a DAY
9 ○ 4 times a DAY
10 ○ 5 or more times a DAY

**42. Over the past MONTH, how many times did you drink sports drinks like Gatorade or Powerade?**

99

1 ○ Never
2 ○ Less than once a WEEK
3 ○ 1-2 times a WEEK
4 ○ 3-4 times a WEEK
5 ○ 5-6 times a WEEK
6 ○ 1 time a DAY
7 ○ 2 times a DAY
8 ○ 3 times a DAY
9 ○ 4 times a DAY
10 ○ 5 or more times a DAY

**43. Over the past MONTH, how many times did you drink other sweetened beverages like kool-aid, fruit drinks, lemonade or energy drinks (like Red Bull)?**

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | Never | 5 | 5-6 times a WEEK | 9 | 4 times a DAY | 100 |
| 2 | Less than once a WEEK | 6 | 1 time a DAY | 10 | 5 or more times a DAY | |
| 3 | 1-2 times a WEEK | 7 | 2 times a DAY | | | |
| 4 | 3-4 times a WEEK | 8 | 3 times a DAY | | | |

**44. Over the past MONTH, how many times did you drink milk as a beverage?**

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | Never | 5 | 5-6 times a WEEK | 9 | 4 times a DAY | 101 |
| 2 | Less than once a WEEK | 6 | 1 time a DAY | 10 | 5 or more times a DAY | |
| 3 | 1-2 times a WEEK | 7 | 2 times a DAY | | | |
| 4 | 3-4 times a WEEK | 8 | 3 times a DAY | | | |

**45. Over the past MONTH, how many times did you drink tap or bottled water?**

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | Never | 5 | 5-6 times a WEEK | 9 | 4 times a DAY | 102 |
| 2 | Less than once a WEEK | 6 | 1 time a DAY | 10 | 5 or more times a DAY | |
| 3 | 1-2 times a WEEK | 7 | 2 times a DAY | | | |
| 4 | 3-4 times a WEEK | 8 | 3 times a DAY | | | |

**46. Think about your eating habits over the PAST YEAR. About how often do you eat each of the following foods? Remember to count breakfast, lunch, dinner, snacks and eating out. (*Mark one response for each food*)**

| | **Times over the PAST YEAR** | | | | | |
|---|---|---|---|---|---|---|
| | 1 time a **month** or less | 2-3 times a **month** | 1-2 times a **week** | 3-4 times a **week** | 5 or more times a **week** | |
| a. Hamburgers ground beef, meat burritos, tacos | 1 | 2 | 3 | 4 | 5 | 103 |
| b. Beef or pork, such as steaks, roasts, ribs or in sandwiches | 1 | 2 | 3 | 4 | 5 | 104 |
| c. Fried chicken | 1 | 2 | 3 | 4 | 5 | 105 |
| d. Hot dogs, Polish or Italian sausage | 1 | 2 | 3 | 4 | 5 | 106 |
| e Cold cuts, lunch meats, ham (not low-fat) | 1 | 2 | 3 | 4 | 5 | 107 |
| f. Bacon or breakfast sausage | 1 | 2 | 3 | 4 | 5 | 108 |
| g. Salad dressing (not low-fat) | 1 | 2 | 3 | 4 | 5 | 109 |
| h. Margarine, butter, or mayo on bread or potatoes | 1 | 2 | 3 | 4 | 5 | 110 |
| i. Margarine, butter or oil in cooking | 1 | 2 | 3 | 4 | 5 | 111 |
| j. Eggs (not Egg Beaters or just egg whites) | 1 | 2 | 3 | 4 | 5 | 112 |
| k. Pizza | 1 | 2 | 3 | 4 | 5 | 113 |
| l. Cheeses, cheese spread (not low-fat) | 1 | 2 | 3 | 4 | 5 | 114 |
| m. Whole milk | 1 | 2 | 3 | 4 | 5 | 115 |
| n. French fries, fried potatoes | 1 | 2 | 3 | 4 | 5 | 116 |
| o. Corn chips, potato chips, popcorn, crackers | 1 | 2 | 3 | 4 | 5 | 117 |
| p. Doughnuts, pastries, cake, cookies (not low-fat) | 1 | 2 | 3 | 4 | 5 | 118 |
| q. Ice cream (not sherbet or non-fat) | 1 | 2 | 3 | 4 | 5 | 119 |

**47. How confident are you that you could change or maintain your eating patterns to …**

| | Not at all confident | A little confident | Somewhat confident | Mostly confident | Very confident | |
|---|---|---|---|---|---|---|
| a. Eat at least 2 servings a day of fruit | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 120 |
| b. Eat at least 3 servings a day of vegetables (not counting fried potatoes) | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 121 |
| c. Limit the soda pop you drink | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 122 |
| d. Limit how often you eat at fast food restaurants, like Taco Bell or McDonalds | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 123 |
| e. Limit between meal snacks | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 124 |
| f. Limit portion sizes of the food you eat | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 125 |
| g. Eat breakfast most days | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 126 |

**48. How strongly do you agree with the following statements? (*Mark one response for each item*)**

| | Strongly Agree | Agree | Neither Agree Nor Disagree | Disagree | Strongly Disagree | |
|---|---|---|---|---|---|---|
| a. I am too busy to eat healthy foods | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 127 |
| b. Healthy foods cost too much | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 128 |
| c. Eating healthy meals just takes too much time | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 129 |
| d. I like the taste of healthy foods | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 130 |
| e. I can get healthy food at the places where I eat | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 131 |
| f. The types of food I eat affect how I look | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 132 |
| g. The types of food I eat affect my weight | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 133 |
| h. The types of food I eat affect how active I am | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 134 |
| i. The types of food I eat affect how I do in school | 1❍ | 2❍ | 3❍ | 4❍ | 4❍ | 135 |
| j. The types of food I eat affect my health | 1❍ | 2❍ | 3❍ | 4❍ | 4❍ | 136 |

**49. If you wanted to, how sure are you that you could eat healthy foods when you are …**

| | Not at all sure | A little sure | Somewhat sure | Mostly sure | Very sure | |
|---|---|---|---|---|---|---|
| a. Stressed out | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 137 |
| b. Feeling down | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 138 |
| c. Bored | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 139 |

**50. Which of these statements best describes the food eaten in your home in the last 12 months?** 140

1❍ Often we don't have enough to eat
2❍ Sometimes we don't have enough to eat
3❍ We have enough to eat but not always the kinds of food we want
4❍ We always have enough to eat and the kinds of food we want

**51. How often during the past 12 months have you been hungry because your family couldn't afford more food?** 141

1❍ Almost every month
2❍ Some months but not every month
3❍ Only one or two months
4❍ I have not been hungry for this reason

# ABOUT SPORTS & PHYSICAL ACTIVITY...

**52. In a usual week, how many hours do you spend doing strenuous exercise (heart beats rapidly)?**
Examples: biking fast, aerobic dancing, running, swimming laps, rollerblading, soccer, basketball, football.

1❍ None
2❍ Less than ½ hour a week
3❍ ½ - 2 hours a week
4❍ 2 ½ - 4 hours a week
5❍ 4 ½ - 6 hours a week
6❍ 6+ hours a week

142

**53. In a usual week, how many hours do you spend doing moderate exercise (not exhausting)?**
Examples: walking quickly, baseball, gymnastics, easy bicycling, volleyball, dancing, skate boarding.

1❍ None
2❍ Less than ½ hour a week
3❍ ½ - 2 hours a week
4❍ 2 ½ - 4 hours a week
5❍ 4 ½ - 6 hours a week
6❍ 6+ hours a week

143

**54. In a usual week, how many hours do you spend doing mild exercise (little effort)?**
Examples: walking slowly (to school, to friend's house), bowling, fishing, yoga.

1❍ None
2❍ Less than ½ hour a week
3❍ ½ - 2 hours a week
4❍ 2 ½ - 4 hours a week
5❍ 4 ½ - 6 hours a week
6❍ 6+ hours a week

144

**55. During the past 12 months, on how many sports teams did you play? Include school teams and community league teams.**

1❍ 0 teams
2❍ 1 team
3❍ 2 teams
4❍ 3 or more teams

145

# ABOUT YOUR FREE TIME . . .

**56. On a typical WEEK day (Monday through Friday), how many hours do you spend …**

| | 0 hr | ½ hr | 1 hr | 2 hr | 3 hr | 4 hr | 5+ hr | |
|---|---|---|---|---|---|---|---|---|
| a. Talking on a phone or cell phone | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 6❍ | 7❍ | 146 |
| b. Watching TV | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 6❍ | 7❍ | 147 |
| c. Watching DVD's or videos | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 6❍ | 7❍ | 148 |
| d. Reading/doing homework | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 6❍ | 7❍ | 149 |
| e. Playing video games/computer games | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 6❍ | 7❍ | 150 |
| f. Using the internet/computer | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 6❍ | 7❍ | 151 |

**57. On a typical WEEKEND day (Saturday and Sunday), how many hours do you spend …**

| | 0 hr | ½ hr | 1 hr | 2 hr | 3 hr | 4 hr | 5+ hr | |
|---|---|---|---|---|---|---|---|---|
| a. Talking on a phone or cell phone | 1○ | 2○ | 3○ | 4○ | 5○ | 6○ | 7○ | 152 |
| b. Watching TV | 1○ | 2○ | 3○ | 4○ | 5○ | 6○ | 7○ | 153 |
| c. Watching DVD's or videos | 1○ | 2○ | 3○ | 4○ | 5○ | 6○ | 7○ | 154 |
| d. Reading/doing homework | 1○ | 2○ | 3○ | 4○ | 5○ | 6○ | 7○ | 155 |
| e. Playing video games/computer games | 1○ | 2○ | 3○ | 4○ | 5○ | 6○ | 7○ | 156 |
| f. Using the internet/computer | 1○ | 2○ | 3○ | 4○ | 5○ | 6○ | 7○ | 157 |

**58. During a usual week, how often has one of your teachers or other adults at your school …**

| | None | Once | Sometimes | Almost Every Day | Every Day | |
|---|---|---|---|---|---|---|
| a. Encouraged you to be physically active or play sports? | 1○ | 2○ | 3○ | 4○ | 5○ | 158 |
| b. Done a physical activity or played sports with you? | 1○ | 2○ | 3○ | 4○ | 5○ | 159 |
| c. Watched you participate in physical activities or sports? | 1○ | 2○ | 3○ | 4○ | 5○ | 160 |
| d. Told you that you are doing well in physical activities or sports? | 1○ | 2○ | 3○ | 4○ | 5○ | 161 |

**59. During a usual week, how often has one of your friends …**

| | None | Once | Sometimes | Almost Every Day | Every Day | |
|---|---|---|---|---|---|---|
| a. Encouraged you to be physically active or play sports? | 1○ | 2○ | 3○ | 4○ | 5○ | 162 |
| b. Done a physical activity or played sports with you? | 1○ | 2○ | 3○ | 4○ | 5○ | 163 |
| c. Watched you participate in physical activities or sports? | 1○ | 2○ | 3○ | 4○ | 5○ | 164 |
| d. Told you that you are doing well in physical activities or sports? | 1○ | 2○ | 3○ | 4○ | 5○ | 165 |

**60. How strongly do you agree with the following statements? (*Mark one answer for each item*)**

| MOST DAYS . . . | Strongly Agree | Agree | Neither Agree nor Disagree | Disagree | Strongly Disagree | |
|---|---|---|---|---|---|---|
| a. I can be physically active no matter how busy my day is | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 166 |
| b. I can ask my parents or other adults to do physically active things with me | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 167 |
| c. I can be physically active instead of watching TV or playing video games | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 168 |
| d. I can be physically active even if it is very hot or cold outside | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 169 |
| e. I can ask a friend to be physically active with me | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 170 |
| f. I can be physically active even if I have to stay at home | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 171 |

**61. How often are the following true?**

| | Never | Rarely | Sometimes | Often | Very Often | |
|---|---|---|---|---|---|---|
| a. I do things to make physical activity more enjoyable | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 172 |
| b. I think about the benefits I will get from being physically active | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 173 |
| c. I try to think more about the benefits of physical activity and less about the hassles of being active | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 174 |
| d. I say positive things to myself about being physically active | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 175 |
| e. When I get off track with my physical activity plans, I tell myself I can start again and get back on track | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 176 |
| f. I try different kinds of physical activity so that I have more options to choose from | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 177 |
| g. I set goals to be physically active | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 178 |
| h. I make backup plans to be sure I get my physical activity | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 179 |

**62. When I am active ...**

| | Strongly Agree | Agree | Neither Agree Nor Disagree | Disagree | Strongly Disagree | |
|---|---|---|---|---|---|---|
| a. … I feel bored | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 180 |
| b. … I dislike it | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 181 |
| c. … it's no fun at all | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 182 |
| d. … it makes me depressed | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 183 |
| e. … it frustrates me | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 184 |
| f. … it's not at all interesting | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 185 |
| g. … I feel as though I would rather be doing something else | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 186 |

**63. How often do these things keep you from being physically active?**

| | Never | Rarely | Sometimes | Often | Very Often | |
|---|---|---|---|---|---|---|
| a. Physical activity is boring | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 187 |
| b. The weather is bad | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 188 |
| c. I don't know how to do the physical activity that I want to do | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 189 |
| d. I don't have a place to be physically active | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 190 |
| e. My hair would get messed up | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 191 |
| f. I don't like to sweat | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 192 |
| g. It would take time away from my friends | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 193 |
| h. I might get hurt or be sore | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 194 |
| i. It would make me embarrassed | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 195 |
| j. It would make me tired | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 196 |
| k. I don't have time | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 197 |
| l. My school doesn't have any sports teams | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 198 |
| m. There's no equipment (like balls, bikes, skates) to use for physical activity | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 199 |
| n. I don't have the energy | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 200 |
| o. It's not safe to be physically active in my neighborhood | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 201 |
| p. My school doesn't offer any physical activities | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 202 |

**64. If I were to be physically active on most days …**

| | Strongly Agree | Agree | Neither Agree Nor Disagree | Disagree | Strongly Disagree | |
|---|---|---|---|---|---|---|
| a. It would help me spend more time with friends | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 203 |
| b. It would help get or keep me in shape | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 204 |
| c. It would help me control my weight | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 205 |
| d. It would put me in a better mood | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 206 |
| e. It would make me better in sports or other physical activities | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 207 |
| f. It would be fun | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 208 |
| g. It would make me look better | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 209 |
| h. I would meet new people | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 210 |
| i. I would feel better about myself | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 211 |

# ABOUT YOUR HEALTH . . .

**65. How would you describe your health?**

1❍ Poor 212
2❍ Fair
3❍ Good
4❍ Excellent

**66. How often have you used the following during the past year (12 months)?**

| | Never | A few times | Monthly | Weekly | Daily | |
|---|---|---|---|---|---|---|
| a. Cigarettes | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 213 |
| b. Beer, wine, hard liquor | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 214 |
| c. Marijuana | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 215 |
| d. Drugs other than marijuana (acid, cocaine, crack, ecstasy, methamphetamine) | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 216 |

**67. How do you describe your weight?**

1❍ Very underweight
2❍ Slightly underweight
3❍ About the right weight
4❍ Slightly overweight
5❍ Very overweight

217

**68. Which of the following are you trying to do about your weight?**

1❍ Lose weight
2❍ Gain weight
3❍ Stay the same weight
4❍ I am not trying to do anything about my weight

218

**69. During the past 30 days, did you exercise to lose weight or to keep from gaining weight?**

1❍ Yes 2❍ No 219

**70. During the past 30 days, did you eat less food, fewer calories, or foods low in fat to lose weight or to keep from gaining weight?**

1❍ Yes 2❍ No 220

**71. During the past 30 days, did you go without eating for 24 hours or more (also called fasting) to lose weight or to keep from gaining weight?**

1❍ Yes 2❍ No 221

**72. During the past 30 days, did you take any diet pills, powders, or liquids without a doctor's advice to lose weight or to keep from gaining weight?**

1❍ Yes 2❍ No 222

**73. During the past 30 days, did you vomit or take laxatives to lose weight or to keep from gaining weight?**

1❍ Yes 2❍ No 223

**74. During the PAST MONTH, how often have you been bothered or troubled by …**

| | Not at All | Sometimes | Very Much | |
|---|---|---|---|---|
| a. Feeling to tired to do things | 1❍ | 2❍ | 3❍ | 224 |
| b. Having trouble going to sleep or staying asleep | 1❍ | 2❍ | 3❍ | 225 |
| c. Feeling unhappy, sad or depressed | 1❍ | 2❍ | 3❍ | 226 |
| d. Feeling hopeless about the future | 1❍ | 2❍ | 3❍ | 227 |
| e. Feeling nervous or tense | 1❍ | 2❍ | 3❍ | 228 |
| f. Worrying too much about things | 1❍ | 2❍ | 3❍ | 229 |

# ABOUT YOUR FRIENDS & TEACHERS . . .

**75. I have friends …**

| | Strongly Agree | Agree | Neither Agree Nor Disagree | Disagree | Strongly Disagree | |
|---|---|---|---|---|---|---|
| a. Who help me to eat healthy foods | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 230 |
| b. Who help me to be physically active | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 231 |
| c. Who help me to feel good about myself | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 232 |

**76. There are teachers and other staff at my school …**

| | Strongly Agree | Agree | Neither Agree Nor Disagree | Disagree | Strongly Disagree | |
|---|---|---|---|---|---|---|
| a. Who help me to eat healthy food | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 233 |
| b. Who help me to be physically active | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 234 |
| c. Who help me to feel good about myself | 1❍ | 2❍ | 3❍ | 4❍ | 5❍ | 235 |

# THANK YOU!

## **APPENDIX B**: **Key Informant Survey**

TC.Version.8.10.06 **Date:** _____

**School ID:** _____
**Interviewer Initials:** _____

# Team COOL Pilot Study
## PRINCIPAL/COORDINATOR KEY INFORMANT INTERVIEW

## A. KEY INFORMANT CHARACTERISTICS

**> I would like to start with a few questions about you.**

**1. What is your current job title?**

a. Principal
b. Coordinator
c. Other _____

**2. How many years have you been in this position?**

a. < 1 year
b. 1-3 years
c. 4-6 years
d. > 6 years

**3. How many years have you been at this school?**

a. < 1 year
b. 1-3 years
c. 4-6 years
d. > 6 years

**4. Respondent is …**

a. Female
b. Male

## B. SCHOOL CHARACTERISTICS

**> Now, let's talk about the school.**

**4. Which of the following best describes your school?**

a. District alternative school.
b. Contract alternative school.
c. Other

_____

**5. What <u>grades</u> does your school include? (*Circle all that apply*)**

a. 6th
b. 7th
c. 8th
d. 9th
e. 10th
f. 11th
g. 12th
h. GED
i. Other adult education

**6. What is the <u>usual number of students</u> enrolled in your school?**

a. < 25
b. 25-50
c. 51-75
d. 76-100
e. 101-150
f. > 150

**7. At your school, most students are in which grades? (*Circle all that apply*)**

a. 6th
b. 7th
c. 8th
d. 9th
e. 10th
f. 11th
g. 12th
h. GED
i. Other adult education

**8. Is your school on …. (Include approximate dates)**

a. Semesters:
_____

b. Trimesters.
_____

c. Quarters:
_____

d. Other:
_____

**9. How many <u>hours per week</u> are students required to be on campus?**

a. No requirement
b. < 5 hours
c. 5-10 hours
d. 11-15 hours
e. 16-20 hours
f. 21-25 hours
g. 26-30 hours
h. > 30 hours

**10. Your school day <u>starts</u> at what time?** _____

**11. Your school day <u>ends</u> at what time?** _____

## C. PHYSICAL FACILITIES

**12. Which of the following best describes your <u>physical facility</u>?**

a. A free-standing building used only by your school
b. An office building that houses other businesses
c. A local high school or middle school
d. A community center
e. Another community building, (describe)

_____

**13. Does your school have a <u>gym or similar indoor space</u> for student activity?**

a. Yes
b. No
c. No, but students can use the gym at another school
School name:

_____

d. No, but students can use the facilities at a nearby YMCA/fitness club.
Club name:

_____

e. Other

_____

**14. Are there <u>outdoor areas</u> at your school where students can be active?**

a. No.
b. Yes, describe

_____

c. No, but students can use outdoor areas elsewhere, describe

_____

**15. Do students have access to the school and school grounds during the following times?**

**School building:**

| | | | |
|---|---|---|---|
| a. Before school | Yes | No | Time: _____ |
| b. After schoolYes | No | Time: _____ | |
| c. Weekends | Yes | No | Time: _____ |

**School grounds:**

| | | | |
|---|---|---|---|
| a. Before school | Yes | No | Time: _____ |
| b. After schoolYes | No | Time: _____ | |
| c. Weekends | Yes | No | Time: _____ |

**16. Does your school have a lunchroom or similar dedicated space for students?**

a. Yes, describe
_____
b. No

**17. Does your school have on-site cooking facilities (i.e. stove/oven, sink, cooking utensils)?**

a. Yes
b. No

**18. Does your school provide any of the following for student use? (*Circle all that apply*)**

a. Microwave
b. Refrigerator
c. Toaster/toaster oven
d. Eating utensils (plates, silverware, cups)
e. Other
_____

**Date:** _____

**School ID:** _____
**Interviewer Initials:** _____

## D. CLASS SCHEDULE

**19. Is a Health Class offered at your school?**

a. Yes
b. No

- Who teaches Health?
  _____
- How often is Health offered (#times/school yr)?
  _____
- How often does class meet (days/wk x #wks)?
  _____
- How many minutes does class last?
  _____
- Usual # of students in class?
  _____

**20. Is Physical Education (PE) offered at your school?**

a. Yes
b. No

- Who teaches PE?
  _____
- How often is PE offered (#times/school yr)?
  _____
- How often does class meet (days/wk x #wks)
  _____
- How many minutes does class last?
  _____
- Usual # of students in class?
  _____

**21. If your school does not offer Health or PE (or even if it does), is there another class where similar content can be or is taught to students?**

a. Yes — Name of class(es): _
_____

b. No

- Who teaches the class(es)?

_____

- How often is the class offered (#times/school yr)?

_____

- How often does class meet (days/wk x #wks)

_____

- How many minutes does class last?

_____

- Usual # of students in class?

_____

## E. FOOD OPTIONS AT SCHOOL

**22. Does your school participate in the free/reduced price school meal program?**

a. Yes
b. No

- What percent of students are *eligible* to participate? _____
- What percent of students *actually* participate? _____
- Why do you think eligible students don't participate in school meals program? _____

**23. Is any food prepared at your school for students?**

a. Yes.
b. No

- For breakfast? Yes No
- For lunch? Yes No

**24. Is food delivered to the school from a school district food service site?**

a. Yes.
b. No

- For breakfast? Yes No
- For lunch? Yes No

School district name:

_____

Contact Person: _____

**25. Is food delivered to the school from a food service management company?**

a. Yes. ——→
b. No

- For breakfast? Yes No
- For lunch? Yes No

Company name: (contact information)

_____

**26. Which of the following eating options are available to students at your school? (*Circle all that apply*).**

a. School breakfast program
b. School lunch program
c. School foodservice a la carte (individual food or beverage items students can purchase)
d. Snack vending machines
e. Beverage vending machines
f. Other vending machines: (describe)

_____

→ *If the school has vending machines, also answer questions 28-31 below.*

g. School store or similar: (describe)

_____

→ *If the school has a school store, also answer questions 32-34 below.*

h. Staff bring food for students
i. Students bring food to school
j. Students can order fast food delivery (delivered to school)
k. Other: (describe)

_____

_____

**27. During the school day, are students allowed to leave school grounds to purchase food?**

a. Yes
b. No ——→

- Which of the following types of stores/restaurants do students visit during school hours to purchase food? *Circle all that apply.*

  a. Convenient store
  b. Fast food restaurant (i.e. Taco Bell, McDonalds, Dominoes)

c. Locally-owned restaurant
d. Gas station
e. Supermarket
f. Small grocery store
g. Other:

_____

_____

## F. VENDING MACHINES

*(SKIP IF NO VENDING MACHINES FOR STUDENT USE)*

**> These next questions are about vending machines.**

**28. How many vending machines (total) are accessible to students at school? ___ ___**

a. How many beverage machines? ____ ____

b. How many food/snack machines? ____ ____

c. Other machines?

Type _____ How many? ____ ____

Type _____ How many? ____ ____

**29. At what times are vending machines turned on for student use? (*Circle all that apply).***

a. Before school starts
b. From the beginning of the first period class until the beginning of the first lunch period
c. During lunch
d. From the end of the last lunch period until the end of the school day
e. After school

**30. Does your school receive funds from vending machine sales?**

a. Yes
b. No
c. Don't know

**31. Does your school receive other incentives, such as cash rewards, equipment, school supplies, from vending machine sales at the school?**

a. Yes
b. No
c. Don't know

→ **Request permission to observe vending machines and record contents. Determine location of machines accessible to students.**

_____
_____
_____

## G. SCHOOL STORES

*(SKIP IF NO STUDENT STORE)*

**> These questions are about the school store.**

**32. Who operates the school store?**

_____

Contact Information:

_____

**33. How are funds from school store sales used?**

_____

_____

**34. At what times is the school store(s) open? (*Circle all that apply).***

a. Before school starts
b. From the beginning of the first period class until the beginning of the first lunch period
c. During lunch
d. From the end of the last lunch period until the end of the school day
e. After school

→ **Request permission to observe the school store and record contents. Determine location of store/s.**

_____
_____

**Date:** _____
**School ID:** _____
**Interviewer Initials:** _____

## H. PRACTICES & POLICIES

**> These next questions are about school practices and policies.**

**35. Which of the following practices (what your students and staff are allowed to do on a regular basis) does your school permit?**

| | | | |
|---|---|---|---|
| 1) Are students allowed to … | | | |
| a. Have food in the classroom? | Yes | No | I don't know |
| b. Have beverages in the classroom? | Yes | No | I don't know |
| c. Have food in school hallways? | Yes | No | I don't know |
| d. Have beverages in school hallways? | Yes | No | I don't know |
| e. Use indoor physical facilities for recreation outside school hours? | Yes | No | I don't know |
| f. Use outdoor physical facilities for recreation outside school hours? | Yes | No | I don't know |
| g. Leave school grounds during lunch? | Yes | No | I don't know |
| h. Leave school grounds during other periods? | Yes | No | I don't know |
| 2) At your school … | | | |
| a. Is food used as rewards or incentives for students? | Yes | No | I don't know |
| b. Are food coupons used as rewards or incentives for students? | Yes | No | I don't know |
| c. Is food used in classroom fundraising? | Yes | No | I don't know |
| d. Is food used in school-wide fundraising? | Yes | No | I don't know |

**36. Does your school have any policies (written guidelines shared with students and staff) about the nutrient quality of food and drink items …**

| | | | |
|---|---|---|---|
| 1) Sold in … | | | |
| a. Vending machines | Yes | No | We don't have vending machines. |
| b. School stores | Yes | No | We don't have a school store. |
| c. Classroom fundraising | Yes | No | We don't use food for fundraising. |
| d. School-wide fundraising | Yes | No | We don't use food for fundraising |
| 2) Offered (without cost) to students … | | | |
| a. As incentives and rewards | Yes | No | We don't permit this practice. |
| b. By school staff | Yes | No | We don't permit this practice. |
| c. During school events (parties, assemblies) | Yes | No | We don't permit this practice. |
| 3) Available for faculty/staff during meetings? | Yes | No | We don't permit this practice. |

**Date:** _____
**School ID:** _____
**Interviewer Initials:** _____

## I. HEALTH/WELLNESS COUNCILS

**37. Does your school district have a health or wellness council?** 1 Yes 2 No 3 I don't know 4 Not applicable

If yes …

a. How long has the council existed?
   1. This is the first year.
   2. 1-2 years
   3. 3-4 years
   4. > 4 years
   5. I don't know

b. How often does the council meet?
   1. weekly
   2. monthly
   3. every quarter
   4. twice a year
   5. annually
   6. other _____

c. Is your school represented on the council? 1 Yes 2 No

   If yes, identify position of school representative (teacher, school nurse, student) _____

d. Has the council addressed food-related policies at school? 1 Yes 2 No 3 Don't know

   If yes, list policies _____

e. Has the council addressed policy related to physical activity? 1 Yes 2 No 3 Don't know

   If yes, list policies: _____

**Date:** _____
**School ID:** _____
**Interviewer Initials:** _____

**38. Does your <u>school</u> have a health or wellness advisory council?** 1) Yes 2) No 3) I don't know

If yes …

a. Who is on the council?
   1. Principal/school coordinator
   2. School nurse
   3. Teacher(s)
   4. Food service staff
   5. Parent(s)
   6. Student(s)
   7. Others: _____

b. How long has the council existed?
   1. This is the first year.
   2. 1-2 years
   3. 3-4 years
   4. > 4 years
   5. I don't know

c. How often does the council meet?
   1. Weekly
   2. Monthly
   3. Every quarter
   4. Twice a year
   5. Annually
   6. Other _____

d. Has the council addressed food-related policies at school? 1 Yes 2 No 3 Don't know

   If yes, list policies _____

e. Has the council addressed policy related to physical activity? 1 Yes 2 No 3 Don't know

   If yes, list policies: _____

**Date:** _____
**School ID:** _____
**Interviewer Initials:** _____

39. Following the Team COOL intervention, has your school started any health related projects?

Yes_____ No_____ Don'tknow_____

If Yes, then list:

_____
_____
_____

**THANKS FOR YOUR TIME!**

## APPENDIX C: Student Assent/Consent Form

**TEAM COOL: STUDENT MEASUREMENT**
**STUDENT ASSENT/CONSENT FORM**

You are invited to be in a research study about the health and physical activity and eating practices of students attending alternative high schools. You were selected as a possible participant because you are a student attending an alternative high school. We ask that you read this form and ask any questions you may have before agreeing to be in the study.

This study is being conducted by: Dr. Martha Y. Kubik from the University of Minnesota School of Nursing, with the cooperation of your school and school district.

## Background Information

The purpose of this study is to learn more about the health and physical activity and eating practices of students attending alternative high schools.

**Procedures:**

If you agree to be in this study, we would ask you to complete a general survey and have your height and weight measured. Some students will also be asked to wear a physical activity monitor for 7 days. If you wear the monitor, you will be asked to return in one week to return the activity monitor and complete a second survey about physical activity. If you agree to be in the study, it will take about 60 minutes of your time today and 60 minutes of your time when you return in one week. Almost all the questions on the general survey are about physical activity and eating, but there are a few health questions that some might find sensitive, such as "during the past 30 days did you take any diet pills?" or "how often have you used drugs other than marijuana?"

**Risks and Benefits of being in the Study**

There are minimal risks to participation in the study. There are no benefits.

**Compensation:**

After you complete the survey and height and weight measurements, you will receive a $5 gift card. If you wear a physical activity monitor, you will receive a $5 gift card for every day the monitor is worn during the 7 day period, so a possible total of $35. For returning the monitor and completing a survey on physical activity, you will receive an additional $10 gift card.

**Confidentiality:**

The records of this study will be kept private. In any sort of report we might publish, we will not include any information that will make it possible to identify a subject. Research records will be stored securely and only researchers will have access to the records.

**Voluntary Nature of the Study:**

Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with the University of Minnesota and with your school and school district. If you decide to participate, you are free to not answer any question or withdraw at any time with out affecting those relationships.

**Contacts and Questions:**
The researcher conducting this study is Dr. Martha Y. Kubik. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact Dr. Kubik at the University of Minnesota, School of Nursing, phone number 612-625-0606 or email kubik002@umn.edu.

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, **you are encouraged** to contact the Research Subjects' Advocate Line, D528 Mayo, 420 Delaware St. Southeast, Minneapolis, Minnesota 55455; (612) 625-1650.

**You will be given a copy of this information to keep for your records.**

**Statement of Consent:**
I have read the above information. I have asked questions and have received answers. I consent to participate in the study.

Signature:_____Date: _____

Signature of
Investigator:_____Date:_____

## APPENDIX D: Parent/Guardian Consent Form

**TEAM COOL: STUDENT MEASUREMENT**
**PARENT/GUARDIAN CONSENT FORM**

Dear Parent/Guardian,

Your teen is being invited to participate in a research study about the health and physical activity and eating practices of students attending alternative high schools. Your teen was selected as a possible participant because he/she is a student attending an alternative high school. We ask that you read this form and ask any questions you may have before agreeing to your teen's participation in the study.

This study is being conducted by Dr. Martha Y. Kubik from the University of Minnesota School of Nursing, with the cooperation of your school and school district.

**Background Information:**
The purpose of this study is to learn more about the health and physical activity and eating practices of students attending alternative high schools.

**Procedures:**
If you agree to your teen being in this study, we would ask him/her to do all or some of the following tasks. He/she would be asked to: 1) complete a general survey, 2) have height and weight measured and 3) wear a physical activity monitor for 7 days. If your child wears an activity monitor, we would ask your son/daughter back in one week to: 1) return the activity monitor and 2) complete a second survey about physical activity. If you agree to allow your son/daughter to be in this study, it will take about 60 minutes of their time on the first day and, if they wear the activity monitor, 60 minutes of their time when they return one week later. Almost all the questions on the general survey are about physical activity and eating, but there are a few health questions that some might find sensitive, such as "during the past 30 days did you take any diet pills?" or "how often have you used drugs other than marijuana?"

**Risks and Benefits of Being in the Study:**
There are minimal risks to participation in the study. There are no benefits.

**Compensation:**
After your teen completes the general survey and height and weight measurements, he/she will receive a $5 gift card. If your child wears a physical activity monitor, he/she will receive a $5 gift card for every day the monitor is worn during the 7 day period, so a possible total of $35. For returning the monitor and completing a survey on physical activity, your son/daughter will receive an additional $10 gift card.

**Confidentiality:**
The records of this study will be kept private. In any sort of report we might publish, we will not include any information that will make it possible to identify a subject. Research records will be stored securely and only researchers will have access to the records.

**Voluntary Nature of the Study:**
Participation in this study is voluntary. Your decision whether or not to allow your son/daughter to participate will not affect your or their current or future relations with the University of Minnesota and with your school and school district. If you decide to allow your son/daughter to participate, they are free to not answer any question or withdraw at any time with out affecting those relationships.

**Contacts and Questions:**
The researcher conducting this study is Dr. Martha Y. Kubik. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact Dr. Kubik at the University of Minnesota, School of Nursing, phone number 612-625-0606 or email kubik002@umn.edu.

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, **you are encouraged** to contact the Research Subjects' Advocate Line, D528 Mayo, 420 Delaware St. Southeast, Minneapolis, Minnesota 55455; (612) 625-1650.

**You will be given a copy of this information to keep for your records.**

Parents must consent to having their teen participate in the study and students must also consent to participate. **Please note that your teen will not be able to participate without a signed parental consent form.**

We ask that you please review this information with your son or daughter. If you approve of your teen joining the study and he/she wishes to join, please sign your name in the area provided below and complete the other information requested. Please give the consent form to your teen so he/she can return it to us. A copy of this form is included for you to keep for your records.

Thank you very much.

Sincerely,

_____

Student's Printed Name

**Statement of Consent:**
I have read the above information. I have asked questions and have received answers. I consent to allowing my son/daughter to participate in the study.

| | |
|---|---|
| Parent/Guardian's Signature | Date |
| Parent/Guardian's Printed Name | Name of your teen's school |

## APPENDIX E: Research Exempt from IRB Committee Review Form

UNIVERSITY OF MINNESOTA

# Research Exempt from IRB Committee Review Category 4:

## EXISTING DATA: RECORDS REVIEW & PATHOLOGICAL SPECIMENS

| Route this form to: See instructions below. | U Wide Form: UM 1573 Rev: 01/10/06 |
|---|---|

| IRB Use Only |
|---|
| # |

**Submission Instructions:**
E-mail a copy of this application and any other materials required to the Research Subjects' Protections Programs Office: RSPPeRev@umn.edu

*Electronically submitted protocols must be carbon copied (Cc) to their advisor as secure electronic notification using password protected authentications, which have been deemed by the University of Minnesota to constitute a legal signature.*

For help with this form and to download additional appendices: see http://www.research.umn.edu/irb/download/ or call 612-626-5654

**1.1 Project Title** (Project title must match grant title. If different, also provide grant title):

The role of individual, behavioral and environmental factors on the dietary practices of alternative high school students

**1.2 Principal Investigator (PI)**

| Name (Last name, First name MI): **Hrisanti Arcan** | Highest Earned Degree: MHS, MBA |
|---|---|
| Mailing Address: School of Nursing 6-169 Weaver-Densford Hall 308 Harvard Street, S.E. Minneapolis, MN 55455 | Phone Number: 612-624-4096<br>Pager or Cell Phone Number: 202-468-2447<br>Fax: |
| U of M Employee/Student ID: 1617532 | Email: arca0021@umn.edu |
| U of M x.500 ID (ex. smith001): arca0021 | University Department (if applicable): School of Nursing |
| Occupational Position: ☐Faculty ☐Staff ☒Student ☐Fairview Researcher ☐Gillette Researcher ☐Other: | |
| Indicate the training and education completed in the protection of human subjects or human subjects records. Training is required for all research. Category four research projects require human subjects training. HIPAA training alone is not sufficient. ***Refer to training links at the end of this section** | |
| Human Subjects Training (one of these must be checked) ☒ CITI ☐ Investigator 101 ☒ Other Safeguarding PHI on Computers and Resp Conduct of Rsch - Part 1 and 2 | HIPAA Training (Required if Data Contains PHI) ☒ HIPAA |
| **As Principal Investigator of this study, I assure the IRB that the following statements are true:** The information provided in this form is correct. I will seek and obtain prior written approval from the IRB for any substantive modifications in the proposal, including changes in procedures, co-investigators, funding agencies, etc. I will promptly report any unexpected or otherwise significant adverse events or unanticipated problems or incidents that may occur in the course of this study. I will report in writing any significant new findings which develop during the course of this study which may affect the risks and benefits to participation. I will not begin my research until I have received written notification of final IRB approval. I will comply with all IRB requests to report on the status of the study. I will maintain records of this research according to IRB guidelines. The grant that I have submitted to my funding agency which is submitted with this IRB submission accurately and completely reflects what is contained in this application. If these conditions are not met, I understand that approval of this research could be suspended or terminated. | |
| Date | |

### 1.3 Department, Division Head, or Dean Information

*Please note as the researcher, you are responsible for confirming and following your departmental standards and requirements for research.*

| Dr. Bernard Harlow, Chair, Division of Epidemiology and Community Health |
|---|
| Name of Department Head, Division Head, or Dean |
| |
| Date |

***Training Links***

**CITI** - **https://www.citiprogram.org/default.asp**
**FIRST** - **http://www.research.umn.edu/first/HumanSubjects.htm**
**Investigator 101** - **http://www.research.umn.edu/irb/training/**
**HIPAA** - **http://www.research.umn.edu/first/AdditionalCourses.htm**
See the Responsible Conduct of Research (RCR) web site for information of human subject protection training.

### 1.4 Are there additional Co-Investigators and Staff?

☐ Yes. Download an extra personnel sheet and include it with your application.
☒ **No.** Continue to 1.5.

### 1.5 Is the PI of this research a student?

☒ **Yes.**
*Electronically submitted protocols must be carbon copied (Cc) to their advisor as secure electronic notification using password protected authentications, which have been deemed by the University of Minnesota to constitute a legal signature.*
☐ **No.** Continue to 2.

| **Academic Advisor to the Student Investigator** | |
|---|---|
| Advisor's Name (Last name, First name MI):<br>**Story, Mary** | University Department:<br>Epidemiology and Community Health |
| Mailing Address:<br>300 WBOB<br>1300 S 2nd St<br>Minneapolis, MN 55454 | Phone Number:<br>612-626-8801 |
| | Email:<br>story@epi.umn.edu |
| | U of M x.500 ID (ex. smith001):<br>story001 |
| | |
| **Date** | |

## 2. Funding

### 2.1 Is this research funded by an internal or external agency?

☐ **Yes.** *Include Appendix A.*
☒ **No.**

**If no**, explain how costs of research will be covered:

No costs involved. Secondary data analysis. Any costs will be funded by the PI (Martha Y. Kubik)

## 3. Institutional Oversight

**3.1 Will this research be utilizing Fairview Health System resources or medical records?**

☐ Yes.
☒ No.

**3.2 Will this research be utilizing Gillette Children's Specialty Healthcare or medical records?**

☐ Yes.
☒ No.

**3.3 Is this research proposal being reviewed by any other institution or peer review committee?**

☐ Yes. It is the responsibility of the PI to secure the appropriate approval from these committees and document that approval to the IRB. Attach a copy of documentation of approval, if received, and indicate committees below.
☒ No.

**If yes**, then please list which committees will review this proposal:

## 4. Conflict of Interest

**4.1 Do any of the investigators or personnel listed on this research have a potential conflict of interest associated with this study? Conflict of interest is defined in Appendix Y.**

☐ **Yes.** *Include Appendix Y.*
☒ **No.**

## 5. Use of Protected Health Information (PHI): HIPAA Requirements

**5.1 As part of this study, do you:**

a. **Collect protected health information (PHI)* from subjects in the course of providing treatment/experimental care; or**
b. **Have access to PHI* in the subjects' records?**

Please read the definition of PHI below before answering.

*PHI is defined under HIPAA as health information transmitted or maintained in any form or medium that:

1. identifies or could be used to identify an individual;
2. is created or received by a healthcare provider, health plan, employer or healthcare clearinghouse; and
3. relates to the past, present or future physical or mental health or condition of an individual; the provision of health care to an individual; or the past, present or future payment for the provision of healthcare to an individual.

The following records ARE EXEMPTED from the definition of PHI even though they may contain health-related information: student records maintained by an educational institution and employment records maintained by an employer related to employment status. If your study uses these kinds of records, it is not subject to HIPAA. However, existing IRB rules on informed consent and confidentiality still apply.

**Health-related information is considered PHI if (any of the following are true):**

1. the researcher obtains it directly from a provider, health plan, health clearinghouse or employer(other than records relating solely to employment status);

2. the records were created by any of the entities in "1" and the researcher obtains the records from an intermediate source which is NOT a school record or an employer record related solely to employment status; OR
3. the researcher obtains it directly from the study subject in the course of providing treatment to the subject.

**Health-related information is not considered PHI if the researcher obtains it from:**

1. student records maintained by a school;
2. employee records maintained by an employer related to employment status; OR
3. the research subject directly, if the research does NOT involve treatment.

☐ **Yes. If yes to a or b above, complete Appendix H to show how you will satisfy HIPAA requirements for authorization to use PHI in research.**

☒ **No.**

## 6. Summary of Activities

***Use lay language, do not cut and paste from or refer to grant or abstract.***

**6.1 Briefly state what is your research question.**

1) What are the potential differences by gender, race/ethnicity and socio-economic status of select dietary practices, such as consumption of sweetened beverages, high fat foods, fruits/vegetables and fast food restaurant use among students attending alternative high schools?

2) What are the associations between food access and eating opportunities during the school day and dietary practices of alternative high school students?

3) What are the personal and behavioral correlates of dietary practices of students attending alternative high schools?

**6.2 Describe the source of the records; medical, educational, employment, existing data set, or pathological specimens (waste).**

*For approval in this category you must plan to use an existing data set without access to identifiers, records review to which you have permissible access to records when the chart is older than January 1, 1997, or where the patient has signed a consent form which is in the file after January 1, 1997, or collecting waste tissue after it has been released to pathology.*

Existing data set without access to identifiers.

**6.3 Number of records or specimens to be used:**

145 subjects

**6.4 How long do you anticipate this research study will last from the time you are determined to meet the criteria for exempt research?**

Exempt research is generally considered short-term in nature. This office routinely inactivates exempt applications after three years from the time it was determined to meet the exempt criteria. If you think your project will extend beyond three years, contact the IRB office (612-626-5654 or irb@umn.edu).

I will need access to the data through 12/31/2009.

**6.5 Is the data you are gathering publicly available?**

☐ **Yes.** Continue to 7.1

☒ **No**. Continue to 6.6

**6.6 Do you already have permissible access to the records or specimens (i.e. through a job, volunteer work, internship etc.)**

☒ **Yes.** Describe how you have permissible access to the records.

I am a research assistant for the Team COOL project and have permission from the PI, Martha Y. Kubik to access the data to conduct research.

☐ **No.** Continue to 6.6a

**6.6a Will the records you receive be stripped of all identifiers that would make it possible for you to identify a subject?**

☒ **Yes.** Continue to 6.7

☐ **No.** This research does not qualify for exempt status. Please complete the full IRB application, requesting expedited review if appropriate.

**6.7 Confirm that the data/specimens you wish to review already exist**

☒ **The data set exists.**

☐ **The data set does not already exist.**

*If the data is not already collected, the research does not qualify for exempt category four research. Please complete the full IRB application requesting expedited review if appropriate.*

**6.8 Please confirm that you will not have access to, or create a link, which would make it possible to identify subjects.**

☒ **I will not have access to, or create, a link.**

☐ **I will have access to a link.**

*If you have access to, or create a link you do not qualify for exempt category four research. Please complete the full IRB application requesting expedited review if appropriate.*

**6.9 Describe the identifying information to which you will have access to prior to recording data:**

Not applicable

**6.10 Describe the identifying information you will record:**

*Please note in order to proceed with exempt research under category four, you may not record information in such a manner that subjects can be identified directly or through identifiers linked to subjects.*

No information will be recorded that allows a subject to be identified directly or through identifiers linked to subjects.

## 7. Confidentiality

*See Protecting Private Data Guideline from the Office of Information Technology (OIT) for information about protecting the privacy of research data.*

**7.1 Describe provisions taken to maintain confidentiality of data:**

No direct identifiers were entered on data collection forms, rather a coding system (a study-generated list of numbers not associated with any direct identifier) was developed that allowed researchers to link study code numbers to direct identifiers. Only the study's principal investigator has access to the linked file, which is maintained as an electronic data file on a shared School of Nursing server that is password protected.

**7.2 Describe the security plan for data including how and where stored and duration of storage (i.e., password protection, encrypted data, etc.):**

Research records will be kept on file for approximately 3 years. Paper documents (surveys and consent forms) will be kept in a locked file in the school of nursing. Electronic data files will be maintained on a secure School of Nursing server that is password protected.

**7.3 Will identifiable data be made available to anyone other than the PI?**

☐ Yes.
☒ No.

**If yes,** explain who and why they will have access to the identifiable data:

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**This regulation does not apply to FDA regulated research.**

***You have reached the end of this form. Please make sure that you have responded to every question on this application (even if your response is "not applicable").***