

AN INVESTIGATION OF FACTORS AFFECTING THE OVERWEIGHT STATUS
OF ALABAMA HIGH SCHOOL ADOLESCENTS

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VITA

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DISSERTATION ABSTRACT
AN INVESTIGATION OF FACTORS AFFECTING THE OVERWEIGHT STATUS
OF ALABAMA HIGH SCHOOL ADOLESCENTS

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Obesity in children and adolescents has reached epidemic proportions in the United States. According to the National Center for Health Statistics (NCHS, 2000) the percentage of overweight young people in the United States has doubled since 1980, currently affecting one in seven children and adolescents.

Current national nutrition surveillance data suggest that the diet of adolescents is putting them at risk for cardiovascular disease, cancer, and osteoporosis, based on their intakes of saturated fat, total fat, fruits, vegetables, fiber, sodium, and soft drinks (CDC, 2004). In addition, the United States is experiencing an epidemic of overweight conditions that extends to the adolescent population; some of the related factors may be an excess in energy intake, low levels of physical activity, and high levels of sedentary

behaviors. The intent of this research is to investigate these three variables and their relationship to the overweight status of Alabama high school adolescents.

This study will explore three lifestyle and environmental risk factors that relate to adolescent overweight status. Using the 2003 Youth Risk Behavior Survey results this study examined the relationship between television viewing, physical activity and fruit and vegetable consumption and overweight status of Alabama high school adolescents.

The Youth Risk Behavior Survey (YRBS) was completed by 1088 students in 39 public high schools in Alabama during Spring 2003. Students participating in the survey completed a self-administered, anonymous, 87 item questionnaire. Adolescents attending the ninth, tenth, eleventh, and twelfth grades in Alabama were included in this study.

Results indicated that race, gender, grade in school, television viewing, physical activity levels and fruit and vegetable consumption were not statistically significant predictors for body mass index using the 2003 Youth Risk Behavior Survey.

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TABLE OF CONTENTS

	Page
LIST OF TABLES	xii
CHAPTER	
I. INTRODUCTION	1
Background of the Problem.....	1
Importance of the Study	4
Purpose of the Study.....	4
Data Source	5
Research Questions	6
Limitations of the Study	6
Assumptions of the Study.....	7
Definition of Terms	7
Summary	9
II. REVIEW OF LITERATURE	10
Purpose of the Study.....	10
Research Questions	11
Theoretical Foundations of Adolescent Development	12
Models and Theories.....	12
Environmental Theories.....	13
Organismic Theories.....	14
Psychodynamic Theories	15
Diagnosis of Obesity	16
Factors Associated with Overweight Conditions.....	18
Overweight Conditions and Television Viewing.....	18
Overweight Conditions and Physical Activity.....	20
Overweight Conditions and Eating Behaviors.....	24
Childhood Overweight Conditions and Adult Obesity.....	33

	Summary	36
III.	METHODS	38
	Purpose of the Study.....	38
	Description of Study Participants.....	39
	Research Questions	39
	Research Variables	40
	An Overview of the Youth Risk Behavior Survey (YRBS).....	41
	Background and Rationale.....	41
	Purpose of the YRBS.....	42
	Initial Questionnaire Development.....	42
	Questionnaire Revisions	44
	Questionnaire Reliability and Validity	44
	Sampling, Weighting, and Response Rates	45
	Data Collection.....	47
	Research Design.....	47
	Summary	48
IV.	RESULTS	50
	Purpose of the Study.....	51
	Results	52
	Results of Research Question One	52
	Race.....	54
	Grade Levels	55
	Vigorous Physical Activity Level.....	55
	Moderate Physical Activity Levels.....	57
	Fruit and Vegetable Consumption	57
	Television Viewing.....	58
	Results of Research Question Two.....	58
	Gender.....	59
	Race.....	60
	Grade Level.....	60
	Television Viewing.....	60
	Results of Research Question Three.....	61
	Gender.....	63

Race.....	63
Grade Levels.....	64
Vigorous Physical Activity Levels.....	64
Moderate Physical Activity Levels.....	64
Results of Research Question Four.....	66
Gender.....	67
Race.....	68
Grade Levels.....	68
Fruit and Vegetable Consumption.....	68
Summary.....	69
V. SUMMARY, DISCUSSION, AND RECOMMENDATIONS.....	72
Purpose of the Study.....	72
Summary.....	73
Discussion.....	75
Limitations.....	77
Recommendations.....	78
REFERENCES.....	80

LIST OF TABLES

Table		
1	Odd Ratios (OR) and 95% Confidence Intervals (CI) for Vigorous Physical Activity Levels, Moderate Physical Activity Levels, Fruit and Vegetable Consumption, and Television Viewing (TV) of Alabama High School Adolescents.....	53
2	Prevalence of Body Mass Index (BMI) and Confidence Intervals (CI) for Alabama High School Adolescents.....	56
3	Odd Ratios (OR) and 95% Confidence Intervals (CI) for Television Viewing (TV) for Alabama High School Adolescents	59
4	Prevalence of Body Mass Index (BMI) and Confidence Intervals (CI) for Alabama High School Adolescents.....	61
5	Odd Ratios (OR) and 95% Confidence Intervals (CI) for Vigorous Physical Activity Levels (VAL) and Moderate Physical Activity Levels (MAL) for Alabama High School Adolescents	62
6	Prevalence of Body Mass Index (BMI) and Confidence Intervals (CI) for Alabama High School Adolescents.....	65
7	Odd Ratios (OR) and 95% Confidence Intervals (CI) for Fruit and Vegetable Consumption for Alabama High School Adolescents	67
8	Prevalence of Body Mass Index (BMI) and Confidence Intervals (CI) for Alabama High School Adolescents.....	69

I. INTRODUCTION

Background of the Problem

Obesity in children and adolescents has reached epidemic proportions in the United States. According to the National Center for Health Statistics (NCHS, 2000), the percentage of overweight young people in the United States has doubled since 1980, currently affecting one in seven children and adolescents. Overweight conditions for children and adolescents is estimated by the age and sex specific 95th percentile of body mass index (BMI) compared to the population in the National Health Examination Surveys (NHES) II and III, measured between 1963 and 1970 (Berkowitz & Stunkard, 2002; Himes & Dietz, 1994; Troiano & Flegal, 1998; Troiano, Flegal, Kuczmarski, Campbell, & Johnson, 1995). Children and adolescents between the 85th and 95th percentiles of BMI are described as at risk for overweight. The incidence and prevalence of obesity and overweight conditions are increasing despite efforts to prevent and treat this condition (Berkowitz & Stunkard, 2002).

According to the 1999 National Health and Nutrition Examination Survey (NHANES) and Centers for Disease Control [CDC], 2001 approximately 13% of children age 6 to 11 years old and 14% of children age 12 to 19 years old are overweight (body mass index [BMI] values greater than the 95th percentile). The prevalence of overweight children has more than doubled since the first NHANES, which was conducted over 30

years ago. According to the National Center for Health Statistics (NCHS, 2000), over the past 20 years, the percentage of overweight adolescents has nearly tripled from 5% to 14%. Numerous studies have investigated such detrimental effects of overweight children as heredity, dietary intake, exercise fitness level, and social environment (DeLany, 1998; Faith, Pietrobelli, Nenez, Heo, Heymsfield, & Allison, 1999; Francis, Bope, MaWhinney, Czajka-Narins & Alford, 1999; Gazzaniga & Burns, 1993; Perusse & Bouchard, 2000; Tucker, Selijaas & Hager, 1997; Whitaker, Wright, Pepe, Seidel & Dietz, 1997).

According to the United States Department of Health and Human Services (2001), presently one of every seven children in the United States is classified as being overweight (defined as a body mass index [BMI] above 95% for age) and being overweight has been shown to track from childhood through adolescence and into adulthood. Thus, children who are overweight are more likely to become overweight as adults (Freedman, Khan, Dietz, Srinivasan, & Berenson, 2001; Guo & Chumlea, 1999; Guo, Roche, Chumlea, Gardner, & Siervogel, 1994; Guo, Wu, Chumlea, & Roche, 2002; Stephens, Harrison, Wilson, Ringler, & Robinson, 2003), with all the morbidity associated with being overweight, such as diabetes hypertension, hyperlipidemia, and coronary artery disease (Calle, Thun, & Petrelli, 1999). Adolescents who are overweight are at risk for being overweight or obese adults. One quarter to one half of individuals who are overweight in adolescence remain overweight or obese in adulthood (Charney, Goodman, McBride, Lyon, & Pratt, 1976; Freedman, Shear, Burke, Srinivasan, Webber, Harsha, & Berenson, 1987; Gam, 1995; Must & Strauss, 1999; Whitaker, Wright, Pepe, Seidel & Dietz, 1997). The prevalence of overweight and obese conditions continues to increase in the United States adult population (CDC, 1994; Kuczmarski, Flegal,

Campbell, & Johnson, 1994; Troiano, Flegal, Kuczmarski, Campbell & Johnson, 1995). In the twelve years between the second National Health and Nutrition Examination Survey (NHANES II, 1976 through 1980) and NHANES III (1988 through 1991), (Troiano, Flegal, Kuczmarski, Campbell & Johnson, 1995) the prevalence of overweight conditions in United States adults increased from 25% to 33%. The prevalence of overweight conditions also increased to similar magnitudes among all sex and age groups of children and adolescents.

Childhood overweight status represents the most prevalent nutritional disease among youth in the United States (CDC, 1999; Gazzaniga & Burns, 1993). Epidemiological data on the prevalence of overweight status can be linked to the societal and cultural changes seen within our population and communities in recent decades. Societal factors have undoubtedly been pivotal in the increase of overweight status in adolescents. Fruhbeck (2000) suggested that the increasing prevalence of overweight people reflects a population and cultural shift towards positive energy balance. There has been a move towards sedentary (low activity) lifestyles in children, an increase in television viewing, changes in eating habits, choices of transport, and other cultural signifiers that lifestyle and environment have impacted the physical energy output of adolescents. Children in the United States are less active and more overweight than ever before (National Center for Health Statistics, 2000). Currently, 40 percent of United States children five to eight years of age have at least one risk factor for heart disease (Faigenbaum, 1998), and one in eight is considered overweight. While the health effects of this rise in overweight status will not be known for years (Hill & Throwbridge, 1998), the time to act is now because risk factors track from childhood to adolescence (Marshall,

Sarkin, Sallis, & McKenzie, 1998) to adulthood (Harsha, 1995; Nieto, Szklo, & Comstock, 1992). To overcome this pandemic of sedentary behavior and resultant obesity, multiple factors must be addressed.

Importance of the Study

This study is important because overweight conditions in children and adolescents pose a national health challenge. Thus, it is prudent to examine the lifestyle and environmental threats that offset the balance between energy intake and expenditure so that interventions may be effective in reducing the alarming increase in overweight status and related risk factors.

Purpose of the Study

Intervention in the epidemic of adolescent overweight conditions is critical if we are to reduce the problem. Current national nutrition surveillance data suggest that the diet of adolescents is putting them at risk for cardiovascular disease, cancer, and osteoporosis, based on their intakes of saturated fat, total fat, fruits, vegetables, fiber, sodium, and soft drinks (CDC, 2004). In addition, the United States population is experiencing an epidemic of overweight conditions that extends to the adolescent population; some of the related factors may be an excess in energy intake, low levels of physical activity, and high levels of sedentary behaviors. The intent of this research was to study these three variables and their relationship to the overweight status of Alabama high school adolescents.

This study explored three lifestyle and environmental risk factors that relate to adolescent overweight status. Using the 2003 Youth Risk Behavior Survey results, this study examined the relationship between television viewing, physical activity and fruit and vegetable consumption, and overweight status of Alabama high school adolescents.

Data Source

This study analyzed data from the 2003 national school based Youth Risk Behavior Survey (YRBS), part of the Youth Risk Behavior Surveillance System (YRBSS) implemented by the Centers for Disease Control and Prevention (CDC) to monitor the prevalence of priority health risk behaviors among youth. The YRBS was developed in 1989 by the CDC to monitor health risk behaviors that contribute to the leading causes of mortality, morbidity, and social problems among youth and adults in the United States. Data from the YRBSS are used to develop policies and programs to prevent health risk behaviors among youth (Everett, Kann & McReynolds, 1997). The YRBSS monitors six categories of behaviors: (a) those that contribute to unintentional injuries and violence; (b) tobacco use; (c) alcohol and other drug use; (d) sexual behaviors that contribute to unintended pregnancy and sexually transmitted disease, including human immunodeficiency virus infection; (e) dietary behaviors; and (f) physical activity. The CDC conducts the YRBS biennially using a national probability sample of high school students.

The YRBSS consists of national, state, and local school based surveys of representative samples of students grades 9 through 12, a national household based survey of 12 through 21 year olds, a national survey of college students, a national survey

of alternative school students, and other surveys of special populations of young people. These surveys all use a similar instrument, the Youth Risk Behavior Survey (YRBS) questionnaire, which was developed with extensive research and testing (Kolbe, Kann, & Collins, 1993). For the purpose of this study the results of the school based survey of students in grades 9 through 12 were collected and analyzed.

Research Questions

1. What, if any, is the relationship between television viewing, physical activity levels, fruit and vegetable consumption and overweight status among Alabama high school adolescents?
2. If so, to what extent does overweight status (BMI) affect prevalence rates for television viewing of Alabama high school adolescents?
3. If so, to what extent does overweight status (BMI) affect prevalence rates in physical activity levels of Alabama high school adolescents?
4. If so, to what extent does overweight status (BMI) affect prevalence rates by fruit and vegetable consumption of Alabama high school adolescents?

Limitations of the Study

Limitations are conditions beyond the control of the researcher that might restrict the conclusions of the study and how they can be applied to other situations (Best & Kahn, 1993). For this study, the following limitations were considered:

1. Collection of data from adolescents in school did not account for dropout, homeless, or runaway adolescents.

2. Scantron sheets were used for recording responses to the questions, which may have affected the accuracy of coding by the students.
3. Four grade levels of students (9–12) were used to represent the entire adolescent population. Thus, results cannot be generalized to junior high/middle school adolescents.

Assumptions of the Study

1. The students completing the instrument were honest and accurate in their responses.
2. The instrument was assessed for and produced appropriate measures of reliability and validity.
3. The instrument accurately addresses and depicts priority health risks for adolescents as defined by the Center for Disease Control (CDC).
4. Data were accurately coded by the researcher prior to the primary analysis.

Definition of Terms

Adolescents – defined as a person between ten and nineteen years of age.

Body Mass Index (BMI) – an index that incorporates height and weight to estimate critical fat values at which risk for disease increases. For youth aged 2 to 20 years, growth charts developed by the Center for Disease Control and Prevention are used (<http://www.cdc.gov/growthcharts>).

Coronary Artery Disease – means narrowing of the coronary arteries (arteries that supply blood to the heart).

Diabetes – a condition characterized by hyperglycemia resulting from the body's inability to use blood glucose for energy.

Epidemiology – is the field of medicine concerned with the study of epidemics, outbreaks of disease that affect large numbers of people.

Human Immunodeficiency Virus (HIV) – either of two closely related retroviruses that invade T-helper lymphocytes and are responsible for AIDS.

Hyperlipidemia – an elevation of lipids (fats) in the bloodstream.

Hypertension – a disorder characterized by high blood pressure; generally this includes systolic blood pressure (the top number of your blood pressure measurement, which represents the pressure generated when the heart beats) consistently higher than 140, or diastolic blood pressure (the bottom number of your blood pressure measurement, which represents the pressure in the vessels when the heart is at rest) consistently over 90.

Obesity – a condition resulting from excessive storage of fat in the body (20% above what is considered normal according to standard age, height, and weight tables).

Overweight – A child or adolescent is considered overweight when their BMI is at or above the 85th percentile on the Center for Disease Control and Prevention growth chart (<http://www.cdc.gov/growthcharts>).

Rickets – a bone disease caused by a deficiency of vitamin D or calcium.

Type 2 Diabetes – also called non-insulin-dependent diabetes mellitus. Type 2 diabetes is associated with insulin resistance and impaired β -cell function.

Summary

The number of overweight children and adolescents, in the United States, has substantially increased over the past twenty years and is of national concern. Although there has been no direct evidence as to the cause of this rapid increase in the incidence of overweight status, many factors have been identified that may contribute, including television viewing, physical activity levels, and eating behaviors.

Children and adolescents who are overweight are at greater risk for adverse health outcomes when compared with children and adolescents from prior generations (Goran & Treuth, 2001). Evidence repeatedly demonstrates the rising prevalence of overweight conditions and overweight related illnesses, with 30% of the United States children and adolescents having a body mass index (BMI) higher than the 85th percentile for their age (Dietz, 1998; Ludwig & Ebbeling, 2001; Ogden, Flegal, Carroll, & Johnson, 2002; Power, Lake, & Cole, 1997; Robinson, 1999). The Youth Risk Behavior Survey (YRBS) was developed to monitor the health behaviors of adolescents in six critical areas, including television viewing, physical activity levels, and fruit and vegetable consumption.

Chapter II will provide a review of the literature concerning children and adolescent development and the background of overweight status, as well as factors associated with its possible cause. Chapter III will discuss the research design and data analysis. The results of the research study will be discussed in Chapter IV. Chapter V will include the summary, discussion, and recommendations based on study findings.

II. REVIEW OF LITERATURE

Purpose of the Study

Intervention in the epidemic of adolescent overweight conditions is critical if we are to reduce the problem. Current national nutrition surveillance data suggest that the diet of adolescents is putting them at risk for cardiovascular disease, cancer, and osteoporosis, based on their intakes of saturated fat, total fat, fruits, vegetables, fiber, sodium, as well as soft drinks (CDC, 2004). In addition, the United States is experiencing an epidemic of overweight conditions that extends to the adolescent population; some of the related factors may be an excess in energy intake, low levels of physical activity, and high levels of sedentary behaviors. This research was intended to investigate these three variables and their relationship to the overweight status of Alabama high school adolescents.

This study explored three lifestyle and environmental risk factors that relate to adolescent overweight status. Using the 2003 Youth Risk Behavior Survey results this study examined the relationship between television viewing, physical activity and fruit and vegetable consumption and overweight status of Alabama high school adolescents.

Research Questions

The following research questions were developed for investigation by this study.

1. What, if any, is the relationship between television viewing, physical activity levels, fruit and vegetable consumption, and overweight status among Alabama high school adolescents?
2. If so, to what extent does overweight status (BMI) affect prevalence rates for television viewing of Alabama high school adolescents?
3. If so, to what extent does overweight status (BMI) affect prevalence rates in physical activity levels of Alabama high school adolescents?
4. If so, to what extent does overweight status (BMI) affect prevalence rates by fruit and vegetable consumption of Alabama high school adolescents?

Although studies review some areas of these research questions, few focus specifically on the nature of the relationship between these variables (Chakravarthy & Booth, 2003; Kimm & Obarzanek, 2002; Neumark-Sztainer, Story, Hannan, Tharp, & Rex, 2003). Hammerberg's (1992) correlational study addressed the relationship between overweight status, activity level, and television viewing of fourth grade children. Results of this study suggested that although genetic factors and familial environment affect the relative weight of fourth grade children, their exact influence remains unclear. Earlier studies addressed some environmental factors in adolescent overweight status (Aristimuno, Foster, Voors, Srinivasan, & Berenson, 1984; Bullen, Reed, & Mayer, 1964; Chirico & Stunkard, 1963; Southam, Kirkley, Murchison, & Berkowitz, 1984). While other studies focused on a wider network of factors that may influence the development and treatment of adolescent overweight status: activity level (Manos, Gutin, Rhodes,

Spandorfer, Jackson, & Litaker, 1993), and other personal habits (Dietz & Gortmaker, 1985; Wolf, Gortmaker, Cheung, Gray, Herzog, & Colditz, 1993). While these studies offer some clarification of the role of various environmental factors in the prevalence of adolescent overweight status, additional clarification is needed.

Theoretical foundations of adolescent development will be discussed in this section along with the definition of obesity, obesity and television viewing, obesity and physical activities, obesity and eating behaviors, and childhood overweight status and adult obesity.

Theoretical Foundations of Adolescent Development

Models and Theories

Models are sets of assumptions researchers make about the nature of reality. These assumptions are too general to be tested; however, theories which derive from models, are more specific explanations of phenomena, and can be confirmed or disconfirmed. Theories serve four major functions: (a) They serve as a guide to formulating questions, (b) they describe phenomena by allowing one to relate isolated facts to a body of knowledge, (c) they make it possible to predict new behavior based on explanations of previous actions, and (d) they suggest ways for changing the behavior they describe by allowing one to identify antecedent events (Kuhn, 1962; Overton, Ward, Noveck, Black & O'Brien, 1987; Reese & Overton, 1970).

The assumptions that make up a model can frequently be expressed as a metaphor. The machine is a popular metaphor for human behavior, and models based on this metaphor assume that behavior is as predictable as that of a machine. Such models,

however, allow no room for self initiated action. Three models of human behavior are the environmental, organism, and psychodynamics models (Reese & Overton, 1970).

The environmental model views humans as passive and sees their actions as reactions to environmental events. People are assumed to remain quiescent until something stimulates them to act. Behavior is linked to external events through simple associations; these are formed through respondent and operant conditioning (Bandura, 1989; Havighurst, 1972; Skinner, 1961).

The organismic model takes the living, biological system as its metaphor for human behavior. Theories derived from this model assume that variables tied to the nature of the organism structure development. These theorists assume that the human organism is active and does not passively await stimulation, and that activity is internally organized instead of structured by environmental events. Behavior is seen as an unfolding of developmental stages, each of which is qualitatively different from the last (Hall, 1904; Gilligan, 1988; Piaget, 1954).

The psychodynamic model emphasizes both inner processes and external events in explaining behavior. Freud, the major theorist for this model, assumed that biological impulses are housed in the id and social standards in the superego; the ego balances the demand for expression of the id against the realities of social constraints (Chodorow, 1978; Erikson, 1968; Freud, 1961; Horney, 1967).

Environmental Theories

Havighurst traces development across a succession of developmental tasks that reflect social expectations for more mature behavior with age; physical maturation sets the pace for these expectations (Havighurst, 1972). The theory of B. F. Skinner is a

radical departure from the way most people understand their behavior. Skinner assumes that behavior is under the control of the events that follow it instead of reflecting preceding motives or intentions. Skinner refers to these antecedent events as reinforcers (Skinner, 1938, 1953, 1961).

Bandura also emphasizes the importance of learning in development, but believes that most human learning occurs through observing others rather than through direct conditioning. Inner processes such as attention and memory are important in Bandura's social cognitive theory (Bandura, 1986, 1989).

Organismic Theories

Hall assumed that stages of development mirrored evolutionary changes from earliest times to the present. Even though his own theoretical assumptions were not supported, Hall laid the foundation for a scientific study of human development (Hall, 1904).

Piaget succeeded where Hall had failed. Piaget also, extended Darwin's theory of evolution to human development. He viewed intelligence as a means of adapting to one's environment only those forms of thought that promotes adaptation surviving with increasing age. Piaget viewed intelligence as biologically based. He assumed that knowledge, rather than being a simple copy of reality, is an active construction of what we know of the world. He also assumed that these experiences are organized in qualitatively different stages with age (Piaget, 1954).

Gilligan focuses on the interpersonal aspects of development. She notes striking gender differences in the ways individuals of either sex define themselves. Males tend to

view themselves as separate from others; females typically describe themselves in terms of their relationships with others (Gilligan, 1988; Gilligan & Attanucci, 1988).

Psychodynamic Theories

Freud assumed that all thoughts and actions are motivated; he termed the life force motivating these as the libido. Different aspects of the personality control the expression of the libido. The id, present from birth, has limited means for gratifying libidinal impulses. The ego, next to develop, seeks to gratify as many libidinal impulses as possible within social constraints. The last aspect of the personality to develop, the superego, contains the moral values of one's culture and dictates what one should and should not do (Freud, 1954, 1961).

Horney (1967) considers the development of a healthy personality in terms of the ability to value oneself and see that one is valued by others. Horney placed less emphasis than Freud on biological instinct and more stress on the impact of one's culture. Though she, like Freud, considered early experiences to be important, she did not view them as having the determining effect on later personality that Freud did. In particular, Horney reinterpreted Freud's analysis of the feminine personality as a reflection of living in a male dominated society and of women's economic dependence on men (Horney, 1967).

Erikson (1963, 1968) assumes, as did Freud, that personality develops through a sequence of stages, but he carries these through the lifespan. He assumes that society challenges us with new demands as we age and that we experience these as crises. Each crisis takes a slightly different form and gives each stage its unique characteristics. Achievement of a personal identity is the central crisis of adolescence; this involves

adolescents in a set of commitments to life goals that give definition to the self (Erikson, 1963, 1968).

Chodorow (1978) builds on a foundation provided by Freud but attributes gender differences to the social fact that for almost all children the first intimate relationship is with a female, the mother. Girls can continue to define themselves within the context of this first relationship, but boys must separate themselves in order to develop as males. As a consequence, girls' development is characterized by attachment and boys' by separation and individuation (Chodorow, 1978).

Diagnosis of Obesity

Obesity is generally defined as a condition in which there is an excessive energy supply (mostly fat) (Bloomgarden, 2002; Cohen, 1985; Roberts, 1993; Shah & Jeffrey, 1991). It is also defined as fat storage that occurs when energy intake is greater than energy output (Bouchard, 1991; Pace, Webster, & Garrow, 1986; Shah & Jeffrey, 1991). The American College of Sports Medicine (2001) defines obesity as an excess of total body fat. Narrower definitions define obesity as a range of percent of ideal body weight. Some researchers have defined obesity as 10 to 30 percent over ideal body weight (Jette, Berry, & Pearlman, 1977; Zakus, Chin, Cooper, Makovsky & Merrill, 1981). Others suggest that 20 percent more than desirable weight usually defines obesity (Felts, Tavasso, Chenier, & Dunn, 1992; Foreyt & Cousins, 1989; Williams, Bollella, & Carter, 1993).

Overweight status refers to an excess of weight (Foreyt, 1987). It is also defined in terms of body mass index (BMI) [weight in kilograms divided by height in meters

squared] (Foreyt, 1987). For children and adolescents, the state of being overweight occurs when body weight is equal to or greater than the 85th percentile; and severely overweight (or obese) is defined as a BMI greater than the 95th percentile (Foreyt, 1987). When referring to children and adolescents risk of overweight and overweight are the terms used, not obesity. For the purpose of this study overweight status will be considered as a BMI equal to or greater than the 85th percentile.

Since 1959, the Metropolitan Life Insurance Company weight/height charts have provided a standard for defining overweight status (Foreyt, 1987). According to the American College of Sports Medicine (2001), body fat content is usually estimated by one of two techniques, measuring skinfold thickness or computing the ratio of body weight to height.

Measurement by skinfold thickness with calipers is the most common technique for testing overweight conditions (Foreyt & Cousins, 1989; Williams, Bollella, & Carter, 1993). With this type of measurement overweight is defined by triceps skinfold exceeding the 85th percentile in adolescents (Dietz, 1987; Obarzanek, 1993). According to Foreyt and Cousins (1989), the ideal way to diagnose overweight conditions is to estimate the percentage of body fat through the methods of hydrostatic means (under water weighing). This method of measurement is both expensive and inconvenient (Foreyt & Cousins, 1989). Another way of measuring overweight conditions is called dual energy x-ray absorptiometry (DEXA); this type of measurement has shown great promise as an effective laboratory standard for measuring overweight conditions in adolescents (Gutin & Manos, 1993). DEXA is a computerized x-ray technique at two

energy levels to image body fat, lean tissues, and bone mineral content. This type of measurement is also expensive.

Factors Associated with Overweight Conditions

This review of the literature focuses on lifestyle and environmental factors that may be associated with the epidemic rise in childhood and adolescent overweight conditions. Television viewing, physical activity, and eating behaviors have been determined to be causal factors. Selected literature to date on these critical factors is reported here.

Overweight Conditions and Television Viewing

Television viewing may promote overweight conditions both by displacing participation in physical activity that would expend energy, and by increasing dietary energy intake, possibly during viewing or food advertisements (Christakis, Zimmerman, DiGiuseppe, & McCarty, 2004; Dietz & Gortmaker, 1985; DuRant, Baranowski, Johnson, & Thompson, 1994; Kennedy, 2000; Kennedy, Strzempki, Danford, Kools, 2002; Kraak & Pelletier, 1998; Taras, Sallis, Patterson, Nader, & Nelson, 1989).

Television viewing has increased significantly during the past 20 years, in part because of increased program development, availability, and marketing (Dennison, Russo, Burdick, & Jenkins, 2004). Time spent viewing television is the single greatest source of physical inactivity among American children, other than sleep (Dietz & Gortmaker, 1993; Dietz & Strasburger, 1991; Robinson, 1995, 1998).

Children and adolescents today participate in many activities that require little to no energy. Further complicating this issue is the use of computers, the Internet, video games, and television viewing, media outlets that could also contribute to the rapid

increase in childhood and adolescent overweight conditions over the past few decades (Gortmaker, Must, Sobol, Peterson, Colditz, & Dietz, 1996).

Arluk, Branch, Swain and Dowling (2003) evaluated different types of sedentary behaviors of military dependent children aged nine to twelve, to explore any relationship to childhood overweight status. Participants included one hundred and one children, along with their parents, who completed three questionnaires that collected data on sedentary activities. Using body mass index (BMI) as an indicator, 39.8 percent of the children were overweight. These children had a BMI greater than or equal to the 95th percentile as determined by the newly revised Centers for Disease Control and Prevention Pediatric growth charts (CDC, 2000).

Television has become the most ubiquitous communication medium in American households over the past three decades. The number of households with more than three television sets increased sevenfold from 1970 to 2000, with the number of households using cable television service, which would allow for an increase in program selections, increasing tenfold (Crespo, Smit, Troiano, Bartlett, Macera, & Anderson, 2001; Epstein, Paluch, Gordy & Dorn, 2000). Currently, 99 percent of adolescents have a television in their home, and approximately 65 percent of adolescents have a television in their bedroom (Robinson, 1999). Due to the rapid increase in childhood and adolescent overweight status (National Center for Health Statistics, 2000; Story, Neumark-Sztainer, & French, 2002; Shannon, Peacock, & Brown, 1991), time spent watching television has become a factor of interest in understanding the overweight epidemic.

In another related study, Utter, Neumark-Sztainer, Jeffery and Story (2003) described the demographic characteristics of adolescent boys and girls who engage in

three sedentary behaviors (television/video use, computer use, and reading/homework). They explored how each sedentary activity is associated with body mass index (BMI). A large population (4,746) of Midwestern, metropolitan school children from three schools was surveyed. Results revealed that among boys, television/video use and time spent reading/homework were positively associated with BMI ($p < .05$). Among girls, television/video use and computer use was positively associated with BMI ($p < .05$). All differences were considered statistically significant at $p < .05$. Thus, television viewing appears to be important in exploring the epidemic rise in overweight conditions. Physical activity is another causal factor.

Overweight Conditions and Physical Activity

Results of the National Health and Nutrition Survey (Briefel, Sempos, McDowell, Chien, & Alaimo, 1997) revealed that 4.7 million American children ages six through seventeen are more than twice their ideal body weight. As compared to the youth of the 1960s, a more sedentary lifestyle and poor dietary habits has led to a greater than 50 percent increase in the prevalence of overweight conditions and a nearly 100 percent increase in the super-overweight conditions (95th percentile) (Epstein & Goldfield, 1999; Sadowksy, Sawdon, Scheiner, & Sticklin, 1999).

Physical activity is an important component of a healthy lifestyle, with implications for the prevention of chronic diseases and overweight conditions (Caspersen & Merritt, 1995; Goran & Treuth, 2001; United States Department of Health and Human Services, 1996). However, physical activity declines sharply during adolescence, especially among girls (Gortmaker, Dietz, & Cheung, 1990; Neumark-Sztainer, Story, Hannan, Tharp, & Rex, 2003).

To prevent this decline in physical activity among adolescent girls, it is essential to identify factors that correlate with physical activity that are amenable to change and can be addressed within intervention. It is important to identify factors likely to influence the physical activity of adolescence girls at greatest risk for low levels of physical activity (Neumark-Sztainer, Story, Hannan, Tharp, & Rex, 2003).

Neumark-Sztainer, Story, Hanna, Tharp, and Rex (2003) conducted a study with the purpose of identifying factors associated with changes in physical activity in adolescent girls at risk for sedentary lifestyles and overweight status. Two hundred one (201) adolescent girls attending six high schools in the Minneapolis/St. Paul area were recruited. The adolescent girls were in ninth through twelfth grade with all ethnic groups sampled. Three assessments by the school-based obesity prevention physical education program were performed during an eight month period.

The assessments explored the association between physical activity and a range of personal factors (self-worth, body image, enjoyment of physical activity, self-efficacy, body mass index, body image and self-acceptance), behavior factors (watching television and time constraints), and socioenvironmental factors (social support and cost resources). The two strongest and most consistent factors associated with change in physical activity were support for physical activity from peers, parents and teachers, and time constraints. Measures assessing self-perception (self-worth) and specific to physical activity (self-efficacy to be physical active) were also associated with change in physical activity.

Data concluded support from family and friends may be an effective intervention strategy. In addition, addressing real and perceived time constraints may be an effective way to increase physical activity levels in adolescent girls.

Physical activity is an integral part of a healthy lifestyle and has been associated with many health benefits (Hu, Leitzmalm, Stampfer, Colditz, Willet, & Rimm, 2001; Simons-Morton, Parcel, Baranowski, Forthofer, & O'Hara, 1991; Steptoe & Butler, 1996). Since physical activity may track from adolescence to adulthood (Raitakari, Porkka, Taimela, Telama, Rasanen, & Vikari, 1994; Telama, Xiaolin, Laakso, Vilkkari, 1997), there is a growing concern that morbidity and mortality associated with physical inactivity will increase.

Feldman, Barnett, Shier, Rossignol, and Abenhaim (2003) conducted a study to determine whether there is a relationship between the time adolescents spend in physical activity and time they spend in different sedentary pursuits, i.e., watching television, playing video games, working on computers, doing homework, and reading. Seven hundred forty three (743) students from Montreal, Quebec in grades seven through twelve participated in this study. Students at two inner-city and one private school were surveyed using a self-administered questionnaire. This questionnaire addressed time spent in physical activity and time spent in sedentary pursuits.

Levels of physical activity were measured as low, moderate or high. Girls outnumbered boys in the low and moderate physical activity groups and boys outnumbered girls in the high activity group. The results also showed that increased time spent in productive sedentary behaviors (reading or doing homework and working on computers) was associated with increased physical activity. On the other hand, time spent watching television and playing video games was not associated with decreased physical activity.

Andersen, Crespo, Bartlett, Cheskin, and Pratt (1998) explored participation in vigorous activity and television viewing habits and their relationship to body weight and fatness in United States children. The design was a nationally representative cross sectional survey with an in person interview and medical examination. Between 1988 and 1994, 4,063 children aged 8 through 16 were examined as part of the National Health and Nutrition Examination Survey III. Mexican Americans and non-Hispanic Blacks were over sampled to produce reliable estimates for these groups.

Vigorous activity was measured by the estimated number of weekly bouts (or sessions) that resulted in sweating or hard breathing. Overall, 80% reported participating in play or exercise that made them sweat or breathe hard three or more times per week; the rate was higher in boys (85%) than in girls (74%). Vigorous activity levels were lowest among non-Hispanic Blacks and Mexican Americans. The study also revealed a decrease in exercise level as students increased in age (Andersen, Crespo, Bartlett, Cheskin, & Pratt (1998).

Television viewing was measured by the number of hours spent watching television per day. Overall, 26% of the students reported watching four or more hours of television per day; the rate was lower in girls (23%) than in boys (29%). Boys and girls who watch four or more hours of television each day had greater body fat ($p = .001$) and had a greater body mass index ($p = .001$) than those who watch less than 2 hours per day (Andersen, Crespo, Bartlett, Cheskin, & Pratt (1998).

Andersen, Crespo, Bartlett, Cheskin, and Pratt (1998) concluded that many United States children and adolescents watch a great deal of television and are not vigorously active. They suggest that intervention strategies to promote lifelong physical activity

among United States children and adolescents are needed to prevent the adverse health consequences of inactivity.

The prevalence of overweight and obese conditions not only continues to increase in the United States population but in children and adolescents as well. People in industrialized countries are expending less energy in activities of daily living and work.

The Centers for Disease Control and Prevention (CDC, 1997) has recommended that comprehensive school and community programs be developed to promote physical activity among children and adolescents. The goals of these programs are to increase knowledge about activity and exercise and to develop behavioral and motor skills that promote lifelong activities. Such recommendations indicate a need to explore interventions in the physical activity levels of children. The third causal factor explored in this study, eating behaviors, also reveals a critical need to seek interventions into the problem.

Overweight Conditions and Eating Behaviors

Efforts to both prevent and manage overweight conditions in adulthood and adolescence often emphasize nutrition information and knowledge. An underlying assumption of this approach is poor understanding or lack of knowledge about nutrition could lead to weight gain (American Dietetic Association, 1999; Burns, Richman, & Caterson, 1987; Maloney, McGuire, Daniels, & Specker, 1989; Munoz, Krebs-Smith, Ballard-Barbash, & Cleveland, 1997; Nader, 1993). The risk of obesity and obesity related conditions in adulthood is greater in individuals who are overweight during adolescence (Battle & Brownell, 1996; Gifford, 2002; Lytle, 2002; Must, Jacques, Dallal, Bajema, & Dietz, 1992; Troiano, Flegal, Kuczmarski, Campbell, & Johnson, 1995).

Thakur and D'Amico (1999) explored whether a lack of nutritional knowledge is correlated with overweight conditions in adolescents. A survey was distributed to 289 ninth through twelfth grade students at three urban high schools in Philadelphia. For this study student responses indicated a 26% prevalence of overweight status. Overweight was defined as a body mass index (BMI) greater than or equal to the 85th percentile, adjusted for age and gender using criteria from the National Health and Nutrition Examination Survey II (Public Health Service, 1991).

Results indicated no significant differences in nutrition knowledge between the overweight and non-overweight students with the exception that overweight students were better able to identify high fiber foods. In addition, overweight students were more likely to report infrequent meals with their families. Otherwise, there were no significant differences in nutritional behaviors or food preferences.

Two recent trends in the American lifestyle are possible contributors to recent trends in overweight status: fast food consumption and passive entertainment through television. Before 1980, the proportion of food dollars spent away from home showed a sharp upward trend, from 26 percent to 37 percent (Kinsey, 1994). Substantial increases were also seen in the availability of television entertainment via wide market use of home VCRs and cable television (Salvaggio & Bryant, 1989). Increased availability of fast foods and television entertainment could contribute to overweight conditions by making eating more attractive and physical activity less so.

Overweight status is an important public health problem that, in recent years, has reached epidemic proportions. The prevalence of overweight conditions has increased gradually throughout this century, and it has risen sharply (Kuczmarski, Flegal,

Campbell, & Johnson, 1994) in the last ten years despite improvements in the quality of the American diet (Committee on Diet and Health, Food, and Nutrition Board, 1989; McDowell, Briefel, & Alaimo, 1994).

Jeffery and French (1998) conducted a study to examine the association between television viewing, fast food eating, and body mass index (BMI). One thousand fifty-nine (1059) men and women were recruited to participate in the year long study. The participants were 198 men, 529 high income women and 332 low income women. Half of the participants were randomly assigned to one of two low intensity intervention groups designed to reduce weight gain, and half were assigned to a no-contract control condition. Eighty-six percent of the participants entering the study completed the one year follow up survey.

This study explored the hypothesis that television viewing and fast food eating may contribute to obesity conditions in the United States. The results of this study found television viewing hours and fast food meals were positively associated with energy intake and body mass index in women but not in men. Jeffery and French (1998) suggested that further studies need to be conducted due to a small sample size and how changes in population exposure to fast foods and television may be related to secular trends in obesity prevalence in the United States.

The decrease in physical activity and the popularity of high-fat, high calorie foods has been implicated as causative factors in the rise of overweight conditions (Berkey, Rockett, & Field, 2000). The prevalence of overweight conditions has been growing in alarming rate for decades in both adolescents and adults (Gortmaker, Dietz, Sobol, & Wehler, 1987; Shear, Freedman, Burke, Harsha, Webber, & Berenson, 1988; Sugarman,

White, & Gilbert, 1990; Troiano & Flegal, 1998). In children, the prevalence doubled from the late 1970s to 1994, and it is currently estimated that 25 percent have a body mass index (BMI) above the 85th percentile and 11 percent have a BMI above the 95th percentile (Troiano & Flegal, 1998). In adults, obesity is known to be an important risk factor for several chronic diseases (DiPietro, Mossberg, & Stunkard, 1994; Freedman, Dietz, Srinivasan, & Berenson, 1999; Johnston, 1985), and among children and adolescents overweight status has been linked to several conditions, including glucose intolerance (Steinberger, Moran, Hong, Jacobs, & Sinaiko, 2001), and hypertension and dyslipidemia (Freedman, Dietz, Srinivasan, & Berenson, 1999). Moreover, two studies reported that half of all overweight children remain overweight as adults (Serdula, Ivery, Coates, Freedman, Williamson, & Byers, 1993; Vanhala, Vanhala, Kumpusalo, Halonen, & Takala, 1998).

The major epidemiologic (factors controlling the presence or absence of a disease) transition in the 20th century was the shift in mortality (number of deaths in a given time or place) and morbidity (relative incidence of disease) from infectious diseases to chronic diseases, with cardiovascular diseases leading the list. This transition was primarily attributable to the social, economic, and public health changes that took place in the United States during the first half of the century. The availability of abundant food led not only to better overall nutrition and improved child health, but also to the current population's state of excess positive energy balance, accelerated by an increasingly sedentary lifestyle in recent decades. At the beginning of this millennium, a new challenge has emerged. This challenge is to understand the increase in overweight prevalence with a parallel increase in overweight status associated with chronic diseases

and their clinical onset at ever younger ages. Type 2 diabetes, a condition traditionally associated with middle age adults, is beginning to occur several decades earlier as overweight conditions afflict a greater number of children and adolescents in the United States (Glaser, 1997; Kimm & Obarzanek, 2002; Pinhas-Hamiel, Dolan, Daniels, Staniford, Khoury, & Zeitler 1996; Rocchini, 2002).

Until recently, one of the major consequences of overweight status, type 2 diabetes mellitus, accounted for fewer than 5 percent of cases of all childhood diabetes (Neufeld, Raffel, Landon, Chen, & Vadheim, 1998). Current research shows some studies of pediatric diabetes clinic populations have reported that as many as 45 percent of new cases of diabetes are type 2 (American Diabetes Association Consensus Statement, 2000; Neufeld, Raffel, Landon, Chen & Vadheim, 1998). The number of cases of type 2 diabetes is increasing in tandem with the rise in overweight rates in this age group (American Diabetes Association Consensus Statement, 2000; Young, Dean, Flett, & Wood-Steiman, 2000). It is important to look at some of the factors that could possibly cause this increase.

A recent study conducted by Giammattei, Blix, Marshak, Wollitzer and Pettitt (2003) explored the prevalence of overweight status among sixth and seventh grade students in a school based setting, and identified lifestyle parameters associated with overweight conditions. There were 186 boys and 199 girls from three schools that participated in a school based screening study and participants (N = 319) completed a short questionnaire. Height and weight were measured, and body fat as a percentage of body weight was obtained.

The overall results revealed that 35.3% of students had a body mass index (BMI; calculated as the weight in kilograms divided by the height in meters squared) at or above the 85th percentile, and half of these students (17.4%) had a BMI at or above the 95th percentile. Rates were higher among Latino and lower among Asian than non-Hispanic white students. Significant association was found between BMI and hours of television watching per evening and daily soft drink consumption. Giammattei, Blix, Marshak, Wollitzer and Pettitt (2003) concluded that time spent watching television and the number of soft drinks consumed was significantly associated with overweight conditions. Latinos spent more time watching television and consumed more soft drinks than did non-Hispanic White or Asian students.

Epidemiologic evidence indicates protective benefits of fruit and vegetable consumption against cardiovascular disease (Hu, Manso, & Willett, 2001; Renaud, 2001), diabetes (Ford & Mokdad, 2001; Lindquist, Gower, & Goran, 2000), and various forms of cancer (LaVecchia & Tavani, 1998; Steinmetz & Potter, 1991). The promotion of adequate dietary intake of fruit and vegetables by youth is reflected in Healthy People 2010 objectives for persons ≥ 2 years old (U.S. Department of Health and Human Services, 2000). However, recent national surveys indicate that children and adolescents in the United States fail to meet public health guidelines (Dixon, Cronin, & Krebs-Smith, 2001). While the U.S. Department of Agriculture Food Guide Pyramid recommends three to five servings of vegetables per day and two to four servings of fruits (Dixon, Cronin, & Krebs-Smith, 2001), only one in five children consumes five or more servings of fruits and vegetables daily (Dixon, Cronin, & Krebs-Smith, 2001).

Social and environmental factors, such as television viewing, are thought to contribute to development of dietary habits among youth (Neumark-Sztainer, Story, Resnick, & Blum, 1996). Through the extensive search of literature, limited studies were found addressing the association between television viewing and fruit and vegetables intake among youth. One study that was found was conducted by Boynton-Jarrett et al. (2003).

Five hundred forty eight public school ethnically diverse students from four Massachusetts communities were studied for a nineteen month period from October 1995 to May 1997. Boynton-Jarrett et al. (2003) examined the associations between baseline and change in hours of television and video viewing per day and change in energy adjusted intake of fruits and vegetables. The results of the study indicated for each additional hour of television viewed per day, fruit and vegetable consumption decreased by 0.14 servings. Baseline hours of television viewed per day was also independently associated with change in fruit and vegetable servings (-0.16).

Boynton-Jarrett et al. (2003) concluded that television viewing was found to be inversely associated with intake of fruit and vegetables among adolescents. They further suggested that this association may be a result of the replacement of fruit and vegetables in youths' diet by foods highly advertised on television.

Children's diets have been complicated by soft drinks, fast food, and high calorie poor quality snacks, with per capita soda consumption having increased fivefold over the past fifty years and now comprising more than ten percent of caloric intake for the average adolescent. Fast food has contributed to an increase from two to fifteen percent of calories in children's diets in all aspects of society since the 1970s, leading to food

high in refined carbohydrates, high in trans fatty acids, low in fiber, and low in vitamins (Lin, Guthrie, & Frazao, 1999).

Fast food is especially popular among adolescents, who on average visit a fast food outlet twice a week (Lin, Guthrie, & Blaylock, 1996; Lin, Guthrie, & Frazao, 1999). A survey of 4,746 students eleven to eighteen years of age reported that about 75 percent ate at a fast food restaurant during the week before the survey (French, Story, Neumark-Sztainer, Fulkerson, & Hannan, 2001). The same survey showed that fast food use was associated with higher intake of fried potatoes, hamburgers, pizza, and soft drinks, and lower intake of fruits, vegetables, and milk.

Approximately one in four children and adolescents in the United States is overweight (Troiano & Flegal, 1998). Dramatic increases in overweight conditions during the past several decades suggest the predominance of environmental factors over genetic factors (Bouchard, 1997; Rosenbaum, Leibel, & Hirsch, 1997). Clearly overweight conditions are the result of a positive balance between energy intake and expenditure. Dietary composition may be related to energy imbalance (Stubbs, Prentice, & James, 1997).

According to the National Health and Nutrition Examination Survey, nearly 13 percent of children six to eleven years of age are overweight (body mass index [BMI] values equal to or greater than 85th percentile) (CDC, 1999). The prevalence of overweight children and adolescents has more than doubled since the first nutrition examination survey, which was conducted over 30 years ago.

Approximately one in four adolescents drink more than 26 ounces of soda per day, averaging 12 percent to 15 percent of his or her daily energy need (Jacobson, 1998).

Liquid candy, the term for soft drinks, are now the leading source of added sugar in the American adolescent diet (Fried & Nestle, 2002; Schlosser, 2002). A study by Ludwig, Peterson, and Gortmaker (2001) found that each additional serving of sugar sweetened beverages (defined as soda and other sweetened drinks such as Kool-Aid and lemonade) is associated with increases in body mass index and risk of overweight status.

For more than 30 percent of adults and 15 percent of children and adolescents in the United States, overweight conditions is a threat to a shortened life span (Flegal, Carroll, Ogden, & Johnson, 2002; Ogden, Flegal, Carroll, & Johnson, 2002). For children and adolescents cultural changes such as vending machines and soda sales as well as reduced frequency of physical education classes are commonplace in the school environment (Fried & Nestle, 2002; Lowry, Wechsler, Kann, & Collins, 2001).

Eating behaviors are central to an adolescent's physical development, health, and identity. Adolescents' eating practices and nutritional intake may have long-term impacts on health (U. S. Department of Health and Human Services, 1988). Many youth engage in unhealthy dieting practices and have erratic eating patterns that include high intakes of fast foods and other foods high in fat and sugar, as well as low intakes of fruits and vegetables, and calcium rich foods (Neumark-Sztainer, Story, Resnick, & Blum, 1996). Studies to date show a lack of concern for healthy eating on the part of young people and little normative support for healthy eating (Croll, Neumark-Sztainer, & Story, 2001; Fried & Nestle, 2002; Schlosser, 2002). With the research indicating that overweight status in childhood tracks to obesity in adulthood, the need for intervention support for healthy eating habits is critical.

Childhood Overweight Conditions and Adult Obesity

Overweight conditions track from childhood into adulthood (Klesges, Klesges, Eck, & Shelton, 1995; Whitaker, Wright, Pepe, Seidel, & Dietz, 1997), and adolescent overweight status has been linked to higher all-cause mortality in adulthood (Must, Jacques, Dallal, Bajema, & Dietz, 1992). More than 60 percent of overweight children have at least one risk factor for cardiovascular disease, such as elevated blood pressure, hyperlipidemia, or hyperinsulinemia (Freedman, Dietz, Scrivinasin, & Berenson, 1999).

Overweight conditions in children, and particularly in adolescence, is a key predictor for obesity conditions in adulthood, leading to a host of more serious health problems, including gallbladder disease, coronary heart disease, respiratory disease, arthritis, and some cancers (Deckelbaum & Williams, 2001). Overweight children and adolescents are vulnerable to a number of health problems. Type-2 diabetes mellitus is becoming a more common diagnosis in pediatric clinics (Sylper, 1998). Overweight conditions at age 20 can significantly lessen life expectancy (Fontaine, Redden, Wang, Westfall, & Allison, 2003). Must, Jacques, Dallal, Bajema, and Dietz (1992) suggest adolescent overweight status increases the long-term (approximately 50 year) risk of adult morbidity and mortality independent of adult obesity status and 70% of overweight ten to thirteen year old children become obese adults.

Whitaker, Wright, Pepe, Seidel, and Dietz (1997) investigated the risk of obesity in young adulthood associated with both overweight conditions in childhood and adolescence with obesity in one or both parents. Height and weight measurements were taken from records of 854 subjects born at a health maintenance organization in Washington State between 1965 and 1971. Their parents' medical records were also

reviewed. Childhood overweight status was defined in this study as a body mass index (BMI) at or above the 85th percentile for age and sex, and obesity in adulthood as a mean body mass index at or above 27.8 for men and 27.3 for women.

The results from this study revealed in young adulthood (defined as 21 to 29 years of age), 135 subjects (16%) were obese. Among those who were overweight during childhood or adolescence, the chance of obesity conditions in adulthood ranged from eight percent for one or two year olds without obese parents to 79 percent for ten to fourteen year olds with at least one obese parent.

Whitaker, Wright, Pepe, Seidel, and Dietz (1997) concluded that overweight children under three years of age without obese parents are at low risk for obesity conditions in adulthood, but among older children and adolescences, overweight status is an increasingly important predictor of adult obesity status regardless of whether the parents were obese. In this study, parental obesity more than doubled the risk of adult obesity among both overweight and non-overweight children less than ten years of age.

Dietary practices during adolescence may have long-term health implications. For example, being overweight as an adolescent is associated with obesity as an adult, high fat intake during adolescent and into adulthood is associated with an increase risk of heart disease, and low calcium intake during adolescence is associated with low bone density and an increased risk for osteoporosis later in life (CDC, 1996).

Public health has a long history of addressing important community issues through regulatory and policy mechanisms. Examples of successful public health policy interventions include the near elimination of rickets through supplementation of milk with vitamin D and the reduction in dental caries through fluoridation of our drinking

water. A contemporary example of healthy public policy is the reduction in the number of cigarette smokers. Smoking has been reduced through clean indoor air regulation, targeted taxes, and restrictions on access (Dietz, Bland, Gortmaker, Molloy, & Schmid, 2002).

Public policy is now required to address the growing childhood and adolescent overweight epidemic. Between 1980 and 1999, the prevalence of overweight status 12 – 19 year old adolescents tripled. Almost 15 percent of children and adolescents are now overweight (CDC, 2004). Multiple changes have occurred with respect to the source, location, and types of food consumption that have likely increased caloric intake. Furthermore, physical activity as part of daily life appears to have declined, and television viewing among children and adolescents have increased (CDC, 2004).

Healthy eating patterns in childhood and adolescence promote optimal childhood health, growth, and intellectual development, prevent immediate health problems such as iron deficiency anemia, overweight status, eating disorders, and dental caries, and may prevent health problems later in life (CDC, 1996). Diet is a risk factor for the nation's three leading causes of death (coronary heart disease, cancer, and stroke) as well as other important health problems such as diabetes, high blood pressure, obesity, and osteoporosis (U.S. Public Health Service, 1988; CDC, 1996). Many diet-related diseases mostly affect adults, but the eating patterns that contribute to them are typically established during youth and continue into adulthood (CDC, 1996; Wechsler, Brener, Kuester, & Miller, 2001). Therefore, it is efficacious to teach persons healthy eating patterns when they are young.

The need to promote healthy eating among young people has intensified in recent years due to the growing national epidemic of overweight conditions. The prevalence of overweight status among children aged six to eleven years in the United States has nearly doubled in recent years, from 7 percent in 1976–1980 to 13 percent in 1999, and the prevalence of overweight conditions among adolescents aged twelve to nineteen years has increased from five percent to fourteen percent during this time (CDC, 1999). An emerging, and possibly related, public health problem is the dramatic rise during the past two decades in cases of Type 2 diabetes among adolescents. Most adolescents diagnosed with this disorder, previously called adult-onset diabetes, are overweight (Fagot-Campagna, Saadinem, Flegal, & Beckles, 2001; Wechsler, Brener, Kuester, & Miller, 2001).

Summary

Adolescence is recognized as a stage in life when youth prepare for adulthood. It is a time marked by changes in physical and emotional characteristics. During adolescence, youth are more prone to low self-esteem and engage in risky behaviors. There is a growing epidemic of increased overweight conditions among adolescents. The intent of this study will be to look for factors which cause this rapid increase in overweight status among adolescents.

Chapter II provides a review of related literature concerning adolescent overweight status, theoretical foundations of adolescent development, and a diagnosis of obesity. Chapter III will discuss the research design and data analysis. The results of the

research study will be discussed in Chapter IV. Chapter V will include the summary, discussion, conclusion, and recommendations based on study findings.

III. METHODS

Chapter III contains a description of the research methods that provided the framework for the analysis of the Youth Risk Behavior Survey (YRBS) data.

Purpose of the Study

Intervention in the epidemic of adolescent overweight conditions is critical if we are to reduce the problem. Current national nutrition surveillance data suggest that the diet of adolescents is putting them at risk for cardiovascular disease, cancer, and osteoporosis based on their intake of saturated fat, total fat, fruits, vegetables as well as soft drinks (CDC, 2004). In addition, the United States is experiencing an epidemic of overweight conditions that extends to the adolescent population; some of the related factors may be an excess in energy intake, low levels of physical activity, and high levels of sedentary behaviors. This research investigated these three variables and their relationship to overweight status of Alabama high school adolescents.

This study explored three lifestyle and environmental risk factors that relate to adolescent overweight status. Using the 2003 Youth Risk Behavior Survey (YRBS) results this study examined the relationships between television viewing, physical activity, and fruit and vegetable consumption and overweight status of Alabama high school adolescents.

Description of Study Participants

The Youth Risk Behavior Survey (YRBS) was completed by 1088 students in 39 public high schools in Alabama during spring 2003. Students participating in the survey completed a self-administered, anonymous, 87 item questionnaire. Survey procedures were designed to protect the privacy of all students by allowing for voluntary and anonymous participation. White (61.1%) and Black (35.7%) adolescents attending the ninth, tenth, eleventh, and twelfth grades in Alabama were included in this study. The cell sizes for all other ethnic groups were too small to analyze. Females made up the majority of the sample (51.1%). No significant differences existed between the participants in any of the demographic categories.

Research Questions

The following research questions provided the basis for the analysis of the YRBS data.

1. What, if any, is the relationship between television viewing, physical activity levels, eating behaviors, and overweight status among Alabama high school adolescents?
2. If so, to what extent does overweight status (BMI) affect prevalence rates for television viewing of Alabama high school adolescents?
3. If so, to what extent does overweight status (BMI) affect prevalence rates in physical activity levels of Alabama high school adolescents?
4. If so, to what extent does overweight status (BMI) affect prevalence rates by fruit and vegetable consumption of Alabama high school adolescents?

Approval for this study was granted by the Auburn University Institutional Review Board for Research Involving Human Subjects on February 22, 2005.

Research Variables

The three independent variables for this study are: television viewing, physical activity levels, and fruit and vegetable consumption. The dependent variable is adolescent overweight status.

The grade in school variable includes students in the ninth, tenth, eleventh, and twelfth grades. The race/ethnicity for this study includes White non-Hispanic and Black non-Hispanic. Due to low response rates that resulted in low cell sizes too small for accurate analysis, other groups were not included in this study. The other groups were Hispanic, Asian, Pacific Islander, Alaskan Native, and Native Americans.

The dependent variables coincide with the YRBS items for television viewing, physical activity levels, and fruit and vegetable consumption. Television viewing was assessed by the following question from the 2003 YRBS: “On an average school day, how many hours do you watch TV?” Response options range from “I do not watch TV on an average school day” to “5 or more hours per day.”

Participation in moderated physical activity and vigorous physical activity were assessed by the following two questions: “On how many of the past 7 days did you participate in physical activity for at least 30 minutes that did not make you sweat or breathe hard, such as fast walking, slow bicycling, skating, pushing a lawn mower, or mopping floors?” and “On how many of the past 7 days did you exercise or participate in physical activity for at least 20 minute that made you sweat and breathe hard, such as

basketball, soccer, running, swimming laps, fast bicycling, fast dancing, or similar aerobic activities?” Response options range from 0 days to 7 days for both questions.

Consumption of fruits and vegetables was measured by six separate questions, all of the form: “During the past 7 days, how many times did you... [eat fruit; eat green salad; eat potatoes; eat carrots; eat other vegetables]?” Response options for each food frequency question ranged from 0 times (in the past 7 days) to 4 or more times per day.

Students were also asked for their current height and weight without shoes. Self reported height and weight were used to calculate body mass index (BMI), expressed as body weight in kilograms divided by the square of height in meters (kg/m²). Current guidelines for evaluation and treatment of childhood obesity, students with a BMI equal to or greater than the 95th percentile, using gender and age-specific cut points recently revised growth charts produced by Centers for Disease Control and Prevention (CDC, 2004).

An Overview of the Youth Risk Behavior Survey (YRBS)

Background and Rationale

In 1987, the Centers for Disease Control and Prevention (CDC) developed a program to provide fiscal and technical assistance to the 50 states and local education agencies for effective human immunodeficiency virus (HIV) prevention programs for youth. Since 1992, the CDC has funded education agencies to also provide additional broad based programs, often referred to as coordinated school health programs. The effectiveness of these programs is partially determined by their ability to positively influence behaviors that increase the risk for HIV infection and that are associated with

the leading causes of death and disability among youth and adults in the United States (CDC, 2004).

During the 1980s, in the United States, only a limited number of health related school based surveys existed (Johnson, O'Malley, & Bachman, 2002). These surveys were conducted only on a national level or they were a one time survey, which did not meet the state or local needs for health risk for youths. The CDC developed the Youth Risk Behavior Surveillance System (YRBSS) to monitor priority health risk behaviors that contribute substantially to the leading causes of death, disability, and social problems among youth and adults in the United States. YRBSS includes biennial national, state, and local school based surveys of representative samples of students ninth through twelfth grades (CDC, 2004).

Purpose of the YRBSS

YRBSS was designed to determine the prevalence of health risk behaviors among high school students; assess whether these behaviors increase, decrease, or remain the same over time. When the YRBSS was developed the decision was made to focus on health risk behaviors rather than determinants of these behaviors (e.g., knowledge, attitudes, or beliefs). Another purpose of the YRBSS is to provide comparable national, state, and local data as well as comparable data among subpopulations of youth (e.g., racial/ethnic groups) (CDC, 2004).

Initial Questionnaire Development

The CDC first reviewed the leading causes of morbidity and mortality among youth and adults, to determine which risk behaviors YRBSS would assess. In 1988, a total of 68 percent of all deaths among persons aged one to twenty-four were from only

four causes: Motor vehicle crashes (31%), other unintentional injuries (14%), homicide (13%), and suicide (10%). These percentages have changed only minimally since the original review (Arias, Anderson, Kung, Murphy, & Kochanek, 2003; CDC, 2004; National Center for Health Statistics, 2000). For example; alcohol use is a factor in approximately one half of the deaths from motor vehicle crashes, homicides, and suicides (CDC, 2004; Perrine, Peck, & Fell, 1988).

Reviews conducted in 2004 indicate that virtually all behaviors contributing to the leading causes of morbidity and mortality can be placed into six categories: behaviors that contribute to unintended injuries and violence; tobacco use; alcohol and other drug use; sexual behaviors that contribute to unintended pregnancies and STDs, including HIV infection; unhealthy dietary behaviors; and physical inactivity (CDC, 2004). These behaviors frequently are interrelated and often are established during youth and extend into adulthood (CDC, 2004).

The first version of the YRBS questionnaire was completed during fall 1989 and was reviewed by representatives from each state education agencies, the District of Columbia, four U.S. territories, and sixteen local education agencies funded by CDC at that time (CDC, 2004). A second version of the questionnaire was used during spring 1990 to generate data from a national sample as well as 25 state and nine district samples of students in ninth through twelfth grades. A third version of the questionnaire was completed in fall 1990 (CDC, 2004).

During Spring 1991, a total of 26 states and 11 districts conducted the YRBS by using the third version questionnaire to conduct a national survey (CDC, 2004). In 1991, CDC determined that because behavioral change in populations typically occurs

gradually over time, biennial surveys would be sufficient to measure health risk behaviors among students. YRBS has since been conducted every odd year at the national, state, and local levels (CDC, 2004).

Questionnaire Revisions

State and districts and the CDC work together to revise the questionnaire to reflect state, district and national priorities, before each biennial YRBS survey is administered. For example, two questions assessing self reported height and weight were added in recognition of increasing concerns regarding obesity. YRBS now includes national, state, and local estimates of body mass index (BMI) calculated from self reported data, as a result of these revisions (CDC, 2004). All YRBS questionnaires are self administered, and students record their responses on a computer scantron booklet or on an answer sheet.

Questionnaire Reliability and Validity

CDC has conducted two test-retest reliability studies of the national YRBS questionnaire, one in 1992 and one in 2000 (CDC, 2004). In the first study, the 1991 version of the questionnaire was administered to a convenience sample of 1,679 students in grade seven through twelve. The questionnaire was administered on two occasions, fourteen days apart (Brener, Collins, Kann, Warren, & Williams, 1995). Approximately three fourths of the items were rated as having a substantial or higher reliability ($\kappa = 61\%–100\%$), and no statically significant differences were observed between the first and second time that the questionnaire was administered. The responses of seventh graders were less consistent than those of students in higher grades, indicating that the questionnaire is best suited for students in grades eight or above (CDC, 2004).

In the second study, the 1999 version of the questionnaire was administered to a convenience sample of 4,619 high school students, on two occasions, approximately two weeks apart (Brener et al., 2002; CDC, 2004). Approximately one of five items (22%) had statistically significant difference prevalence estimates for the first and second times that the questionnaire was administered. Ten items (14%) had both kappas \leq 61% and statistically significant different time-1 and time-2 prevalence estimates, indicating that the reliability of these items is questionable. These items have been revised or deleted from the questionnaire (CDC, 2004).

Although no study had been conducted to assess the validity of all self-reported behaviors that are included on the YRBS questionnaire, in 2003 CDC conducted a review of existing empirical literature to assess cognitive and situational factors that might affect the validity of adolescent self-reporting of behaviors measured by the YRBS questionnaire (Brener, Billy, & Grady, 2003; CDC, 2004). In this review, CDC determined that, although self-reports of these types of behaviors are affected by both cognitive and situational factors, these factors do not threaten the validity of self-reports of each type of behavior equally (CDC, 2004).

Sampling, Weighting, and Response Rates

Each state and local school based YRBS uses a two stage cluster sample design to produce representative samples of students in grades nine through twelve in their jurisdiction. In the first sampling stage, in all except a few states and districts, schools are selected with probability proportional to school enrollment size. In the second sampling stage, intact classes of a required subject (e.g., math) or intact classes during a required

period (e.g., second period) are selected randomly. All students in sampled classes are eligible to participate (CDC, 2004).

The national YRBS employs a three stage cluster sample design to obtain a nationally representative sample of students in grades nine through twelve in the United States. The target population comprises all public and private high school students in the 50 states and the District of Columbia (CDC, 2004).

The first stage sampling frame from each national survey includes primary sampling units (PSUs) consisting of large sized counties or groups of smaller, adjacent counties. PSUs are selected with probability proportional to school enrollment size for PSUs (CDC, 2004).

In the second stage of sampling, schools are selected from PSUs. These databases also include enrollment figures. Schools with all four high school grades (9–12) are considered whole schools. Schools with any other set of grades are considered fragment schools. The fragment schools are combined with other schools (whole or fragment) to form a cluster school that includes all four grades (CDC, 2004).

The final stage of sampling consists of randomly selecting, in each chosen school and in each of grade ninth through twelfth, one or two entire classes. Examples of classes include homerooms or classes of a required discipline (e.g., Science or Social Studies). All students in the sampled classes are eligible to participate (CDC, 2004).

A weight based on student race/ethnicity, sex, and school grade is applied to each record to adjust for student non-responses and over-sampling of Black and Hispanic students. Therefore, weighted estimates are representative of all ninth through twelfth

grade students who are attending public and private school in the United States (CDC, 2004).

Data Collection

Local procedures for obtaining parental permission are followed before administering YRBS in the schools. Survey procedures for the national, state, and local surveys are designed to protect student privacy by allowing the anonymous and voluntary participation. The questionnaire, containing 87 items, was administered in the classroom by a trained CDC data collector. The YRBS has been reviewed and approved by an Institutional Review Board at the CDC (CDC, 2004).

Research Design

Examination of statistically significant predictors and prevalence rates between fruit and vegetable consumption, physical activity levels and television viewing were analyzed with logistic regression analysis using Software for the Statistical Analysis of Correlated Data (SUDDAN). Statistically significant predictors were determined using odds ratios at a .05 alpha level. Odds ratio is a statistical measure, an estimate, particularly important in logistical regression. It is defined as the ratio of the odds of an event occurring in one group to the odds of it occurring in another group. The odds ratio is calculated by dividing the odds in one group by the odds in another group. These groups, for example, might be men and women, or any other dichotomous classification. An odds ratio of 1.00 means the odds for one group was the same as the odds for the other group. Along with the odds ratio, one should calculate the range over which they

are confidence that this estimate is reliable. In this study a 95% confident level was used, meaning the researcher was 95% confidence the estimate would fall within that range 95 out of 100 times. Prevalence rates were determined by using the 95% confidence intervals (Hosmer & Lemeshow, 1989; Kleinbaum, 1994).

Logistic regression is similar to that of multiple regression even though the mathematical criterion of maximum likelihood rather than least squares is employed. The independent variable should be correlated with the dichotomous criterion and contribute non-redundant information. Logistic regression does not assume that the dependent variable is a linear function of the independent variables (Glass & Hopkins, 1996).

For this analysis, logistic regression was applied to each of the sets of variables addressing all research questions. Logistic regression were used to calculate odds ratios at 95% confidence intervals. “Because of the importance of the odds ratio as a measure of association, interval estimates are often used when presenting the results of a logistic regression analysis” (Hosmer & Lemeshow, 1989). The confidence interval is a “range of values that are confident contains the population parameter” (Hinkle, Wiersma, & Jurs, 1994, p. 197).

Summary

Chapter III contains an overview of the YRBS, data collection, research design and data analysis. The purpose of this analysis was to determine statistically significant predictors and prevalence rates between television viewing, physical activity levels, and fruit and vegetable consumption and overweight status among Alabama high school adolescents using the 2003 YRBS data. The YRBS is a school based survey that monitors

priority health risk behaviors among representative samples of student in grades nine through twelve, at the national, state, and local levels.

Logistic regression is a method of statistical analysis most often used in the health science, particularly epidemiology. Risk ratios and odds ratios are two methods that can be used to determine the probability of disease or outcome. Logistic regression is used by the CDC to analyze the YRBS.

Results are discussed in Chapter IV. Chapter V includes the summary, discussion, conclusions, and recommendations based on this study finding.

IV. RESULTS

This chapter presents results for each question related to television viewing, physical activity levels and fruit and vegetable consumption on the 2003 Youth Risk Behavior Survey (YRBS). Thirty nine public schools in Alabama during Spring 2003 were surveyed. The sample size was 1088 respectively. Five hundred forty five (545) were females (51.1%) and 510 were males (48.9%). White adolescents accounted for 61.1 percent (n = 752) and Black adolescents accounted for 36.7 percent (n = 224). The cell size for all other groups (Hispanic/Latino, 0.7%; All Other Races 1.3%; and Multiple Races 1.2%) were too small to analyze. The grade levels sampled were ninth (30.1%, n = 282), tenth (25.9%, n = 270), eleventh (22.6%, n = 240), and twelfth (20.9%, n = 251).

Results will assess the relationships between variables by analyzing the independent variables, gender, race and grade in school, for each of the dependent variables separately. Dependent variables were:

- a) During the past 7 days, how many times did you eat fruit, green salad, potatoes, carrots, and other vegetables? [these are questions 74 through 78 on the YRBS combined into one variable],
- b) On how many of the past 7 days did you exercise or participate in physical activity for at least 20 minutes that made you sweat or breathe hard, such

as basketball, soccer, running, swimming laps, fast bicycling, fast dancing, or similar aerobic activities? [this is question 80 on the YRBS],

- c) On how many of the past 7 days did you exercise or participate in physical activity for at least 30 minutes that did not make you sweat or breathe hard, such as fast walking, slow bicycling, skating, pushing a lawn mower, or mopping floors? [this is question 81 on the YRBS], and
- d) On an average school day, how many hours do you watch TV? [this is question 83 on the YRBS]).

Purpose of the Study

Intervention in the epidemic of adolescent overweight status is critical if we are to reduce the problem of overweight adolescents. Current national nutrition surveillance data suggest that the diet of adolescents is putting them at risk for cardiovascular disease, cancer, and osteoporosis, based on their intake of saturated fat, total fat, fruits, vegetables, as well as soft drinks (CDC, 2004). In addition, the United States is experiencing an epidemic of overweight conditions that extends to the adolescent population; some of the related factors may be an excess in energy intake, low levels of physical activity, and high levels of sedentary behaviors. This research investigated these three variables and their relationship to the overweight status of Alabama adolescents.

This study explored three lifestyles and environmental risk factors that could possibly affect adolescent overweight status. Using the 2003 Youth Risk Behavior Survey (YRBS) results this study examined the relationship, if any, between television

viewing, physical activity, and fruit and vegetable consumption among Alabama high school adolescents.

Results

Results of Research Question One

Research Question 1 was, “What, if any, is the relationship between television viewing, physical activity levels, fruit and vegetable consumption and BMI among Alabama high school adolescents?”

Data used to answer Research Question 1 were found in the responses to questions 2 (What is your sex?), 3 (In what grade are you?), 4 (How do you describe yourself?), 74 (During the past 7 days, how many times did you eat fruit?), 75 (During the past 7 days, how many time did you eat green salad?), 76 (During the past 7 days, how many times did you eat potatoes?), 77 (During the past 7 days, how many times did you eat carrots?), 78 (During the past 7 days, how many times did you eat other vegetables?), 80 (On how many of the past y days did you exercise or participate in physical activity for at least 20 minutes that made you sweat and breathe hard, such as basketball, soccer, funning, swimming laps, fast bicycling, fast dancing, or similar aerobic activities?), 81 (On how many of the past 7 days did you participate in physical activity for at least 30 minutes that did not make you sweat or breathe hard, such as fast walking, slow bicycling, skating, pushing a lawn mower, or mopping floors?), and 83 (On an average school day, how many hours do you watch TV?) on the 2003 YRBS. There is a referent or reference group for each set of independent variables. The referent groups used were males, white, twelfth grade students, did not exercise vigorously, did

not exercise moderately, did not eat the recommended fruit and vegetable consumption and watched television 2 hours or more per day. The odds ratio for the referent group is 1.0 (see Table 1).

Table 1

Odd Ratios (OR) and 95% Confidence Intervals (CI) for Vigorous Physical Activity Levels, Moderate Physical Activity Levels, Fruit and Vegetable Consumption, and Television Viewing (TV) of Alabama High School Adolescents

Variables	OR	95% CI
Gender		
Female	1.32	(0.90, 1.94)
Male	1.00	Referent
Race		
White	1.00	Referent
Black	0.78	(0.55, 1.10)
Grade		
9 th	0.80	(0.57, 1.12)
10 th	0.90	(0.59, 1.37)
11 th	1.03	(0.59, 1.80)
12 th	1.00	Referent
Vigorous Physical Activity Levels		
< 3 days per week	1.00	Referent
≥ 3 days per week	1.05	(0.79, 1.40)

(table continues)

Table 1 (continued)

Variables	OR	95% CI
Moderate Physical Activity Levels		
< 5 days per week	1.00	Referent
≥ 5 days per week	0.77	(0.54, 1.12)
Fruit and Vegetable Consumption		
< 5 per day	1.00	Referent
≥ 5 per day	1.08	(0.68, 1.73)
Television Viewing		
1 hour or less per day	1.33	(0.92, 1.92)
≥ 2 hours per day	1.00	Referent

The prevalence of overweight status among Alabama high school adolescents by gender is females (White and Black = 29.97) and males (White and Black = 30.77).

Prevalence among the different races was Whites (male and females = 26.14) and Blacks (males and females = 31.24). Prevalence between grade levels was ninth (30.26), tenth (28.74), eleventh (26.16) and twelfth (24.16).

Race

The participants in this study were White (61.1%, n = 752) and Black (37.7%, n = 224) adolescents; all other groups (2.2%) were too small to provide valid data for analysis. There were no statistically significant differences between BMI and the two races analyzed (White and Black participants).

Grade Levels

The grade levels used in this study were ninth (30.1%, n = 282), tenth (25.9%, n = 270), eleventh (22.6%, n = 240), and twelfth (29.9%, n = 251) grade students. There were no statistically significant differences between BMI and grade levels.

Vigorous Physical Activity Levels

Question number 80 on the 2003 YRBS (“On how many of the past 7 days, did you participate in physical activity for at least 20 minutes that made you sweat and breathe hard, such as basketball, soccer, running, swimming laps, fast bicycling, fast dancing, or similar aerobic activities?”) was used to assess vigorous physical activity levels. The United States Department of Health and Human Services (2000) recommends < 3 days per week for the criteria as not being vigorously physically active and \geq 3 days or more per week as the criteria for being vigorously physically active. There were no statistically significant differences between BMI and Alabama high school adolescents who were vigorously physically active and the Alabama high school adolescents who were not vigorously physically active (see Table 2).

Table 2

Prevalence of Body Mass Index (BMI) and Confidence Intervals (CI) for Alabama High School Adolescents

Variable	BMI	CI	BMI	CI
	< 85 th %	95%	≥ 85 th %	95%
Gender				
Females	75.03	(69.42, 79.91)	24.97	(20.09, 30.58)
Males	69.23	(63.31, 74.57)	30.77	(25.43, 36.69)
Race				
White	73.86	(70.87, 76.63)	26.14	(23.37, 29.13)
Black	68.76	(61.00, 75.60)	31.24	(24.40, 39.00)
Grade in School				
9 th	69.74	(64.19, 74.77)	30.26	(25.23, 35.81)
10 th	71.26	(63.56, 77.90)	28.74	(22.10, 36.44)
11 th	73.84	(64.32, 81.54)	26.16	(18.46, 35.68)
12 th	75.84	(70.23, 80.69)	24.16	(19.31, 29.77)
Vigorous Activity Level				
< 3 Days Per Wk	72.32	(67.38, 76.76)	27.68	(23.24, 32.62)
≥ 3 Days Per Wk	71.64	(66.57, 76.21)	28.36	(23.79, 33.43)
Moderate Activity Level				
< 5 Days Per Wk	72.92	(68.59, 76.84)	27.09	(23.16, 31.41)
≥ 5 Days Per Wk	67.87	(59.18, 75.48)	32.13	(24.52, 40.82)
Fruit & Vegetable Consumption				
≥ 5 Per Day	72.23	(68.11, 76.02)	27.77	(23.98, 31.89)
< 5 Per Day	72.85	(63.75, 80.37)	27.15	(19.63, 36.25)

(table continues)

Table 2 (continued)

Variable	BMI	CI	BMI	CI
	< 85 th %	95%	≥ 85 th %	95%
Television Viewing				
≤1 Hr. Per Day	75.90	(70.53, 80.56)	24.10	(19.44, 29.47)
≥2 Hrs. Per Day	69.79	(64.55, 74.57)	30.21	(25.43, 35.45)

Moderate Physical Activity Levels

Question number 81 on the 2003 YRBS was, “On how many of the past 7 days, did you participate in physical activity for at least 30 minutes that did not make you sweat and breathe hard, such as fast walking, slow bicycling, skating, pushing a lawn mower, or mopping floors?” The United States Department of Health and Human Services (2000) recommends < 5 days per week for the criteria as not being moderately physically active and ≥ 5 days or more per week as being moderately physically active. There were no statistically significant differences between BMI and adolescents who were not moderately physically active and adolescents who were moderately active (see Table 2).

Fruit and Vegetable Consumption

The United States Department of Agriculture (2000) recommends 5 servings of fruits and vegetables per day. Questions 74 through 78 on the 2003 YRBS (5 questions were in the form of: During the past 7 days, how many times did you eat fruit, green salad, potatoes, carrots, and other vegetables?) were assessed. There were no statistically significant differences between BMI and Alabama adolescents who ate five servings of

fruits and vegetables per day and Alabama adolescents who did not eat five servings of fruits and vegetables per day (see Table 2).

Television Viewing

The review of the literature (Kotz & Story, 1994; Kronenberg, Pereira, & Schmitz, 2000; Robinson, Wilde, Navracruz, Haydel, & Varady, 2001; Tucker, 1986; Tucker & Bagwell, 1991;) suggested two hours or more of television viewing may be a causal factor for obesity. Question 83 on the 2003 YRBS (“On an average school day, how many hours do you watch TV?”) was used to evaluate the findings. The criteria were established using < 2 hours per day of television viewing and ≥ 2 hours or more per day of television viewing. There were no statistically significant differences between BMI and < 2 hours of television viewing per day by Alabama adolescents and ≥ 2 hour or more of television viewing per day by Alabama adolescents (see Table 2).

Results of Research Question Two

Research Question 2 was “If so, to what extent does overweight status (BMI) affect prevalence rates for television viewing of Alabama high school adolescents?” Data used to evaluate this Research Question 2 was found in the responses to questions 2 (What is your sex?), 3 (In what grade are you?), 4 (How do you describe yourself?), and 83 (On an average school day, how many hours do you watch TV?) on the 2003 YRBS. The referent or reference groups for each set of independent variables were males, White, twelfth grade students, and watched television 2 hours or more per day. The odds ratio for the referent group was established as 1.0 (see Table 3).

Table 3

Odd Ratios (OR) and 95% Confidence Intervals (CI) for Television Viewing (TV) for

Alabama High School Adolescents

Variables	OR	95% CI
Gender		
Females	1.30	(0.88, 1.90)
Males	1.00	Referent
Race		
White	1.00	Referent
Black	0.81	(0.58, 1.13)
Grade		
9 th	0.82	(0.59, 1.14)
10 th	0.90	(0.60, 1.37)
11 th	0.98	(0.55, 1.74)
12 th	1.00	Referent
Television Viewing		
1 hour or less per day	1.28	(0.87, 1.89)
≥ 2 hours per day	1.00	Referent

Gender

Male (48.9%, n = 510) and female (51.1%, n = 545) Alabama high school adolescents were evaluated using the 2003 YRBS. There were no statistically significant differences between BMI and male and female adolescents.

Race

The participants in this study were White (61.1%, n = 752) and Black (36.7%, n = 224) Alabama adolescents, and all other groups (2.2%) were again too small to provide valid data for analysis. There were no statistically significant differences between BMI and race.

Grade Level

The grade levels were ninth (30.1%, n = 282), tenth (25.9%, n = 270), eleventh (22.6%, n = 240), and twelfth (20.9%, n = 251) grade students in Alabama. There were no statistically significant differences between BMI and grade levels.

Television Viewing

The literature review (Kotz & Story, 1994; Kronenberg, Pereina, Schmitz, 2000; Robinson, Wilde, Navracruz, Haydel, Varady, 2001; Tucker, 1986; Tucker & Bagwell, 1991) suggested two hours or more of television viewing may be a casual factor for obesity. Question 83 on the 2003 YRBS (On an average school day, how many hours do you watch TV?) was analyzed using the following criteria: < 2 hours per day of television viewing and \geq 2 hours or more per day of television viewing. There were no statistically significant differences between BMI and < 2 hours of television viewing per day by Alabama adolescents and \geq 2 hours or more of television viewing per day by Alabama adolescents (see Table 4).

Table 4

Prevalence of Body Mass Index (BMI) and Confidence Intervals (CI) for Alabama High School Adolescents

Variable	BMI	CI	BMI	CI
	< 85 th %	95%	≥ 85 th %	95%
Gender				
Females	75.03	(69.42, 79.91)	24.97	(20.09, 30.58)
Males	69.23	(63.31, 74.57)	30.77	(25.43, 36.69)
Race				
White	73.86	(70.87, 76.63)	26.14	(23.37, 29.13)
Black	68.76	(61.00, 75.60)	31.24	(24.40, 39.00)
Grade in School				
9 th	69.74	(64.19, 74.77)	30.26	(25.23, 35.81)
10 th	71.26	(63.56, 77.90)	28.74	(22.10, 36.44)
11 th	73.84	(64.32, 81.54)	26.16	(18.46, 35.68)
12 th	75.84	(70.23, 80.69)	24.16	(19.31, 29.77)
Television Viewing				
≤1 Hr. Per Day	75.90	(70.53, 80.56)	24.10	(19.44, 29.47)
≥2 Hrs. Per Day	69.79	(64.55, 74.57)	30.21	(25.43, 35.45)

Results of Research Question Three

Research Question 3 was, “If so, to what extent does overweight status (BMI) affect prevalence rates in physical activity levels of Alabama high school adolescents?” Data used to answer Research Question 3 were found in the responses to items number 2 (What is your sex?), 3 (In what grade are you?), 4 (How do you describe yourself?), 80

(On how many of the past 7 days did you exercise or participate in physical activity for at least 20 minutes that made you sweat and breathe hard, such as basketball, soccer, funning, swimming laps, fast bicycling, fast dancing, or similar aerobic activities?), 81 (On how many of the past 7 days did you participate in physical activity for at least 30 minutes that did not make you sweat or breathe hard, such as fast walking, slow bicycling, skating, pushing a lawn mower, or mopping floors?), on the YRBS. The referent groups were males, white, twelfth grade students, and < 3 days per week of vigorous physical activity, and < 5 days per week of moderate physical activity (see Table 5).

Table 5

Odds Ratios (OR) and 95% Confidence Intervals (CI) for Vigorous Physical Activity Levels (VAL) and Moderate Physical Activity levels (MAL) for Alabama High School Adolescents

Variables	VAL		MAL	
	OR	95% CI	OR	95% CI
Gender				
Female	1.31	(0.89, 1.94)	1.30	(0.88, 1.92)
Male	1.00	Referent	1.00	Referent
Race				
White	1.00	Referent	1.00	Referent
Black	0.77	(0.56, 1.05)	0.77	(0.56, 1.06)

(table continues)

Table 5 (continued)

Variables	VAL		MAL	
	OR	95% CI	OR	95% CI
Grade				
9 th	0.76	(0.54, 1.09)	0.78	(0.54, 1.12)
10 th	0.86	(0.55, 1.32)	0.87	(0.56, 1.35)
11 th	0.95	(0.51, 1.75)	0.98	(0.53, 1.82)
12 th	1.00	Referent	1.00	Referent
Vigorous Physical Activity				
< 3 days per week	1.00	Referent		
> 3 days per week	1.06	(0.79, 1.43)		
Moderate Physical Activity				
< 5 days per week			1.00	Referent
> 5 days per week			0.80	(0.54, 1.19)

Gender

Male (48.9%, n = 510) and female (51.1%, n = 545) Alabama high school adolescents were analyzed using the 2003 YRBS data. There were no statistically significant differences between male and female adolescents based on BMI.

Race

White (61.1%, n = 752) and Black (36.7%, n = 224) Alabama high school adolescents were the races to be evaluated in the 2003 YRBS, and all the other groups (2.2%) were again too small to provide valid data for analysis. There were no statistically significant differences between BMI and the two races.

Grade Levels

The grade levels used in this study were ninth (30.1%, n = 282), tenth (25.9%, n = 270), eleventh (22.6%, n = 240), and twelfth (20.9%, n = 251) grade students in Alabama. There were no statistically significant differences between BMI and the grade levels.

Vigorous Physical Activity Levels

Question number 80 on the 2003 YRBS, (“On how many of the past 7 days, did you participate in physical activity for at least 20 minutes that made you sweat and breathe hard, such as basketball, soccer, running, swimming laps, fast bicycling, fast dancing, or similar aerobic activities?”) was used to assess vigorous physical activity levels. The United States Department of Health and Human Services (2000) recommends, ≤ 2 days per week for the criteria as not being vigorously physically active and ≥ 3 days or more per week as the criteria for being vigorously physically active. There were no statistically significant differences between BMI and the Alabama high school adolescents who are vigorously physically active and the Alabama high school adolescents who are not vigorously physically active (see Table 6).

Moderate Physical Activity Levels

Question number 81 on the 2003 YRBS asked “On how many of the past 7 days, did you participate in physical activity for at least 30 minutes that did not make you sweat and breathe hard, such as fast walking, slow bicycling, skating, pushing a lawn mower, or mopping floors? The United States Department of Health and Human Services (2000) recommends, < 5 days per week for the criteria as not being moderately physically active and ≥ 5 days or more per week as being moderately physically active. There were no

statistically significant differences between BMI and the Alabama high school adolescents who were not moderately physically active and the Alabama high school adolescents who were moderately active (see Table 6).

Table 6

Prevalence of Body Mass Index (BMI) and Confidence Intervals (CI) for Alabama High School Adolescents

Variables	VAL		MAL	
	OR	95% CI	OR	95% CI
Gender				
Females	75.03	(69.42, 79.91)	24.97	(20.09, 30.58)
Males	69.23	(63.31, 74.57)	30.77	(25.43, 36.69)
Race				
White	73.86	(70.87, 76.63)	26.14	(23.37, 29.13)
Black	68.76	(61.00, 75.60)	31.24	(24.40, 39.00)
Grade in School				
9 th	69.74	(64.19, 74.77)	30.26	(25.23, 35.81)
10 th	71.26	(63.56, 77.90)	28.74	(22.10, 36.44)
11 th	73.84	(64.32, 81.54)	26.16	(18.46, 35.68)
12 th	75.84	(70.23, 80.69)	24.16	(19.31, 29.77)
Vigorous Activity Level				
< 3 Days Per Wk	72.32	(67.38, 76.76)	27.68	(23.24, 32.62)
≥ 3 Days Per Wk	71.64	(66.57, 76.21)	28.36	(23.79, 33.43)
Moderate Activity Level				
< 5 Days Per Wk	72.92	(68.59, 76.84)	27.09	(23.16, 31.41)
≥ 5 Days Per Wk	67.87	(59.18, 75.48)	32.13	(24.52, 40.82)

Results of Research Question Four

Research Question 4 was “If so, to what extent does overweight status (BMI) affect prevalence rates by fruit and vegetable consumption of Alabama high school adolescents?”

Data used to answer Research Question 4 were found in the responses to items number 2 (What is your sex?), 3 (In what grade are you?), 4 (How do you describe yourself?), 74 (During the past 7 days, how many times did you eat fruit?), 75 (During the past 7 days, how many time did you eat green salad?), 76 (During the past 7 days, how many times did you eat potatoes?), 77 (During the past 7 days, how many times did you eat carrots?), and 78 (During the past 7 days, how many times did you eat other vegetables?) on the 2003 YRBS. The referent groups used were males, white, twelfth grade students, and < 5 fruit and vegetable consumed daily. The odds ratio for the referent group is 1.0 (see Table 7).

Table 7

Odd Ratios (OR) and 95% Confidence Intervals (CI) for Fruit and Vegetable

Consumption for Alabama High School Adolescents

Variables	OR	95% CI
Gender		
Females	1.31	(0.89, 1.92)
Males	1.00	Referent
Race		
White	1.00	Referent
Black	0.76	(0.54, 1.06)
Grade		
9 th	0.78	(0.54, 1.14)
10 th	0.87	(0.55, 1.37)
11 th	0.99	(0.54, 1.83)
12 th	1.00	Referent
Fruit and Vegetable Consumption		
< 5 per day	1.00	Referent
≥ 5 per day	1.08	(0.71, 1.65)

Gender

Male (48.9%, n = 510) and females (51.1%, n = 545) Alabama high school adolescents were analyzed using the 2003 YRBS data. There were no statistically significant differences between BMI and male and females adolescents.

Race

White (61.1%, n = 752) and Black (36.7%, n = 224) Alabama high school adolescents were selected as the races analyzed in the 2003 YRBS, the cell size for all the other groups (2.2%) were again too small to provide valid data for analysis. There were no statistically significant differences between BMI and the two races.

Grade Levels

The grade levels were ninth (30.1%, n = 282), tenth (25.9%, n = 270), eleventh (22.6%, n = 240), and twelfth (20.9%, n = 251) grade students in Alabama. There were no statistically significant differences between BMI and grade levels.

Fruit and Vegetable Consumption

The United States Department of Agriculture (2000) recommends 5 servings of fruits and vegetables per day. Questions 74 through 78 on the 2003 YRBS (5 questions were in the form of: During the past 7 days, how many times did you eat fruit, green salad, potatoes, carrots, and other vegetables?) were assessed. There were no statistically significant differences between BMI and Alabama high school adolescents who ate five servings of fruits and vegetables per day and Alabama high school adolescents who did not eat five servings of fruits and vegetables per day (see Table 8).

Table 8

Prevalence of Body Mass Index (BMI) and Confidence Intervals (CI) for Alabama High School Adolescents

Variables	BMI	CI	BMI	CI
	< 85 th %	95%	≥ 85 th %	95%
Gender				
Females	75.03	(69.42, 79.91)	24.97	(20.09, 30.58)
Males	69.23	(63.31, 74.57)	30.77	(25.43, 36.69)
Race				
White	73.86	(70.87, 76.63)	26.14	(23.37, 29.13)
Black	68.76	(61.00, 75.60)	31.24	(24.40, 39.00)
Grade in School				
9 th	69.74	(64.19, 74.77)	30.26	(25.23, 35.81)
10 th	71.26	(63.56, 77.90)	28.74	(22.10, 36.44)
11 th	73.84	(64.32, 81.54)	26.16	(18.46, 35.68)
12 th	75.84	(70.23, 80.69)	24.16	(19.31, 29.77)
Fruit & Vegetable Consumption				
≥ 5 Per Day	72.23	(68.11, 76.02)	27.77	(23.98, 31.89)
< 5 Per Day	72.85	(63.75, 80.37)	27.15	(19.63, 36.25)

Summary

Results of the 2003 Youth Risk Behavior Survey relating to television viewing, physical activity levels, fruit and vegetable consumption and BMI for Alabama high school adolescents have been reported in this chapter. Logistic regression analyses, with a

.05 alpha level, determined the odds ratios and 95% confidence intervals for the dependent variables (i.e., during the past 7 days, how many times did you eat fruit, green salad, potatoes, carrots, and other vegetables [these are questions 74 through 78 on the YRBS], on how many of the past 7 days did you exercise or participate in physical activity for at least 20 minutes that made you sweat or breathe hard, such as basketball, soccer, running, swimming laps, fast bicycling, fast dancing, or similar aerobic activities [this is question 80 on the YRBS], on how many of the past 7 days did you exercise or participate in physical activity for at least 30 minutes that did not make you sweat or breathe hard, such as fast walking, slow bicycling, skating, pushing a lawn mower, or mopping floors [this is question 81 on the YRBS], and on an average school day, how many hours do you watch TV [this is question 83 on the YRBS].

Results indicated that race, gender, grade in school, television viewing, physical activity levels and fruit and vegetable consumption were not statistically significant predictors for BMI using the 2003 Youth Risk Behavior Survey. Although the findings were not significant it should be noted that 27.97% of Alabama high school adolescents have a BMI at or greater than the 85th percentile, putting them at risk of becoming overweight, or overweight at the present time. When broken down by gender, 24.97% of females and 30.77% of males had a BMI at or greater than the 85th percentile, putting them at risk of becoming overweight, or overweight at the present time. 26.14% of White and 31.24% of Black Alabama adolescents had a BMI at or greater than the 85th percentile, putting them at risk of becoming overweight, or overweight at the present time. Alabama high school adolescents by grade level with a BMI at or above the 85th percentile level were as follows: (1) 9th grade – 30.26% (2) 10th grade – 28.74%, (3) 11th

grade – 26.16%, and (4) 12th grade – 24.16% (see Table 8). Chapter V includes the purpose of the study, summary, discussion limitations, and recommendations for future research based on study methods and findings.

V. SUMMARY, DISCUSSION, AND RECOMMENDATIONS

Purpose of the Study

Intervention in the epidemic of adolescent body mass index (BMI) equal to or greater than the 85th percentile is critical if we are to reduce the problem. Current national nutrition surveillance data suggest that the diet of adolescents is putting them at risk for cardiovascular disease, cancer, and osteoporosis, based on their intake of saturated fat, total fat, fruits, vegetables, as well as soft drinks (CDC, 2004). In addition, the United States is experiencing an epidemic of obesity conditions that extends to the adolescent population; some of the related factors may be an excess in energy intake, low levels of physical activity, and high levels of sedentary behaviors. This research intended to investigate these three variables and their relationship to the overweight status of Alabama adolescents.

This study explored three lifestyles and environmental risk factors related to potential adolescent overweight status. Using the 2003 Youth Risk Behavior Survey (YRBS) results, this study examined the relationships, if any, between television viewing, physical activity, and fruit and vegetable consumption among Alabama high school adolescents.

Summary

Data from the 2003 Youth Risk Behavior Survey (YRBS) were analyzed to determine the statistically significant predictors and prevalence rates between BMI, television viewing, physical activity levels, and fruit and vegetable consumption. Thirty nine public schools in Alabama were surveyed in Spring of 2003. One thousand eighty-eight (1088) students participated; 545 were females (51.1%) and 510 were males (48.9%). There were 752 White (61.1%) and 224 Black (36.7%) adolescents in this study. All Other Races (2.2%) were too small to analyze the data. There were 282 ninth (30.1%), 270 tenth (25.9%), 240 eleventh (22.6%), and 251 twelfth (20.9%) grade adolescents who completed the survey.

The 2003 YRBS is an assessment of priority health-risk behaviors among representative samples of students in grades 9–12, at the national, state, and local levels. Six categories of behavior, identified by the Centers for Disease Control and Prevention (2004), which directly influence adverse health and social problems in adolescents were assessed. These were:

- (1) behaviors that result in unintentional and intentional injuries,
- (2) drug and alcohol use,
- (3) sexual behaviors that result in HIV infection, other sexually transmitted diseases and unintended pregnancy,
- (4) tobacco use,
- (5) dietary behaviors, and
- (6) physical activity.

The categories explored in this study related to television viewing, physical activity levels and fruit and vegetable consumption. The survey questions used were:

- 1) On an average school day, how many hours do you watch TV;
- 2) On how many of the past 7 days did you participate in physical activity for at least 30 minutes that did not make you sweat or breathe hard, such as fast walking, slow bicycling, skating, pushing a lawn mower, or mopping floors;
- 3) On how many of the past 7 days did you exercise or participate in physical activity for at least 20 minutes that made you sweat and breathe hard, such as basketball, soccer, running, swimming laps, fast bicycling, fast dancing, or similar aerobic activities;
- 4) During the past 7 days, how many times did you eat fruit;
- 5) During the past 7 days, how many times did you eat green salad;
- 6) During the past 7 days, how many times did you eat potatoes;
- 7) During the past 7 days, how many times did you eat carrots; and,
- 8) During the past 7 days, how many times did you eat other vegetables?

For this study, the YRBS data were made available by the Center for Disease Control and Prevention. The data are public use files of national data sets and are usable without restriction. Logistic regression was used to determine statistically significant predictors and prevalence rates between variables for the following research questions:

1. What, if any, is the relationship between television viewing, physical activity levels, and fruit and vegetable consumption and BMI among Alabama high school adolescents?

2. If so, to what extent does overweight status (BMI) affect prevalence rates for television viewing of Alabama high school adolescents?

3. If so, to what extent does overweight status (BMI) affect prevalence rates in physical activity levels of Alabama high school adolescents?

4. If so, to what extent does overweight status (BMI) affect prevalence rates by fruit and vegetable consumption of Alabama high school adolescents?

Discussion

No significant relationships between variables were found between BMI, television viewing, physical activity levels, and fruit and vegetable consumption among Alabama high school adolescents. Although numerous factors and variables related to BMI and television viewing, physical activity levels, and fruit and vegetable consumption, in general, have been identified in existing literature.

Television viewing is a sedentary behavior most often associated with adolescents. Adolescents may spend an average of 35 hours per week watching television (AC Nielson Company, 1989). In this study, there was no statistically significant differences between BMI levels and television viewing ($p = 0.1931$). Because watching television has been shown to affect energy intake and encourage consumption of high calorie foods it was thought that those adolescents who watched the most television would have the greatest dietary intake. Television viewing has been associated with increased energy intake due to food advertisements, snacking more often, and increased food consumption among obese individuals when exposed to television programs that incorporated food commercials (Dietz, 1991). Television viewing is the single greatest

source of physical inactivity among American children, other than sleep (Dietz & Strasburger, 1991).

Physical activity is an important component of a healthy lifestyle, with implications for the prevention of chronic diseases and obesity conditions (United States Department of Health and Human Services, 1996). However, physical activity declines sharply during adolescence, especially among girls (Neumark-Sztainer, Story, Hannan, Tharp, & Rex, 2003). In this study, there was no statistically significant differences between BMI and physical activity levels (vigorous $p = 0.6765$ and moderate $p = 0.2590$), when all other variables were deleted and vigorous and moderate physical activity levels and BMI were analyzed. The United States Department of Health and Human Services (2000) recommends < 3 days per week for the criteria as not being vigorously physically active, and ≥ 3 days per week as the criteria for being vigorously physically active. For moderately physically active the United States Department of Health and Human (2000) services recommends ≥ 5 days per week and < 5 day per week is considered to not be moderately physically active.

The third factor explored in this study was fruit and vegetable consumption. According to the United States Department of Agriculture (USDA, 1995) Food Guide Pyramid guidelines for fruit and vegetable consumption, adolescents should consume 2–4 servings per day of fruits and 3–5 servings per day of vegetables (Dixon, Cronin, & Krebs-Smith, 2001). Adolescents would need to consume a minimum of 5 fruits and vegetable servings a day to meet a minimum of USDA requirements. Many youth engage in unhealthy dieting practices and have erratic eating patterns that include high intakes of fast foods and other foods high in fat and sugar, as well as, low intakes of fruits and

vegetables, and calcium rich foods (Neumark-Sztainer, Story, Resnick, & Blum, 1996). While the USDA Food Guide Pyramid recommends three to five servings of vegetables per day and two to four servings of fruits, only one in five children consumes five or more servings of fruits and vegetables daily (Dixon, Cronin, Krebs-Smith, 2001). Studies to date show a lack of concern for healthy eating on the part of young people and little normative support for healthy eating (Croll, Neumark-Sztainer, & Story, 2001). Eating behaviors are central to an adolescent's physical development and health. In this study, there was no statistically significant differences between obesity and fruit and vegetable consumption ($p = 0.6943$), when all other variables were deleted and BMI and fruit and vegetable consumption were analyzed.

Limitations

Many different hypotheses exist to delineate the various possible reasons for these results. The small sample size of Alabama adolescents in this study ($N = 1088$) may have been a limiting factor. A study by Dietz and Gortmaker (1985), and the National Longitudinal Study of Adolescent Health (Gordon-Larsen, McMurray, & Popkin, 1999) all included large nationally representative samples of adolescents 6600 and 14,000 respectively.

The physical activity measure for this study may not provide reliable and valid data for use with adolescents. Adolescents have been shown to under and over estimate the amount of exercise in which they participate (U. S. Department of Health and Human Services, 2001). Self-report of physical activity levels may not be an accurate tool for measuring physical activity levels for adolescents.

Adolescents, as an age group, tend to underreport their dietary intake (U.S. Department of Health and Human Services, 2001); a more accurate way of measuring fruit and vegetable consumption should be considered. This measure with adolescents may not be an accurate tool for self-report of fruit and vegetable consumption.

Self reported height and weight was used to calculate body mass index (BMI), expressed as body weight in kilograms divided by the square of height in meters (kg/m^2). To receive a more accurate BMI for this age group, body composition, using calipers by a trained individual, should be considered.

Recommendations

1. Future research should focus on a larger sample of adolescents. This study included 1088 Alabama adolescents, 752 White and 224 Black adolescents. Despite the highly complex sampling strategy used to achieve a representative sample of the US population, the actual samples sizes become quite small when Youth Risk Behavior Survey data are stratified by race, gender, and grade in school.
2. Additional objective methods to measure the number of hours of television viewing may reduce subjective bias. Pairing parental report with adolescent self-report or requiring subjects to use television timers are two examples.
3. Adolescents as an age group tend to underreport their dietary intake (U. S. Department of Health & Human Services, 2001); so a more accurate way of measuring dietary intake should be developed for this group. A daily log for an extended period of time pairing parental report with adolescent self-report would be a consideration.

4. The use of a trained evaluator to assess activity level frequency, intensity and duration of activity levels. Adolescents as an age group tend to over-report the amount of physical activity they participate in (U. S. Department of Health & Human Services, 2001).

5. As contemporary United States adolescents become more physically inactive, the goal of physical education in schools also needs to be reassessed. According to the Center for Disease Control (2004) there is only one state that requires physical education every day for all students.

6. The Youth Risk Behavior Surveys serve many purposes, in light of the looming public health crisis of obesity; the scope of these surveys may need to be expanded to encompass public health issues related to overweight adolescents. For instance, as Type 2 diabetes is seen in increasing numbers in children and adolescents, diabetes might be tracked as part of the surveillance.

7. Future research may consider comparing different regions within the United States (i.e., South to North, East to West).

8. Comparing the Alabama YRBS data to the national YRBS data could provide a valuable educational tool. Awareness of the magnitude of this epidemic is critical to correcting and preventing obesity in the future.

9. Using the YRBS data, look at trends for Alabama, which could provide valuable data for areas needing special attention.

10. From the YRBS survey take out the eleven questions used and conduct a survey with these questions only rather than giving the 87 items questionnaire.

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