To the Graduate Council:

I am submitting herewith a dissertation written by Ruth C. Obersaat entitled "In-Class Microcomputer Health and Safety Assessment Among Tennessee Third, Fourth and Fifth Grade Students." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Education, with a major in Health Education.

Robert J. Pursley, Major Professor

We have read this dissertation
and recommend its acceptance:

Accepted for the Council:

Vice Provost
and Dean of The Graduate School

IN-CLASS MICROCOMPUTER HEALTH AND SAFETY ASSESSMENT AMONG TENNESSEE THIRD, FOURTH AND FIFTH GRADE STUDENTS

A Dissertation

Presented for the

Doctor of Education

Degree

The University of Tennessee, Knoxville

Ruth C. Obersaat

May 1990

DEDICATION

To the memory of my most dear and

beloved maternal grandmother

Mrs. Berta Obersat

ACKNOWLEDGMENTS

The doctoral researcher wishes to express a sincere appreciation and bona-fide gratitude to each of her committee members. A distinctive thank-you is expressed to Dr. Robert J. Pursley, committee chair, for his unending insight and direction, his availability and encouragement, and for his candid mentorship and professional assistance throughout the entire scope of the Tennessee School Health and Safety study; Dr. Bill Wallace, who was most instrumental in the researcher's matriculation and ingress into the graduate program and for his practical direction, leadership and timely wit; Dr. Jack Ellison, for his continuous support, friendship and excitement for life; and, Dr. Charles Thompson, for his expert ideas, patience and gentle guidance. A sincere appreciation is expressed to Dr. Donald Dessart, for his direction and expert consultation with the quantitative techniques used in the research study.

A sincere thank-you is expressed to the Tennessee Department of Health and Environment-Health Promotion and Chronic Disease Control section for allowing me to participate in the design and development of the Tennessee School Health and Safety Profile research project.

I am indebted to the third, fourth and fifth grade students, teachers, and administrators from across the state of Tennessee for their willingness, enthusiasm and friendly spirit during the data gathering.

Sincere appreciation is extended to those individuals who provided such needed moral and emotional support: Theddie Lawson, Pat Wrinkle, Dody Tillet, Dr. Ken Krick, and fellow doctoral students.

Special sincere gratitude is expressed to my good friend and colleague, James McGuire, for his kindness, humour and endless encouragement.

I am indebted to Mrs. Marilyn Caponetti, for her exceptional typing skills and listening ear.

Deep gratitude and love are extended to my family for their loving support across the miles.

Finally, I give thanks to my Creator-Saviour for surrounding me with intimate friendship, direction, and everlasting hope.

ABSTRACT

The purpose of the study was to design and develop an in-class microcomputer program to identify health and safety risk factors of children attending selected Tennessee public schools as third, fourth or fifth graders during the school year 1989-90, and to provide baseline data to address whether significant differences exist among grade, gender-, race-, and geographic-specific populations. Initial instrument reliability and internal consistency were established through pilot test and retest. Statistical methods used to assess reliability were Pearson Product-Moment Correlation Coefficient, Cronbach Coefficient Alpha, and Varimax Rotation of Factor Analysis.

The data were collected using the in-class computer program entitled: The Tennessee School Health and Safety Profile. The sample consisted of 986 third, fourth and fifth grade students from 16 selected Tennessee public schools. Descriptive statistics were used to obtain frequencies and percentages of the sample according to grade, gender, race, and geographical area. Analysis of variance, the *t*-test for independent samples, and chi-square were utilized to determine whether significant differences existed among third, fourth and fifth graders, and between male and female students, nonwhite and white students, and students from rural and urban areas.

The major findings of the study included: (1) The majority (39.3%) of Tennessee third, fourth and fifth grade students were categorized into the fair health and safety risk category; (2) The results of cross tabulations of grade, gender, and geographic area with

the health and safety risk categories were significant when chi-square was applied but were not significant for race; (3) Significant differences were found in the practice of risky health and safety behaviors according to grade, gender, and geographical area, however no significant difference was determined between nonwhite and white students; (4) The major health and safety risk factors among Tennessee school-age children were inability to swim, feeling life was not worth living, lack of supervision at home, poor dental hygiene habits, fear of the AIDS virus, lack of proper home fire safety, poor nutrition habits, watching television six or more hours a day, carrying a knife, lack of adequate exercise, and lack of seat belt use.

The following major conclusions were drawn from the findings of the study: (1) The overall health and safety of Tennessee's school-age children is fair; (2) As students progress in grade, their practice of risky health and safety behavior increases; (3) The race of the students seems not to be a factor concerning the practice of risky behavior; (4) The gender of the students is a factor, with the males practicing risky health and safety behavior more so than the females; (5) The geographical area of the students is an influencing factor concerning the major health and safety risk factors and categories.

The significance of the study is that this research is a major step toward primary prevention and intervention resources in health and safety education programs for dealing with the health and safety behavioral needs of children in Tennessee.

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CHAPTER I

INTRODUCTION

Childhood growth and development should be a time of good health, strength, and joy. Children are dependent upon adults to provide sufficient and nutritious food, adequate shelter and clothing, quality health care, nurturing, secure and safe environments, sound educational experiences, and wise and appropriate guidance. The needs of children are great, yet, when met, help to ensure a better, healthier childhood (Tennessee Teacher, 1988). Unfortunately, many children will not know a healthier, happier childhood. Many will not survive.

Injury is the leading cause of morbidity and mortality in childhood (Roberts, Elkins & Royal, 1984). The most frequent childhood accidents are motor vehicle mishaps, drownings, burns, poisonings, and firearm-related occurrences (Wright, Flagler & Friedman, 1988). Accident rates have not improved during the past 30 years, while death rates from tuberculosis, influenza, and pneumonia (the previous second, third, and fourth leading causes of mortality in children) have declined by more than 85 percent during the same time period (Baker, O'Neill & Karpf, 1984). Deaths from childhood injuries can be attributable to risky behavior such as speeding, drinking and driving, and failure to use seat belts (Roberts, Elkins & Royal, 1984). Several studies point to positive correlations between family dysfunction, risky behavior, and injuries (Plionis, 1977; Bithoney, Snyder, Michalek & Newberger, 1985). Suicide is the second most frequent cause of death

among adolescents and young people (Richman, 1981). Each year thousands of American children of all ages are sexually abused (Lew & Sapp, 1989). Substance use and abuse normally begins in junior high, and smoking at ages eight and nine (Tucker, 1987; Wells & Stuart, 1981). Children today have more body fat than those children in the 1960s (Pate, Ross, Dotson & Gilbert, 1985). The vitality, productivity, and health of American children each are endangered by the lifestyle choices they are making and the habits taking root early.

Lifestyle choices are recognized in the state of Tennessee's Health Curriculum Framework (1985). The incidence of chronic diseases (diabetes, heart disease, and cancer) "depends, in large part, on choices people make each day . . . exercise, diet, and the use of alcohol and drugs" (Health Curriculum Framework, 1985, p. iv). Healthy People (DHEW, 1979) emphasizes health promotion and maintenance accomplished through individual lifestyle and behavior change. "One of the most promising approaches to lifestyle and health behavior changes has been the development of health risk appraisals" (Fortune, 1988, p. 2). These instruments are used by health educators to collect information about individuals, provide estimates of one's risk of premature death, and to recommend risk reduction intervention strategies (Weiss, 1984). Health risk appraisals (HRA) have been used on adult and adolescent populations over the past several years (Alexy, 1984; Pursley, Neutens, Bolton, and Dewey, 1987; Fortune, 1988). The use of HRAs with school-age children presents a challenge to school health educators. The most effective approach to prevention of

disease, injury, and risky behavior in children is to concentrate on the populations at greatest risk (Wright, Flagler & Friedman, 1988). The "Tennessee School Health and Safety Profile" will be a major step in assessing those school-age children at risk in the state of Tennessee and will afford recommendations for future school health and safety programs. Children are our future.

I. Problem Statement

Pursley and Dewey (1988) have stated that the need for population-based data on health and safety behaviors becomes more urgent in light of the contemporary increases in substance abuse, teen pregnancy, risk-taking behavior, and other health concerns afflicting a significant number of adolescent and school-age youth. However, no such population-based research on school-age youth in grades three, four and five in the State of Tennessee has been done. Therefore, the present study has been directed toward filling the above research void.

II. Purpose of the Study

Since there are sparse systematic data concerning the current health and safety behaviors of third, fourth and fifth graders in Tennessee, the goal of this research effort was to develop a specialized instrument designed to identify health and safety risk factors of school-age children in grades three, four, and five in selected Tennessee public schools during the school year 1989. This study also focused on the establishment of initial instrument

reliability and internal consistency; the early steps in developing a risk-assessment tool for classroom use.

III. Research Questions

The study specifically sought to address the following research questions:

1. What are the major health and safety risk factors for school-age children in the State of Tennessee as assessed by the "Tennessee School Health and Safety Profile" questionnaire?

2. Are there significant differences for the major health and safety risk factors among third, fourth and fifth grade students?

Null Hypothesis

There were no significant differences in the mean health and safety risk scores among third, fourth, and fifth grade students.

3. Are there significant differences for the major health and safety risk factors between male and female students?

Null Hypothesis

There was no significant difference in the mean health and safety risk scores between female and male students.

4. Are there significant differences in the major health and safety risk factors between white and nonwhite students?

Null Hypothesis

There was no significant difference in the mean health and safety risk scores between white and nonwhite students.

5. Are there significant differences in the major health and safety risk factors between students from rural and urban areas?

Null Hypothesis

There was no significant difference in the mean health and safety scores between students from urban areas and students from rural areas.

IV. Need for the Study

One of the major obstacles confronting those who wish to assess the threats to health and safety of school-age children is the lack of comprehensive state-wide and region-wide information about the problems of youth in specific age, area, gender, and racial groups. While figures can be cited based on national studies with adolescent populations, states do not have comprehensive sources of information on school-age populations (NCHS, 1985; AMA, 1986). Regions within states and communities within regions are left to speculate about the nature of school-age health and safety problems. Effective prevention and intervention, likewise, is made extremely difficult when an information-base is lacking concerning school-age health and safety problems. The need for population-based data becomes more urgent in light of the contemporary increase in the frequency of alcohol and substance abuse, teen pregnancy, violent behavior, risk-taking behavior, suicide, sexually transmittable diseases including acquired immune deficiency syndrome, and many other health concerns afflicting a significant number of adolescent and school-age youth (Pursley & Dewey, 1988). According to a report issued by the Tennessee Children's

Services Commission (State of the Child Report, 1988), a grim picture is painted for the children in Tennessee. One out of every 10 Tennessee children does not live with either of his or her biological parents. One out of every six Tennessee children lives in a single parent family. One of every four teenage females becomes pregnant. One of every eight children today, in Tennessee, needs some level of mental health services. More than 40,000 children in the state of Tennessee were reported victims of child abuse and neglect this past year. And finally, the report estimates that during 1987, more than 86,000 Tennessee adolescents between the ages of 12 and 17 used illegal drugs.

Because of their growing interest in the health and safety status of Tennessee's school-age children, the Tennessee Department of Health and Environment-Health Promotion and Chronic Disease Control section, together with the State Department of Education, and the University of Tennessee Department of Health, Leisure and Safety sought to study school-age children in third, fourth, and fifth grades regarding their health and safety risk behaviors. Valid information regarding health and safety risk factors were assessed. Since there are sparse systematic data concerning the current health and safety risk behaviors of Tennessee school-age children prior to completion of this study, the results of the "Tennessee School Health and Safety Profile" questionnaire will be important in providing a research data base related to school-age health and safety risk behaviors. A better understanding of health and safety behaviors of school-age children at

the third, fourth, and fifth grade levels in a selected number of public schools could provide direction and/or suggestions to school health education and safety programs.

V. Assumption

The following assumption was made regarding the study:

1. The school-age subjects would respond honestly to the survey instrument.

VI. Delimitation

The study was delimited to third, fourth, and fifth grade students from selected Tennessee public schools across the state.

VII. Limitations of the Study

The study was bound by the following limitations:

1. Only those students present the days the "Tennessee School Health and Safety Profile" questionnaire was administered were included in the study.

2. The information collected on specific health and safety risk factors was limited by the type of instrument used.

VII. Definitions

For the purpose of this study, the following terms were defined.

Appraisal Age. The age of the average person of the same age-sex-race group with a total ten year risk equivalent to the total individual risk of the person taking the HRA (Dewey, 1984; Hall & Zwemer, 1979).

Attainable Age. The lower ten-year risk projected upon individual compliance with the intervention suggestions of the HRA (Dewey, 1984; Hall & Zwemer, 1979).

Attainable and Appraisal Ages. These terms are used frequently in HRA profiles to express the degree by which a user can reduce risks and prolong life (U.S. Public Health Service; U.S. Department of HHS, 1987).

Batch Processing. This is one method of entering and processing data in a computer. Paper and pencil questionnaires are used and the answers are entered and processed all at one time--in a batch.

Geller-Gesner Tables. These probability tables form the foundation for most HRAs. Geller tables give the average person's risk of dying from common causes by age and race and Gesner tables show, in mathematical terms, how certain behaviors or conditions increase or decrease these risks. These tables were developed by Harvey Geller at the National Cancer Institute and Norman Gesner of J. Peters and Associates in Indianapolis, based on U.S. vital statistics and major epidemiological studies (U.S. Public Health Service, U.S. Department of HHS, 1987).

Health Risk Appraisal. The art and science of identifying an individual's present and potential health hazards through evaluation of lifestyle, estimation of potential reduction in risk based on epidemiological data, mortality statistics, and actuarial techniques, and determination of the probability of an individual becoming ill or dying from selected diseases (Guidelines, 1981; Goetz, Duff & Bernstein, 1980).

Health Risk Appraisal Instruments. Questionnaires, either printed or computer-assisted, which are used to identify an individual's health risk (Guidelines, 1981).

Lifestyle. Day-to-day behaviors that are essentially self chosen and personally regulated (Dewey, 1984; Healthy People, 1979). Examples include choosing a high fat diet, excessive consumption of alcohol, and exercise participation.

Non-white Students. All the students excluding the white students. This is to include students who are Blacks, Hispanics, Asians, Native American Indians, and all those classified as others.

Precursors. Those characteristics that place the individual at high risk for leading causes of mortality (Taylor, Ureda & Penham, 1982). Examples of precursors include smoking, high blood pressure, and failure to wear seat belts.

Risk Factors/Risk Indicators. A behavior or physiological condition that increases an individual's risk of contracting a certain disease; for example, smoking is a risk indicator for lung cancer, excessive consumption of alcohol is a risk indicator for cirrhosis. Often risk indicator and risk factor are used interchangeably. However, "risk factor" is a statistical term which refers to the amount by which a risk indicator increases or decreases the risk of morbidity (U.S. Public Health Service, U.S. Department of HHS, 1987).

School-Age Children. Late elementary/middle school ages 8-12.

School Health Education Program. A program providing continuing health instruction and knowledge, with information on values-

clarification and decision-making skills in a school setting. It is planned and carried out with the purpose of maintaining, reinforcing or enhancing health, health related skills, and health attitudes and practices of children and youth which collectively enables students to make voluntary adaptation of those behaviors that are conducive to their good health and quality of life (NPSHEO, 1984).

Society of Prospective Medicine. Founded by Robbins and Hall, this is the professional association most responsible for advancing the technology and application of Health Risk Appraisal to the public (U.S. Public Service, U.S. Department of HHS, 1982).

IX. Summary

The study consists of six chapters. Chapter I introduces the research study by providing background information on the health and safety status of children, purpose of the study, research questions and hypotheses, need for the study, assumption, delimitation and limitations of the study, definition of terms, and summary.

Chapter II contains a review of literature pertaining to health and safety problems and risk factors of children, an overview of health risk appraisals, microcomputer technology and HRA application, and the summary.

Chapter III describes the methodology, procedures of the study, and includes statistical procedures.

Chapter IV contains the analysis and discussion of data.

Chapter V presents the summary, findings, conclusions, and recommendations of the study.

Chapter VI is the epilogue of the researcher.

CHAPTER II

REVIEW OF RELATED LITERATURE

This chapter consists of a review of literature related to the study. It is divided into three categories. Part I is a review of literature related to school-age children and their health and safety problems and risk behaviors. Part II is a review of literature related to an overview of health risk appraisals. Part III is a review of literature related to the application of health risk appraisal and microcomputer technology in school-age populations.

I. Health and Safety Problems and Behaviors of School-Age Children in the United States

The health professions are becoming increasingly aware of the influence of people's lifestyles on morbidity and mortality. The attitudes people hold and many of the behaviors performed or not performed can affect one's health significantly. A logical place to search for the origins of health attitudes and behaviors is childhood, but the general difficulty of conducting research with children, combined with the presumption that children's health behaviors are largely under the control of their parents, has led to a dearth of research in this area.

Health Beliefs in Children

The study of health beliefs in children has been limited for the most part to an examination of children's conceptions of illness and

the changes in those conceptions associated with cognitive development (Biba ce & Walsh, 1979; Burbach & Peterson, 1986). Most of this research has been placed in a Piagetian framework. For example, the cognitions of preoperational children (ages 2-7) are focused narrowly; their reasoning is concrete and irreversible. This irreversibility makes cause-and-effect relationships very difficult for these children to understand. Such children will see no connection between their own health and any health-related behaviors (going to a doctor for a check-up) that parents may attempt to teach.

In the stage of concrete operations (ages 7-11), children begin to distinguish between the internal and external world. They begin to realize that disease is reversible--that a healthy person can become sick and a sick person can be cured. Concrete operational children can begin to understand that disease is preventable (Lau & Klepper, 1988). In the final cognitive development stage, that of formal operations (ages 11 and up), children can reason logically and hypothetically. They take actions for specified future outcomes, and their understanding of how one gets sick becomes more realistic (Biba ce & Walsh, 1979; Burbach & Peterson, 1986).

In related work, Gochman (1970, 1972) and Dielman (1980) studied aspects of the Health Belief Model (HBM) (Becker, 1979) in children. Gochman concentrates on children's perceptions (ages 7-17) of susceptibility to health problems. A great deal of consistency is found in their beliefs, not only consistency within individuals (if children feel vulnerable to one type of health problem, they are likely

to feel vulnerable to another type of health problem) but also interpersonal consistency across groups (Lau & Klepper, 1989).

One plausible source of children's health attitudes and behaviors is their parents. Lau (1982) found that health locus of control beliefs in college students are a function of their parents' health practices. The parental data, however, came from memories provided by the college students themselves. Mechanic (1964) collected one of the few such existing data in which both children and their parents are studied. He studied 350 fourth and eighth grade children and their parents. A strong relationship was found between a mother's inclination to go to a doctor when feeling ill and her tendency to take her child to a doctor when the child felt ill. The mother's education level was associated with less fatalism about disease and with a greater willingness to take preventive actions to avoid illness. However, Mechanic (1964) used only cross tabulations, thus, limiting greatly the number of different explanatory factors that could be considered simultaneously (Lau & Klepper, 1989).

Pratt (1973) studied health beliefs and behaviors of both parents and their children. She found that among 9-13 year old children, child rearing practices which emphasize reason, autonomy, and reward rather than punishment, are associated with the performance of a variety of different discretionary health behaviors (brushing one's teeth). Pratt reports that child-rearing practices have a significant effect on children's health behaviors even when the parents' own health behaviors are controlled.

Studies exploring the health beliefs and behaviors of children and parents do exist, but these studies present zero-order relationships. No comprehensive model exists to link demographic background factors, parents' health beliefs, parents' child-rearing practices, and the child's actual health to the child's health attitudes, beliefs, or behavior (Lau & Klepper, 1989).

Therefore, much research is needed to further annotate the origins of health beliefs, attitudes, and behaviors of children.

Childhood Injury

Childhood injury has long been recognized as the leading cause of morbidity and mortality in young children. Many deaths from childhood injuries are attributable to risky behavior when children are passengers in automobiles driven at excessive speeds, driven under the influence of alcohol and other drugs, and by not using seat belts. Certain of these risk-taking behaviors may be altered by minimal changes and thus are seen as highly amenable to intervention (Roberts, Elkins & Royal, 1984). To date, most accident prevention efforts have targeted behaviors related to seat belt and child restraint usage (Roberts & Turner, 1984), pedestrian safety (Limburg & Gerber, 1981), and fire safety (Hillman, Jones & Farmer, 1986). The most effective approach to prevention is to concentrate on populations at greatest risk. An ability to predict which children are at highest risk for accidental injury would have enormous implications for health education and for the health care system. Preventive interventions could be made

more cost effective by targeting the population at highest risk (Wright, Flagler & Friedman, 1988).

The most frequent childhood accidents are motor vehicle mishaps, drownings, burns, poisonings, and firearm-related occurrences (Wright, et al., 1988). Accident rates have not improved during the past 30 years, while death rates from tuberculosis, influenza, and pneumonia, and gastric-intestinal disorders (the previous second, third, and fourth leading causes of mortality in children) have declined by more than 85 percent during the same period of time (Baker, O'Neill & Karpf, 1984).

Boys appear to have higher overall injury rates than girls (Rivara, Bergman, Lofierfo & Weiss, 1982), but gender differences vary for specific types of injuries. Males have a higher rate of vehicle injuries, homicides, and suicides. Overall, the death rate is more than twice as high for males as for females for unintentional injuries, and more than three times as high for intentional injuries (Baker, et al., 1984). The higher rate of intentional injuries in boys may reflect a masculine-cultural expectation that males should exhibit excessive risk-taking behavior (Wright, et al., 1988).

Studies have reported positive correlations between family dysfunction and risk-taking behavior and injuries (Bithoney, Snyder, Michalek & Newberger, 1985; Plionis, 1977; Sibert, 1975). One study (Beautrais, Fergusson & Shannon, 1981) identified the following factors as significantly related to childhood injury rates: maternal education level, stressful family life events, and gender of the child.

Wadsworth, Burnell, Taylor & Butler (1983) found that gender and frequency of moving were correlated with injuries requiring hospitalization. Tooley's (1970) observation of families at the Children's Psychiatric Hospital in Michigan led to the conclusion that six year olds, early adolescents, and young mothers who leave their support systems are most vulnerable to stress associated with relocation. Associated with the mother and child stress provoked a high incidence of accidental injury to the child. A time period of two to five months following a move was identified as the critical period in which children are most vulnerable to accident or injury (Puskar, 1989). Jones, et al. (1984) points out that in adult groups geographic relocation is as high on the Holmes and Rahe Scale of stressors as pregnancy, the death of a close friend, or marital problems.

Family instability appears to be a strong correlate to accidental injury. Wright, et al. (1988) comments that it is yet unclear whether children from such unstable households exhibit behaviors that increase their risk or whether family instability exposes them to situations (for example, unsupervised play or faulty storage of household drugs and medicines) related to higher risk. Assessment, according to Wright, et al. (1988) of both family functioning and the child's and caretaker's behavior may help to explain the variable interactions which increase injury liability.

Family structure has been linked directly to children's health (Guidubaldi, Cleminshaw & Perry, 1985). Children from single-parent families usually have lower health status than do children from two-

parent families, but it is unclear whether this situation is due to the absence of a parent (usually the father) per se, the disruption of family roles and routines caused by a change in the number of parents in the home, the fights and the tension in the home that may accompany a divorce, or the sorrow and shock that is associated with the death of a parent.

The majority of research on accidental risk and behavioral variables has been retrospective in nature. Nevertheless, a relationship between certain behavioral or emotional characteristics and a high propensity for accidental injury has been demonstrated by Wright, Schaefer & Solomon (1979). Children with a history of accidental injury have been found to have higher activity levels and are described by parents as hyperactive or overactive (Wright, et al., 1988).

Several studies have examined the relationship between socioeconomic status (SES) and childhood injuries. Many have shown that lower SES children have more injuries than higher SES children (Wise, 1983; Husband & Hinton, 1972). Death rates by opiates and drownings are higher in high SES groups (Samkoff & Baker, 1982). Accident rates on lower SES children may appear elevated because their injuries are more often treated in hospital emergency rooms (more reported), while higher SES children are seen more often by a private physician (Berger, 1981; Wright, et al., 1988).

The following are the major areas of injury in children:

1. Motor vehicle occupant injuries are the predominant cause of deaths in children (Wright, et al., 1988).

2. Aspiration of foods (both solid and regurgitated) accounts for the majority of all asphyxiation deaths in the first year of life and half of all asphyxiation deaths in older children. Suffocation by fallen earth causes a significant number of deaths (141 in 1980). Males ages 10 to 14 appear to have the greatest risk for fallen earth suffocation (Baker, et al., 1984).

3. Submersion is the third most common cause of unintentional death, resulting in approximately 600 non-boat-related drownings and 1200 boat-related drownings in the United States annually, and another 1,000 per year are probable suicide and intentional incidents (Baker, et al., 1984). Eighty-five percent of these deaths are male (five times greater than females) with the highest incidence in the age range of 10 to 19 years. Among younger children ages 1-4, rates for Whites are almost twice as high as for Blacks (Spyker, 1985). In older children the rates are highest among Native Americans and Blacks. Most drowning deaths of children involve nonswimmers. Children of older parents or children who are members of large families are at greater risk from submersion injury than are children in lower socioeconomic homes (Nixon & Pearn, 1978).

4. Each year 2,000 children and youth in the United States are fatally injured by motor vehicles. Another 110,000 receive nonfatal injuries (National Safety Council, 1984). Pedestrian injury rates are highest for children in the age group 4 to 9 years (Guyer, Talbot &

Pless, 1985). Injuries most often occur on local roads in urban areas where children often run into streets in pursuit of play objects. The rate of pedestrian accidents for boys is greater than for girls in each age group.

5. Burns and fires cause more than 6,000 deaths (1,300 children) annually, and more than a million injuries requiring medical attention (National Safety Council, 1984). House fires cause 3.1 percent of all childhood deaths, the majority occurring at night (Baker, et al., 1989). (House fire deaths are more than twice the rate for Whites than Blacks and Native Americans.) Geographically, the highest death rates are found in the East, especially the Southeast region, often in rural settings (Baker, et al., 1984). As children become older, burn injuries relate more to risk-taking behavior and curiosity (Wright, et al., 1988). Several studies have shown a relationship among burn injury and low economic status, overcrowding, family mobility, and family size. Additionally, family stressors and instability (alcoholism, single-parent, isolation, and emotional dysfunction) are also related to childhood burn rates (Libber & Stayton, 1984; Nixon & Pearn, 1978; Knudson-Cooper, 1984; Williams & Bowman, 1958).

6. Falls are the most common cause of nonfatal injury in the United States (Wright, et al., 1988). Head trauma is present in the majority of falls causing death. Falls are more frequent with boys than girls, and injuries become more severe with age (Baker, et al., 1984; Garrettson & Gallagher, 1985). Black children have a 67 percent higher death rate from falls than White children. This may be due to

aging homes, concrete play areas, lack of window guards, and lack of adult supervision (Garrettson & Gallagher, 1985).

7. Childhood poisoning accounts for less than 3 percent of the total mortality for childhood deaths, yet a substantial number of injury deaths do occur annually among children. Prescription and non-prescription drug misuse account for the majority of poisonings, while personal care products, household products, and plants are other commonly ingested poisonous substances (Wright, et al., 1988).

8. Each year, children and adolescents involved in bicycle accidents account for 600 deaths and 300,000 visits to hospital emergency rooms (Stethoscope, 1988, p. 10). More than one of every 80 elementary school-age children in Massachusetts required hospital treatment for a non-motor vehicle involved bicycle accident which is twice the rate for teenagers and four times that of preschoolers (Gallagher, Finison, Guyer & Goodenough, 1984). The numbers could be significantly reduced if bicycle riding teens and youth were to wear helmets (Stethoscope, 1988, p. 10).

Accurate discrimination of children who are at high risk for injury from those who are not, according to Wright, et al. (1988), would enable preventive efforts to be focused on the appropriate population. Identification of those factors that are correlated with risk for accidental childhood injury may provide the opportunity for prevention and intervention, and thus to help reduce the child's risk of injury.

Self-Esteem

Self-esteem can influence a child's future health through its relationship with the child's illness orientations. Mechanic (1980) found that self-esteem is one of the few significant predictors of young adults' health behavior. Lewis and Lewis (1982) provide additional corroborating evidence of the importance of self-concept for children's health behavior. In their study, elementary school children were allowed to make their own decisions regarding when they should be excused from school because of illness. They found that children with inappropriate medical care utilization had fundamental difficulties in making decisions in all aspects of school life. These children suffered from poor self-concepts and inadequate problem-solving strategies in general (Lewis & Lewis, 1982).

The data from the Foundation for Child Development's 1976 National Survey of Children, a nationally representative sample of 6 through 12 year old children and their parents, are used by Lau and Klepper (1988) to examine the development of illness orientations. A comprehensive model linking family structure and socioeconomic factors, health services utilization, parental child-rearing practices, children's basic health, and one specific type of illness orientation (accepting "correct" beliefs about illness and doctors) was developed. The findings suggest that the most important direct influence on children's illness orientations is the child's self-esteem. The most prominent background factors relating directly and indirectly to the child's self-esteem are the parents' intellectual ability and, for younger children, living in a one-parent family.

Depression

Depression, persistent anxiety and behavior problems, are one of the most common expressions of emotional dysfunction among children and adolescents. Depression is a complex phenomenon. Two studies, however, support the contention that depressive illness, as it is found in adults, does exist in children (Weinberg, 1973; Kuhn & Kuhn, 1972). Frequently, depression may be masked by other behavior problems. In its mildest form, depression can cause a child to be periodically listless and disinterested. In its most severe form, it can lead to school failure, serious behavior problems, withdrawal, or suicide (Adolescent Health in Colorado, 1986). As in other studies, the single best predictor of suicidal ideation was depression (Brent, Perper and Goldstein, 1988; Valez and Cohen, 1988). Anxiety (found in 50% of the suicidal ideations) was the most common diagnosis after depression, followed by conduct disorder.

Depression may start at a very early age, even in infancy. It is not until ages 12 to 14, however, that children are willing or able to talk about it. Girls are more likely to report feeling depressed than boys.

Anxiety

Anxiety is another common phenomenon in adolescence and childhood. Approximately 10 to 20 percent of children experience severe anxiety (Adolescent Health in Colorado, 1986). Using structured psychiatric interviews to help assess a large community sample comprised of preadolescent children, Anderson, Williams, McGee and Silva (1987)

found that approximately 47 percent of children with attention deficit disorder (ADD) had an oppositional disorder, while approximately 26 percent of children with ADD had a coexisting anxiety or phobic disorder. Very similar figures emerged from a Puerto Rico epidemiological study (Bird, Canino, and Rubio-Stipes, 1988). Strauss, Lease, Last and Francis (1988) found that 34.6 percent of preadolescent children with anxiety disorders met the criteria for attention deficit disorder (Pliska, 1989). Anxiety is more common among children of parents who have unreasonably high expectations or them or among children who have experienced some type of trauma and fear its recurrence. Somatic symptoms such as stomach aches and frequent headaches are associated with anxiety. They are equally common among boys and girls, although boys are less likely to report their symptoms.

Suicide

The frequency of suicidal behavior in young children and adolescents has increased dramatically in recent years. Epidemiological studies have found the rate of mortality by suicide to be second only to accidents in the late adolescent age group (Rosenberg, Smith, Davidson & Conn, 1987). Anonymous surveys by Smith and Cranford (1986) and Harkovy, Friedman, Asmis, Boeck, and DiFiore (1987) found approximately 9 percent of high school students report at least one previous suicide attempt. Furthermore, according to Spirito, Overholser, Ashworth, Morgan, and Benedict-Drew (1988) more than one of three students has been found to know a peer who had attempted suicide (Overholser, Heinstreet, Spirito & Uyse, 1989).

Although the incidence of suicide in preadolescent populations is low (Kashani, Goddard & Reid, 1989; Asarnow, Carlson & Guthrie, 1987; Carlson, 1983), the rate of suicide attempts by preadolescent children has increased in recent years to become one of the most common emergencies in child psychiatric practice (Holden, 1986). The National Center for Health Statistics reported that in 1984, 1900 youngsters aged twelve to nineteen years committed suicide. Of these 205 were between the ages of twelve and fourteen (NCHS, p. 53, 1989).

Clinically, there is a significant association between self-destructive or suicidal behavior and depression (Pokorny, 1964). Most significant to the factors for childhood suicidal behavior is the environment in which the child lives. Loss of a parent by separation, divorce, or death, as well as loss of the parent resulting from intense marital discord and violence, may increase the child's sense of helplessness, hopelessness, and vulnerableness to suicidal ideation (Pfeffer, 1981, p. 111).

Suicide is the second most frequent cause of death among adolescents and young people ages 15-24 (accidents are first); and it is likely that many deaths officially listed as accidents are suicides in disguise. Moreover, the actual suicide rate is undoubtedly higher than the official rate, since according to Richman (1981, p. 274), many suicides are concealed primarily due to the stigma attached to the act of self-destruction.

Firearms, poisonings, and hanging are the major causes of self-inflicted death in the age groups 5-14, and 15-24 (National Safety

Council, 1979; McIntire & Angle, 1981). Wells and Stuart (1981) note that in children over the age of five years, ingestion of a toxic substance is rarely accidental. Poison control centers report more than 250,000 intentional self-poisoning cases in children and adolescents each year. But, these patients are not attempting suicide; they are using self-poisoning to change an oppressive life situation by playing "pharmacologic brinkmanship" (Pfeffer, 1981, p. 223). Early identification of suicidal ideations is needed so that treatment aimed at intervention and prevention of later attempts can be implemented (Kastani, et al., 1989).

Child Sexual Abuse

Each year thousands of American children of all ages are sexually abused. Child sexual abuse is a public health problem of enormous concerns and proportions (Deblinger, McLeer, Atkins, Ralphe & Foa, 1989). Estimates indicate that there are 150,000 to 200,000 new cases of child abuse each year (Finkelhor & Hotaling, 1984; Deblinger, et al., 1989). According to England and Thompson (1988), it is generally accepted that one of every seven to ten boys and one of every four girls will experience some kind of sexual encounter with an adult before reaching age 18 (Seattle Institute for Child Advocacy, 1985). Since the late 1970s, many attempts have been made to determine incidence and prevalence rates of childhood sexual abuse. At present there is little consensus among health professionals and social scientists concerning the exact scope of this problem (Lew & Sapp, 1989; Peters, Wyatt & Finkelhor, 1986). According to the National

Center on Child Abuse and Neglect (1981), a random sample of cases coming to the attention of child protection services and agencies in 1979 led to a conservative estimate of 44,700 children reporting sexual abuse in that year. Because it is assumed, however, that many cases are not reported, prevalence rates are based on retrospective self-reports and vary widely from 6 percent to 62 percent for females and 3 percent to 31 percent for males (Peters, et al., 1986). Despite the lack of precise data to indicate incidence and prevalence rates of childhood sexual abuse, health professionals agree that the physical and emotional health of the children is at risk (Lew & Sapp, 1989). Drug and alcohol abuse, truancy, isolation, depression, and suicide are among those long-term responses to childhood sexual abuse that impose the greatest human and economic costs to society (Lew & Sapp, 1989).

However, on July 19, 1987, the legal requirement to notify the Department of Family and Community Services of suspected cases of child abuse and sexual assault was extended to include not only physicians but school principals, school teachers (except those who are also ministers of religion), social workers in schools, school counselors, and those early childhood teachers in the schools (Lammond, 1989). All 50 states in the United States have child abuse and sexual assault reporting legislation which covers all forms of abuse and neglect (Slavenas, 1988; Lammond, 1989). However, according to Faller (1985) there is a significant increase in the number of abuse cases being reported; unfortunately, though, professionals still report approximately one fifth of the child abuse cases of which they are

aware. England and Thompson suggest that estimates are based on reports and that the actual number of abuse incidences is probably much higher (1988).

Self Report Behavior in Children

One of the myths permeating child sexual abuse victimization is that children frequently make up stories about engaging in and experiencing sexual activities with adults. In a review of literature, Herman and Hirschman (1981) found that over 99 percent of children were truthful in their reports. However, according to Quinn (1989), current estimates of false allegations of abuse range from 2 percent to 8 percent of all child sexual abuse allegations referred to social service departments or hospital-clinic programs. Quinn goes on to clarify that in recent samples of cases involving custody and ugly visitation disputes, the number of false allegations rises to approximately 20 percent.

Oates (1989) writes that child sexual abuse is emotive with major legal implications and many of the issues relating to the medical-physical findings are not clear-cut. Oates suggests that although the medical aspects of the physical findings in cases of child abuse are important, it is essential that professionals be aware that while those findings are helpful confirmatory evidence, it is still the child's story on which the diagnosis is based. Early diagnosis and intervention might avert the development of the long-term effects of maintaining silence. Failure to uncover and treat victimization has

exposed children to future symptoms of distress and psychiatric-mental health problems (Berliter, 1989; England and Thompson, 1988).

Homicide or violent assault is seldom an isolated event. The potential for committing violence exists among children whose lifespace includes incest, substance abuse, sexual abuse, serious interpersonal struggles and dysfunction, and a disorganized family (Adolescent Health in Colorado, 1986). Homicide rates in 10-14 year olds are low (1.5 deaths per 100,000 in 1978). Young Black males are at highest risk of homicide and criminal assault. It is estimated that one out of every 25 Blacks over age 12 in the United States was a victim of violent crime in a one year period (USPHS, 1985).

Substance Use

Psychoactive drug-taking has become an integral part of coming-of-age in America. These behaviors are determined by the complex interaction of social, psychobiological, and pharmacological factors. Most young people do not experience serious disability as a result of their drug-taking; it is experimental or intermittent (Wells & Stuart, 1981, p. 12). Most psychoactive drug use and abuse begins in the adolescent years (Johnston, Bachman & O'Malley, 1979). It is also during these early years that the impact of drug-taking is most profound. Deadly drugs like "crack" are now widely used. Children are experimenting with drugs and alcohol. As Packard reported (1983), the extent is alarming that arrests of children for drug use or dealing rose 4,600 percent in fifteen years.

A survey of 8,000 youngsters revealed that 12 percent of the fifth grade students polled had used marijuana over the past year; 10 percent of the students in the sixth grade admitted to its use; 11 percent of the seventh grade students had used the drug; 12 percent of the eighth grade students, and 21 percent of the ninth grade students had used marijuana (Benson, Williams & Johnson, 1987). Furthermore, 40 percent of the children in the fifth grade admitted to worrying about drugs and alcohol "quite a bit" or "very much" (p. 70, 1987).

Evidence indicates that experimentation with cigarettes occurs primarily between the ages of 12 and 17, with many youths, however, beginning to smoke in the junior high school years. Tucker (1987) suggests that many children first tried smoking as young as 5 or 6 years of age.

Certain social and psychological variables have been associated with young people smoking. Peer pressure (youth with friends who smoke are more likely to begin and maintain), following sibling's and parental examples, and employment outside the home (Adolescent Health in Colorado, 1986; Tucker, 1987).

Smokeless tobacco is being promoted "cynically and aggressively around the world" (Health Values, 1988, p. 62), in spite of its known harmful health consequences. Young males are the major targets in promotional and advertising campaigns. Dangers of smokeless tobacco use include cancer of the mouth as well as potential nicotine addiction. Gum disease is also an important risk (AMA, 1986).

A study conducted to determine the prevalence of smokeless tobacco among high school students in selected rural communities in Arkansas in 1985 revealed that 34.5 percent of males and 2.5 percent of females reported regular use of smokeless tobacco. Factors contributing most to smokeless tobacco use was the influence of a parent (57.1%) who used smokeless tobacco products followed by the influence of a coach. The most frequent occasions cited by the students who used smokeless tobacco were: when bored or alone (63.6%) and when participating in sports (33.6%) (Williams, Guyton, Marty, McDermott & Young, 1986).

Typically, the average adolescent has had their first drink by age 13, and the average amount of alcohol ingested increases with age through high school (Neidengard & Yalisove, 1981). According to Packard (1983), the average age of a child taking his or her first drink of alcohol is now twelve years of age. Over one million children aged twelve to seventeen have a serious drinking problem (Brough, 1990).

A limited amount of research has been published addressing the issue of the influence of parental drinking on Native American children. Drinking within the family seems to influence the degree of adolescent and child alcohol use. Weibel and Orlando (1984) suggest a causal relationship between parental alcohol abuse and dysfunction in children's lives leading to alcoholism. Characteristics most frequently noted within families where one or both parents use alcohol are child abuse and neglect, foster home removal, increased truancy, poor academic achievement, high drop-out rates, juvenile delinquency, and early use among children (Longclaws, 1980).

Other harmful consequences reported in relation to drinking among Native American adolescents include a survey by Dizmang, Watson, May & Bopp (1974) indicating that nearly 50 percent of all suicide victims among Shoshone and Arapaho reservation dwellers were under 25 years of age, which in the general population, was one of the lowest groups for suicide. It has been suggested that by age 11, nearly one-third of all Native American children have drunk beverage alcohol (Lamarine, 1988).

Diet

The leading causes of death in the United States today have dietary implications: stroke, hypertension, atherosclerosis cancer, diabetes, arteriosclerosis and cirrhosis. The dietary patterns of adolescents and youth are extremely variable and difficult to characterize. Irregular eating habits, missed meals, snacking and fast foods have become routine among American youth. Lack of time, poor morning appetite, school activities, part-time jobs and desire to lose weight are reasons given for missed meals among youth (Bendette, 1981). Fast foods appeal to adolescents and youth due to their accessibility and convenience. Fast food establishments also provide an arena for socialization (Clark, 1986).

Prewitt, Haynes, Graves, Haines & Troyler (1988) assessed pediatric differences in nutrient intake, lipids, and lipoproteins in Black and White children ages 5-19 years who participated in the Collaborative Lipid Research Clinics (LRC) Prevalence Study at Cincinnati and Houston locations. A second aim of this study was to

assess racial differences in the contribution of major food groups to total calories in these children. The results are as follows:

1. The fundamental nutrient differences between Blacks and Whites were in total calories and in calories per kilogram of body weight. Both were uniformly and significantly lower among Black than White boys, and generally lower among Black than White girls.

2. No racial differences in total cholesterol or cholesterol intake per kilogram body weight were observed.

3. There was no significant independent effect of education of head of household on the children's caloric intake.

4. Racial differences in SES did not appear to systematically account for differences in total energy intake.

5. Race was a significant independent explanatory variable for high-density lipoprotein cholesterol levels (higher in Blacks) and for very low-density lipoprotein and triglyceride levels (higher in Whites) after covariate adjusting for education of head of household, gender, age, calories, saturated fat, and clinic site.

6. Lower caloric intake among Blacks compared with Whites, the major nutrient difference in the current study, did not account for differences in lipoprotein cholesterol levels between the two groups.

Consistent significant differences in the energy distribution from food groups for Blacks and Whites were not observed. A general trend, however, was that vegetables, meat, fish, and poultry provided a greater proportion of total calories in the diets of Blacks than Whites. Milk and cheese provided lower proportions of total calories

of Blacks. The authors suggest that implications of these racial differences of dietary intake should be investigated to determine their significance, for example, particularly for urban, low-income Blacks, where dietary calcium intake is low, and is highly associated with serum lead levels (Mahaffey, Gartside & Glueck, 1986).

Physical Fitness

Over the past several years, there has been much talk of improved physical fitness in America. Fitness for youth has been defined by the Office of Disease Prevention and Health Promotion to include 5 facets: body fatness, flexibility, abdominal strength, and cardiorespiratory endurance. These 5 measures were selected for their ability to provide indicators of current health status and future resistance to disease (President's Council on Physical Fitness and Sports, 1985). Concern has been expressed, however, that children and adolescents as a group, have not been participating in physical activity and are less fit than previous generations. The Office of Disease Prevention and Health Promotion within the Department of Health and Human Services, in response to this fitness concern, undertook a study to describe fitness levels of youth, document patterns of physical activity and examine the relationship between physical activity and health fitness. The survey included 8,800 students from across the country. Major findings were presented in the National Children and Youth Fitness Study (NCYFS) (which was included as a supplement to the Journal of Physical Education, Recreation and Dance, January, 1985. Tests have subsequently been developed by the American Alliance for Health,

Physical Education, Recreation and Dance (AAPHERD) to measure performance in each of these areas. A comparing of this information on youth fitness with the results of a 1960 study suggests that children and adolescents today are fatter (skin folds 2-3 millimeters thicker) than those children in the 1960's (Pate, Ross, Dotson & Gilbert, 1985).

Over 80 percent of students in grades 5-12 were enrolled in physical education. This enrollment declines with age from a high 97 percent in grades 5 and 6 to less than 50 percent for girls in grades 12. Only 36.3 percent of the students participated on a daily basis, short of the 60 percent daily participation rate suggested in Objectives for the Nation (1980). This has not changed substantially in the past 10 years. The report noted that physical education programs in junior and senior high schools are still geared more toward competitive sports than to lifetime physical and recreational activity (Pate, et al., 1985). Phillip, Piland, Seidenwurm and Smith (1989) suggest that physical fitness attitudes and behaviors that are adopted during adolescence will eventually form habits that persist through life. Consequently, according to Phillip, et al. (1989), the behavioral risk factors for adolescents are presumably the same as those risk factors in adult populations. Smoking, substance abuse, obesity, poor nutrition habits, hyperlipidoma, stress, insufficient exercise, lack of health knowledge, hypercholesterolemia and other factors eventually lead to morbidity and mortality. Phillip believes that the primary differences between adolescent and adult cohorts exist in the stage and degree of development of disease resulting from poor

behavior. As many as 40 percent of U.S. adolescents have been estimated to have one or more of the risk factors which are associated with heart disease: high blood pressure, high blood cholesterol, overweight, use of tobacco, lack of proper exercise, or diabetes (Healthy People, 1979). This statistic illustrates the seriousness of the problem of the physical fitness in adolescents. According to Prevention 84/85 (1985), when the behavior and the statistics are extrapolated, the health status of adults is directly associated with the behaviors in the adolescent years.

The concerns and health problems associated with injury, self-esteem, depression, suicide, and diet are felt by most health educators to be areas that can be ameliorated through school health and safety programs (Connell, Turner & Mason, 1986; Mason & McGinnis, 1985). The School Health Education Evaluation (SHEE, 1985) study helped to demonstrate that student exposure to a health education curriculum can result in substantial voluntary changes in a student's self-reported health practices. This study to determine the effectiveness of four school health curricula was conducted from 1982 through 1984. It involved more than 30,000 children in grades 4-7, representing 1,071 classrooms from 20 states. The study revealed that children exposed to school health education curriculum exhibited increased knowledge and cognition, healthier attitudes, and improved health skills and practices than those who did not receive school health education (Connell,Turner & Mason, 1985; Connell, Turner & Mason, 1986; Seffrin, 1981; Fortune, 1988). The SHEE study was "a landmark event for the

general field of educational research and evaluation" (Christenson, Gold, Katz & Reuter, 1985, p. 295). This study demonstrated that health education in the school curriculum can help to decrease the likelihood that children will adopt behaviors that are hazardous to health, such as cigarette smoking (Mason & McGinnis, 1985).

Forces such as injury, accidents, acute and chronic sickness, sexual abuse and neglect, poverty, family dysfunction, motor vehicle mishaps, fire, drownings, substance abuse, violent assault, suicide, and homicide are stripping the livelihood from our nation's children. Attitudes and behaviors adopted during childhood may lead to habits formed with potentiality throughout life. The vitality, productivity, health, and safety of American children are each endangered by the lifestyle choices made and habits taking root during childhood (Phillip et al. 1989). The need for population-based data on the health and safety behavior of children together with concentration on the needs of those children becomes more urgent in light of the increase in the frequency of alcohol and substance abuse, teen pregnancy, sexual assault, risk-taking behavior, suicide, and many other health and safety concerns afflicting a significant number of adolescent youth (Pursley & Dewey, 1988). Effective prevention and intervention is made more commodious when an information-base is present concerning the health and safety behavior of children.

Middle level schools, according to Brough (1990), need to respond with programs and activities which can help students cope with these changing societal structures such as substance abuse, decisions about

sex, mobility, and suicide. The purpose of any educational organization is "to promote healthy physical, social, emotional, and cognitive growth of the students it serves" (Brough, p. 81, 1990). The world is changing for the students in America. Their educational program will need to change, to evolve continually in order to keep pace with the changing needs and characteristics of the nation's youth.

Today's society has been characterized well by James Beane and Michael Lipka in these sentences:

> We live in troublesome times. Ours is a world of ambiguity, of discontinuity and disbelief. The old order is breaking up not only in the industrial to post-industrial economic shift, but in the lifestyles we choose and the diversity of values we espouse. A quick glance around shows us that many adults are having a hard time finding anything to hang onto. For the young, whose life skills are not so mature, the scenario is even more complicated. Traditional sources of stability such as family, the church, the legal system, and even the prospects for eventual employment are rapidly shifting. The only certainty is uncertainty (Beane & Lipka, p. 5, 1987; Lounsbury, p. 66, 1990).

The overall health and safety of children in the United States, based on the review of literature, is tentative and uncertain. The problems children face continue to increase with a serious rapidity, thus giving cause for grave concern. Intense considerations must be given to those factors which are contributing to these statistics, and the methods for society and its individuals to help these children must be found (Thompson and Rudolph, p. 4, 1988).

II. Overview of Health Risk Appraisals

Theoretical Basis

Health risk appraisal instruments estimate the odds that an individual with a given set of characteristics will become ill or die from selected diseases over a given timespan. Health risk appraisals (HRA) were developed to help individuals analyze lifestyle and personal characteristics related to future risk of premature morbidity or mortality (Petosa, Hyner & Melby, 1986). Since HRAs use perceived threat of premature morbidity and mortality as the main motivational strategy, the Health Belief Model (HBM) is appropriate for analyzing the health risk appraisal paradigm (Becker, 1974).

The HBM suggests the potential likelihood of a person adopting a preventive action as a function of at least the following five components. Individuals experience "cues" which help to bring a health-related decision or modification action into awareness so a conscious voluntary choice can be made. Individuals perceive themselves as "susceptible" to the threat. The threat (or its consequences) are then perceived as "serious," whereby some action is warranted for change. Individuals, once aware, understand the "benefits" associated with taking preventive action. Lastly, perceived barriers to taking the preventive action are minimal (Becker, 1974; Petosa, et al., 1986, p. 54).

HRAs may serve as "cues" that encourage individuals to perceive themselves as susceptible to health threats. HRAs may also reinforce the concept that personal behavior is related to health status (Petosa,

et al., 1986). HRA is applied in the hope that individuals learning about their odds will act to improve them either by modifying malleable variables, for example, quitting smoking, or by arranging for preventive measures such as annual screening in situations where the odds of illness or death are increased due to non-malleable variables such as a genetic family history of cancer (Goetz & McTyre, 1981).

HRA History

Thirty years ago, public concern over the rising cancer death toll led to the suggestions for integrating cancer control with the practice of medicine. Dr. Lewis C. Robbins, chief of the new Cancer Control Program of the United States Public Health Service, contended that control should preferably begin with the identification, appraisal and reduction of cancer precursors rather than with the diagnosis, prognosis and treatment of present illness or with multiphasic screening for early disease or disability (Robbins & Hall, 1970; Hall & Zwemer, 1979). The early development of the health risk appraisal movement closely paralleled the career and directive of Dr. Robbins. During his extensive work with the Framingham Study (Dawber, Meadors & Moore, 1951), Robbins discovered that certain health hazard behaviors were closely aligned with the onset of disease. If the physician could chart those hazards over time, she might be able to use those assessments in making suggestions to her patients on ways to prevent disease. The initial use of HRAs, according to Robbins, was to assist the practicing physician with knowledge of causes of death and disability in a particular patient's age group; beginning early before

conditions (which lead to death or disability) become irreversible; and, making a prognosis based on the total risk of the individual patient (Robbins & Hall, 1970).

The concept of the use of risk recognition, assessment, and reduction was first tested in the Department of Preventive Medicine at Temple University during the summer of 1959, under the direction of Dr. John Hanlon. The "Geller Tables," in their initial form, were first used in this demonstration study (Hall & Zwemer, 1979). Robbins employed Harvey Geller, a statistician with the U.S. Public Health Service, to compile tables representing the probability of death within ten years from specific causes for various cohort groups. Geller collated the data from all death causes and compiled it in five year groupings by age, gender and race. The result was the initial comparative information on the leading causes of death by groupings by age, gender and race (Robbins & Hall, 1970).

In 1962, Cecelia Conrath, a health educator for the Cancer Control Program, and Dr. William DeMaria of Duke University School of Medicine, independently and simultaneously proposed the term "prospective medicine" for this new approach to preventive medicine, and described the use of HRA by physicians (Hall & Zwemer, 1979; Blankenbaker, 1979).

The first multidisciplinary approach to prospective medicine was undertaken by Dr. Joseph Sadusk at George Washington University School of Medicine in 1963. In this study using the Geller Tables, the causes of death for age, gender and race were linked to specific health hazard-risk behavior, and specific risk reduction interventions were

identified for each of the 103 patients. Dr. Sadusk is credited for the first recorded use of the health risk appraisal approach implemented to modify health behavior in identified high risk individuals (Sadusk & Robbins, 1968; Robbins & Hall, 1970; Hall & Zwemer, 1979). In that same year, Dr. Hall introduced prospective medicine at the Methodist Hospital of Indiana as part of the undergraduate and graduate medical training of its students. A weekly medical conference between patient and physician occurred whereby patient histories and health risks could both be reviewed and discussed (Blankenbaker, 1979). Risk assessments (HRAs) were soon incorporated into the family practice residency program to give a broader dimension to the family doctor-patient relationship. A potential for professional concern for the patient to extend beyond the crisis-oriented care to a comprehensive continuing concern for the well patient before and at risk presented itself. Preventive medicine would become a vital part of physician education and of comprehensive patient care (Hall & Zwemer, 1979).

In 1964, the first annual meeting of Health Hazard Appraisal was convened at Methodist Hospital in Indianapolis, Indiana, with health professionals from around the country (Breslow, 1981). Professionals met for an annual scientific forum to discuss the concepts of prospective medicine and the use of health risk appraisal in family practice medicine.

By 1967, many of the health risks developed had been assigned weights. These weights, or "risk factors" were developed by examining

the findings of the Framingham and other prospective studies (Kannel & Gordon, 1976). The contribution of life insurance actuarial principles to the assessment of risk was first considered by Kenneth Veit and Dr. Robbins in 1968. They suggested that if insurance companies could successfully estimate the personal risk of an individual for economic advantage, the medical estimate of long-term risk of healthy patients could render a survival advantage (Gesner, 1971-1972).

Norman Gesner, a consultant and insurance actuary, acted on this suggestion and proceeded to develop a formula to convert the data on causes of death (mortality ratios) and prevalence figures to risk factors--into risk factor tables (Gesner, 1971-1972). The Geller Tables on mortality combined with the Gesner Tables on risk factors (together with logistic regression and logistic transformation) to form the foundational basis for prediction used in health risk appraisal and prospective medicine of today.

In 1970, Robbins and Hall worked together to develop an instructional handbook to assist physicians in conducting prospective medicine and health risk appraisals. How to Practice Prospective Medicine included the quantitative assessment of risk factors and directions on how to use the Geller-Gesner Risk Factor Manual, the core ingredient of prospective medicine (Robbins & Hall, 1970).

During the 1970s, health risk appraisals grew in their popularity among Americans and Canadians alike. Canada used HRA on a nation-wide basis to encourage healthy behavior among its citizens, and the Centers for Disease Control (CDC) in Atlanta, Georgia, used HRA with federal

employees and the general public (Ross, 1974; LaSalo & Milsum, 1977; Blankenbaker, 1979; Marciano, 1985). The computer application of HRAs in the 1970s helped the growing utility of HRAs into the 1980s.

In 1974, the annual meetings on health hazard appraisal were incorporated into a new "Society of Prospective Medicine" with an international membership committed to improved life expectancy through risk recognition and reduction. These annual meetings of the Society of Prospective Medicine which generated considerable awareness and interest, provided the initial research impetus and literature development through the late 1970s to early 1980s (Hall & Zwemer, 1979; Society Proceedings, 1975-1980).

Hall and Zwemer published an update of the Robbins and Hall (1970) original health risk appraisal manual in 1979. Prospective Medicine highlighted original foundations of HRA but also included those changes in the state-of-the-art of prospective medicine and its role, changes in risk calculating methodologies, changes in operational definitions, and updates on mortality tables (Hall & Zwemer, 1979).

"Prospective medicine starts with the well individual" (Hall & Zwemer, 1979, p. 5). Prospective medicine recognizes that the individual is the ultimate health decision-maker and focuses on what the individual can do to enhance her own survival. Prospective medicine and the basis for health risk appraisal build upon these four fundamental assumptions:

1. Every person is subject to death;

2. The risk of death for each age, gender and race group of society can be described by an average or mean risk;

3. The average risk for each group-age, gender and race can be quantitatively adjusted into a probable risk for each individual. This adjustment is made by estimating the effect on average risk of such individual categories as family history factors, present physical state or condition, and those factors positive and negative of one's own health history.

4. By recognizing and intervening to ameliorate those risk factors that are possible to change and modify, the individual could reduce risk of death and increase the probability of survival (Hall & Zwemer, 1979, p. 5). If these fundamental assumptions are to have validity and impact on the individual risk of death, it would be necessary to have a knowledge of major causes of death to bring about accurate predictions; acknowledge of the average probability of death by major causes; a knowledge of these particular precursors or prognostic categories and the risk intensity associated with those causes; and, a knowledge of clear methods for using the identified and appraised risks that could have an impact on the individual over time (Hall & Robbins, 1970; Hall & Zwemer, 1979).

Two primary objectives of most HRA instruments are: (1) To provide to the individual an accurate and personalized assessment of risk factors that may lead to medical or health maladies; and (2) to help stimulate behavioral changes and modifications that are assumed to yield reduction of health risks. The uniqueness of the HRA instrument is attributed to these inherent characteristics:

1. HRA has the ability to individualize the assessment of risk, thereby removing health assessment from the arena of "impersonal averages."

2. HRA makes specific recommendations for behavioral change.

3. HRA weights specific recommendations and demonstrates how much the individual's risk is improved by each particular change.

4. The use of risk age is a graphic, quantitative representation of the impact of an individual's lifestyle (Doerr & Hutchins, 1981).

Since the development and initial testing of the first HRA at Temple University during the summer of 1959 (Robbins & Hall, 1970), many HRAs have been developed. HRAs can be self-scored questionnaires, computer-scored questionnaires, and micro-computer-based questionnaires. The strength of the HRA, so believed by its developers in the 1950s and today, lies in its utility to serve people in the enhancement of life survival through recognition and reduction of those behaviors placing the individual at-risk for premature death or disability; hence, preventive action through lifestyle change.

Principle Components of HRA

The National Center for Health Statistics in Atlanta, Georgia (NCHS, 1975-1977) shows in mortality reports that approximately two-thirds of the mortality for any age-gender-race subgroup of society was attributable to ten to twelve major causes. These major causes of mortality are ranked in order of magnitude by rates per 100,000 persons in the next 10 years for each category (Hall & Zwemer, 1979). An average probability of dying for each of the causes (expected

deaths/100,000 population) could then be described for the particular age, gender, or race group. The HRA procedure was developed by Harvey Geller and referred to as the Geller Tables (Geller & Steele, 1977-1978).

Many of the major causes of death have preconditions or precursors. These are reported in the form of destructive lifestyles, details of personal or family history, certain clinical conditions, that have been proven in such prospective analyses as the Framingham study to correlate highly with the onset of that particular disease (Dewey, 1984). Robbins and Hall termed the precursors "prognostic categories," which are used in health risk appraisal (Hall & Zwemer, 1979). Prognostic categories are then broken down into prognostic characteristics, such as high blood pressure, which has a range of values or scores. Other prognostic characteristics are determined by the presence or absence of a condition such as predisposition to coronary heart disease. HRA then takes the individual prognostic characteristic and mathematically converts it into a numerical risk value termed a "risk factor." By examining the impact of the identified prognostic characteristic on mortality in each age, gender and race subgroup in the Framingham study, risk factors were then determined (Kannel & Gordon, 1976; Dewey, 1984). By measuring the effect of the prognostic characteristic, it was shown how each individual varied from the mortality for each age, gender and race subgroup (Hall & Zwemer, 1979, pp. 8-9).

Risk factor values adjust mathematically ten-year mortality probabilities for the leading causes of death within each gender, race and five year group. Life table methods are applied to National Center for Health Statistics mortality reports (Bureau of Health Education, 1975-1977) to calculate the probability tables (Petosa, et al., 1986). Together, Gesner/Gellen tables calculate an "appraised" or "risk" age, which shows a disparity between chronological age and risk age. Similarly, HRAs calculate the potential for reducing risk by estimating an "achievable" age, assuming, however, the HRA user modified certain specific disease-promoting behaviors. For example, a 40-year-old female might "achieve" the risk status of a 35-year-old if she stopped smoking, exercised, lost weight, and used her seat belt (Petosa, et al., 1986). A risk factor is obtained by dividing the mortality rate for the event among the members of an age-gender-race subgroup with a particular prognostic characteristic by the mortality rate for the event in all members of the age-gender-race subgroup. Thus, a risk factor is represented by a probability ratio:

$$\text{Risk Factor} = \frac{P/(1-P) \text{ in members of an age-gender-race group within a particular prognostic characteristic}}{P/(1-P) \text{ for all members of the age-gender-race group}}$$

Health appraisal age (or health risk age) is the age of the average person of the same race, gender and age subgroup with a total ten year risk similar to the total individual risk of the person being appraised. The achievable age represents the lower ten year risk projected upon the individual's compliance with the suggested intervention suggestions. Determination of the health appraisal age

from the total individual risk can be quickly assessed by checking the tables in Hall and Zwemer (1979) for the corresponding age. The expression of risk in terms of a risk-age not only converts the risk of death into a health measurement but also conveys an immediate concern of being at risk. If the health appraisal age was above the actual age, a knowledge of risk often can induce an awareness of health problems and may provide an opportunity to prescribe preventive actions through lifestyle change and appropriate behavior modification (Becker, 1974; Hall & Zwemer, 1949). Those individuals with a health appraisal age below their actual chronological age could then be encouraged to maintain that age advantage. The appraisal age, attainable age, and risk intervention programs of HRAs are intended to bring about an awareness and to encourage the use of individual control for the health consequences to that individual (Dewey, 1984).

Most health risk appraisals used today have similar components. The HRA is used to gather information for the following health related behaviors and characteristics: (1) lifestyle factors and behaviors such as seat-belt use, smoking and diet; (2) health screening outcomes such as chest X-rays, breast exams, and pap smears; and (3) genetic predisposition in personal and family history of certain diseases such as diabetes, heart disease, and cancer. Many HRAs include certain diagnostic and physical measurements such as height, weight, blood pressure, and blood analyses (Tennessee Department of Health and Environment, Health Promotion, 1984; Fortune, 1988).

These measurements of risk and potential benefits of behavioral lifestyle changes are presented to the individual in order to stimulate participation in activities aimed at changing lifestyle and improving health. To be effective in improving health and reducing risks to preventive mortality and morbidity, HRA must be followed with other health programs. Risk reduction, health education, health promotion, social support systems, and follow-up evaluations and counseling are examples of such programs (Sievert, 1986).

Reliability and Validity of HRA

The scientific basis for HRA predictions is problematic. Many studies have attempted to evaluate and assess the extent and appropriateness of HRA technique as well as to review its scientific basis, efficacy, and effectiveness in varied settings (Wagner, Beery, Schoenbach & Graham, 1982). Wagner, et al. (1982) attempted to document the extent and manner in which HRA is being applied by using a multiple approach to gather information. Literature review, consultation with experts in epidemiology, biostatistics and behavioral science, developers and users of HRA, inventory of HRA instruments and programs, epidemiologic and biostatistical review of risk estimation in HRA, and panel visitation to HRA site programs revealed to the authors that HRAs are used primarily as health promotion devices, motivational devices for behavior change, and are used as a means for structuring educational programs around health-related behavior change (Wagner, et al., 1982; fortune, 1988). This investigation also found that most HRAs overreach the extent of existing scientific knowledge in order to

accomplish a comprehensive risk projection even though those predictions appear reasonably accurate.

Many of the risk factor values are based on extrapolations of various kinds from data derived from two major epidemiologic investigations: the Framingham Heart Disease Study (Dawber, Meadors & Moore, 1951) and the American Cancer Society study (Sterling, 1975). These two studies primarily involved middle-aged, middle-class, White subjects, yet, their findings are used in HRAs to predict the degree of risk for Blacks, Hispanics, Native Americans, teenagers, and other dissimilar groups (Wagner, et al., 1982; Moriarty, 1985). Data base and methodological problems are highlighted in the Wagner, et al. (1982) report.

Chaves, Jennings, McKinlay and McKinlay (1984) assessed the strength of seven different health risk appraisals in providing comparable estimations of risk for individuals with a cardiovascular disease risk profile. The results demonstrated the need for HRA validation studies that would discover which estimates are more accurate than others when compared against an accepted standard such as data bases containing mortality and risk indicator data.

According to Goetz (1981), even if all data and methods are up to date and state-of-the-art, one of the fundamental limitations of HRA lies in the historic nature of epidemiologic data. "Risk estimation is not a prediction of individual fate; it is the projection of odds into the future" (Goetz, 1981, p. 313). Individual HRA results represent the experience in the past of a hypothetical group of people with the

present individual's characteristics as captured by the HRA instrument, everything else being equal. Everything is not equal. Doerr and Hutchins (1981) comment:

> Problems in assessing the merit of the measurement instrument for HRA specifically are magnified by its complexity and by its wide range use--with or without supporting data on its reliability and validity in varying situations (1981, p. 301).

Schoenbach, Wagner, and Karon (1983) cited that a major limitation of HRA is the absence of empirical data. Risk factor data are extrapolated from age-gender-race groups other than those of the present health risk appraisal client. Clients, therefore, may receive inappropriate health intervention messages and behavioral recommendations if they are not reasonably typical of their age-gender-race group.

A study to determine the validity of 41 HRA instruments for assessing coronary heart disease risk was developed by Smith, McKinlay and Thorington (1987). Instruments were obtained from a wide variety of organizations, including federal, state and local government agencies, universities, and for-profit corporations. To conduct the validity assessments, the characteristics of the 240 test cases drawn from the Framingham data base were inserted in the scoring assessment used by each health risk appraisal. Several characteristics were identified as having important implications for the validity of the HRA risk scores: (1) The sophistication of the estimation method; those instruments using logistic regression or the Geller/Gesner tables had the highest validity coefficients, while the self-administered general

health status and lifestyle questionnaires had the lowest. (2) The range of risk estimates an instrument is capable of producing; the greater the number of different risk categories an instrument has, the greater the likelihood for validity. (3) The degree to which an individual's age was taken into consideration. These results also suggested that validity is related to the costs of scoring an instrument. The HRAs with more valid scoring systems are also generally the most expensive to use due to the need for computer processing. Inexpensive self-administered instruments are less valid according to the authors.

Like the issue of validity of HRA instruments, the issue of reliability, at best, is illustrative and methodologically unsophisticated (Doerr & Hutchins, 1981). In an effort to address the issue of test-retest reliability, Alexy (1984) administered a health risk assessment questionnaire to 25 males. The instrument was then readministered three to five days later to the same males without any intervention during the time interval between tests. Most data would be expected to remain the same. Pearson product correlations were calculated on the quantifiable data afforded by the profile response print-out. Reliability coefficients ranged from 0.996 to 0.239. Variables most likely to be influenced by an individual's attainable age and chronological current age represented several of the highest reliability coefficients (.90-.99). The lowest reliability coefficients for this group was exercise levels which required daily reporting of individual activity and weekly planned exercise (Alexy, 1984).

Systolic blood pressure was the variable with the lowest reliability coefficient (0.239). The subjects were asked to report their blood pressure levels over the past three months. Responses differed from test to test. Some reported current readings while others had computer assumed values on the first test and actual values on the second test. Ranges varied on the respondent profiles (Alexy, 1984). Best and Wilson (1977) reported reliability data regarding two kinds of HRA responses: (1) those which are not likely to change over time such as history, body frame, body size; and (2) those reflecting health lifestyles which may change over time such as the use of seat belts, smoking, and condom use. They found as much change in those responses which should not change as in those which might. This makes the use of HRA confusing, especially in determining effects from treatment programs. The question raised by Best and Wilson is important. Was there a change reflecting real change or was it merely a measure of unreliability?

In a controlled clinical trial of health assessment and behavior modification, Duntor and Elias (1979) studied the stability of a modified HRA instrument and administered it to the same group on two different occasions approximately three weeks apart. Appropriate test statistics were not employed and certain methodological questions were left unanswered.

According to the editorial in the American Journal of Public Health (1989), the measurement properties of HRA instruments have been questionable in terms of the stability of responses to items which

potentially affect the accuracy of the appraisal. While the paper on reliability (Smith, McKinlay & McKinlay, 1989) revealed that the different HRA instruments were reliably consistent over time in terms of risk estimates, the authors reported considerable variation by topics such as the variables "lifestyle" and "diet." The authors suggested that the potential behaviors for low reliability among HRAs is straightforward:

> Don't ask questions that people can't answer (blood pressure), develop better and multiple items to assess complex behaviors, and above all do not let the respondent do the calculations needed for a risk estimate (American Journal of Pubic Health, p. 1598, 1989).

A study of the reliability of four HRA investments was designed and included:

1. Health Risk Appraisal (CDC)
2. The Heart Test (Arizona Heart Institute)
3. RISKO (American Heart Association)
4. Determine Your Medical Age (Blue Cross/Blue Shield, NY).

All of the HRA instruments were self-scored except the CDC's Health Risk Appraisal. A total of 338 adults aged 25-65 were randomly selected and completed an HRA on two occasions 7 to 12 weeks apart. Test-retest reliability was assessed on the self-reported baseline risk scores and the follow-up scores. Researchers found that the respondents gave consistent reports for family history, smoking, and relative weight ($r > .75$), but self-reported scores for blood pressure and cholesterol together with diet, physical activity, and stress were less stable. Mathematical errors made by respondents greatly reduced

the reliabilities of two self-scored instruments. While computational mistakes of respondents are not an issue with computerized Geller/Gesser method HRAs like the Health Risk Appraisal from the CDC, these instruments typically insert risk weights of 1.0 for any unknown risk factor (say, smoking). This practice will artificially inflate reliability coefficients (Smith, et al., 1989).

A study on the perception of heart attack risk based upon the effect of individualized risk feedback on risk perception using the four HRA instruments mentioned in Smith, et al. (1989) was completed by the Cambridge Research Center (Avis, Smith & McKinlay, 1989). Data were derived from a random sample of 732 adult men and women aged 25-65. At baseline and reassessment two months later, all participants completed a questionnaire assessing their own health-related behavior, risk factors, and prevention of heart attack risk. Results showed that people do use established epidemiologic risk factors in the estimation of overall risk of heart attack in their own life. The authors conclude that their respondents did not receive any additional counseling or education, as is often done with HRAs. HRAs may not be effective for use in mass screenings, but may have a greater effect long term on risk perception where the HRA feedback is easier to comprehend, or when the HRA is given in conjunction with a health education program. This conclusion was also drawn by Schoenbach, et al. (1987).

According to Doerr and Ellyn (1984), the purpose or the use of the HRA will determine the need for reliability. If the identification of

risks for counseling with clients is the purpose, then a great deal of precision may not be necessary. However, if HRA is to be used as a measuring device for research and as a means to determine change over time, then, according to the authors, a fair amount of reliability is warranted. Again, it is important to know in health research whether changes over time are due to real lifestyle changes or to the unreliable reporting by the HRA client. The need for continued psychometric research with the HRA is critical to its increased use and acceptance (Doerr & Ellyn, 1984).

An ethical concern in the use of HRAs deals with the anonymity and confidentiality of the information to be obtained. According to Henerson, Morris and Fitz-Gibbon (1978), whenever possible, arrangements should be made for the respondents to a questionnaire or the subjects of an observation to remain anonymous. When self-report procedures are used, it must be assumed that the participants whose behaviors are being assessed have the self-awareness to recognize their own behaviors and the ability to articulate them. Also, the assumption is made that the participants have no reason to lie about their behavior provided confidentiality and anonymity are ensured (Henerson, et al., 1978). When individuals are able to understand the questions asked of them, have sufficient self-awareness to provide the necessary information, and are likely to answer honestly and not deliberately falsify their responses, then self-report measures such as questionnaires and surveys should be used (Henerson, et al., 1978).

Research indicates that self-reported data may be gathered as reliably from adolescents as from adults (Beitchman, Krudenier, Inglis & Clegg, 1989). Internal reliability checks will identify the small percentage of students who intentionally answer the questionnaire in a random, inconsistent manner. To obtain truthful answers, it is important for students to perceive the questionnaire as important and that their anonymity and confidentiality is guaranteed (SSSHRS, 1988). And, according to Beitchman et al. (1989), the self reporting of children should be considered a legitimate area of enquiry. Although self-report instruments or surveys may be of restricted utility due to the limited capacities of young children to report on their own internal states, Beitchman et al. (1989) believes that what children are able and willing to say about themselves and about their feelings, attitudes, and beliefs should be of concern. In view of the reliability limitations of parent and teacher reports, the self reporting of children is an area worthy of greater research effort.

Research Studies in HRA

Since the introduction of the health risk appraisal by Robbins and Hall in the late 1950s, health practitioners have expanded their use of available HRA instruments to evaluate health status of participants and to encourage health-enhancing habits (Hyner & Melby, 1985). The use of HRAs has expanded to diverse settings including community, occupational, corporate, and educational spheres. Several studies have implemented HRA in educational settings (Petosa, Hyner & Melby, 1986;

Beusley, 1981; Ellis & Raines, 1983; Neutens & Pursley, 1985; Pursley & Dewey, 1988).

Neutens and Pursley (1985) compared the use of two HRAs for use in the university classroom. The two HRAs selected were the Micro-HRA developed by Planetree Medical Systems (1984) and the Tennessee Department of Health and Environment (TDHE, 1984). The study sought to compare these two HRAs in terms of appraised age, attainable age, positive lifestyle factors for reinforcement, list of lifestyle factors to be changed, and the variables of desirable weight and blood pressure as well as observed differences in display and unique comment characteristics of each program. One hundred and thirty-three students at a large southeastern university comprised the student sample. Though no significant differences were found in appraised age or attainable age, significant differences existed in the number of positive lifestyle changes listed, number of suggested lifestyle changes to be made by the students, and several observable differences in display, including graphics and tables. The authors present the following implications: (1) since health educators wish to reinforce a positive health lifestyle, it is appropriate to select an HRA that demonstrates to students as many positive behaviors as possible to show that those students are doing some things very well; (2) for students wishing to improve health status, an HRA that suggests a greater number of lifestyle changes to increase life expectancy, such as highlighting personal behaviors that would detract from a healthy lifestyle, would be the choice; (3) with overweight and underweight status being of

concern to many students, it is important to select an HRA that best calculates the percentage of overweight or underweight, and makes appropriate recommendations. Those HRAs using body weight tables rather than percent body fat have a definite limitation; (4) the ease of HRA profile interpretation is valuable to the student; and (5) usability in regard to a main frame computer versus a microcomputer and reflective interaction. The authors concluded that HRA is still in its infancy, yet, school health educators must be prepared to determine quality and scope of services in the HRA they are considering for use.

Pursley, Neutens, Bolton, and Dewey (1987) studied the use of HRAs in two dissimilar school systems in Tennessee. The underlying assumption was that if health educators better understood health habits of adolescents at these two grade levels (ninth and twelfth), a better focus on health education at the elementary level on issues of great importance and specific relevance could occur. The study emphasized the need for reliability on self-reported assessments particularly with regard to adolescent populations. The entire area of subjective self-reported health status is an area in which micro-computers may provide empirical measures for varying and different subpopulations including adolescents at the school site (Pursley, et al., 1987).

Fortune (1988) assessed health risk factors of teenagers attending selected Tennessee public schools during the school year 1986-1987. The study specifically sought to address, through the use of the "Teen Wellness Check" (1984), those major health risk factors for teens. The "Teen Wellness Check," according to Fortune, appeared to be racially

biased and faces similar criticism as other HRAs. It appears to be more of a valid indication of those risk factors present among White, middle and upper-class adolescents than for Black teens and other minority groups.

Marciano (1985) reported that in the state of Rhode Island, White middle and upper-class suburban students were more likely than non-White students to practice risky behaviors. Similar results using the "Teen Wellness Check" were revealed in the pilot study.

An investigation similar to the Tennessee Teen Wellness Check Project (Fortune, 1988) was conducted in Connecticut schools in 1985 and again in 1986. Data were generated through the administration of the "Teen Wellness Check" questionnaire to 14,127 students in grades seven through twelve (DeMusis & Dewey, 1987). Findings reveal that as students progress by grade, there is an increase in risky behaviors, and a need for early and consistent school health education. Males had the highest percentage of alcohol drinkers, mixing alcohol and drugs, and having few family or friends for counsel. Females had the highest percentage in non-aerobic exercise and cigarette smoking. White teens are more likely than Black teens to engage in risky behaviors such as drinking alcohol and driving under the influence, being a passenger in a vehicle driven by an individual under the influence of alcohol, smoking and drug use.

The Teen Wellness Check (1984) was incorporated into the curriculum of an experimental physical fitness course designed through the joint efforts of the Albuquerque Public Schools and the Lovelace

Medical Foundation (Phillip, et al., 1989). The experimental course used community resources as an integral part of its content and instructional approach. The TWC was used to help assess students' health behavior and biophysical changes after participating in the 2 year course. The TWC was administered to a control group and experimental group to measure self-reported health risk factors and behaviors most relevant to teenagers. The results of the study revealed that both experimental and control groups fell into the fair category (71-84 = fair) on mean lifestyle scores for pre- and posttest measures during each year of the study. The authors concluded that there was little improvement in risk factors or behaviors. Furthermore, there were no statistically significant differences between the mean scores of the experimental and control groups in either year (Phillip, et al., 1989).

Phillip (1985) conducted a study to investigate the ability of the Centers for Disease Control's Teen Health Risk Appraisal to identify in students those behaviors that influence health. The experimental students were significantly able to identify behaviors influencing health than were the control students. Phillip (1985) suggests that although further development work on the Teen Health Risk Appraisal is warranted, it was suggested that the HRA procedure does have the potential to help individual students and groups in the school setting better understand health behavior and health risk behavior pertaining to better health.

III. HRA Application and Microcomputer Technology in School-Age Classrooms

The 1980s became "the decade of the computer" (Breckon, 1986, p. 1). Microcomputers are taking a prominent role in health education. Schools are charged with the important responsibility to prepare young people to participate in the world of "tomorrow." Active participation in that world is facilitated by optimum health and by the knowledge of the microcomputer (Breckon, 1986).

The advances made in microcomputer technology in recent years have, according to Sarvela, Ritzel, Karaffa and Naseri (1989), greatly increased the potential capabilities of health professionals. Microcomputers will have a positive impact on school health education programs. The microcomputer can be used for desk-top publishing, to help monitor and evaluate program status, to network and control office operations and to deliver educational programs (Bailey & Pigg, 1983). Health educators will need to recognize the potential of the applications involved in microcomputer use in the classroom and school health programs in order to function effectively within the next ten years. Sands, et al. (1989) reports that despite the potential for microcomputer use in the school health program, there are limitations in which the most notable problem is the paucity of quality software for educational instruction. The authors encourage health educators to implement applications software packages such as word processing systems, filing and data base management systems, spread sheets, graphics packages, desk-top publishing programs, and statistical

packages. Applications software packages are noteworthy in that they were developed originally for business and private industry use and are subject to many hours of research, design and development along with the market demand influences for quality. The authors present a review of those applications software packages most conducive in allowing for the health educator to remain on the cutting edge of the discipline.

Chen (1983) reviewed both the technical capabilities and constraints of microcomputer-based health education programs. Among the technological features relevant to health educators are the microcomputer's ability to process both alphabetic (health textual information) and numerical (comparing weights and heights to norms) data at a much lower cost than before. Ordinary television monitors together with the keyboard which responds to students' commands or hand printing on pre-printed scan forms are a means for microcomputer interaction with students. Student interest through learning and retention and color graphics can be enhanced. Tailor-made instructional lessons such as a computer-assisted health risk appraisal, can be developed to facilitate a student's particular interests and self-pacing.

"Promises of increased effectiveness and more efficient use of educational resources can be realized if educational technology is appropriately employed" (Matta & Kern, 1989, p. 83).

The computer has entered the classroom as a very useful tool in education. In a nationwide survey, Frost and Sullivan (1984) found that computer-aided instruction (CAI) is in use in over 50 percent of

the United States' educational institutions. Matta and Kern (1989) suggest the notion that this trend in the use of computers in the classroom is likely to continue as the cost of computer hardware and software decreases.

The immediate future for microcomputers and health educators, according to Breckon (1986), is most predictable. Schools have adopted the microcomputer. Diverse and better quality software is becoming more available each year. Many children are becoming computer literate and will expect, if not demand, application of microcomputers, videodiscs, graphics and the sophistication of the technology. "Health educators may well be required to use the technology in order to reach this and future generations" (Breckon, p. 42, 1986).

HRA Application to Microcomputers

The microcomputer has enhanced the use of HRAs by classroom teachers. Sophisticated HRAs require mathematical formulas and quantitative cumulative computations to estimate health risk and longevity. A microcomputer can lead a student through an HRA program, eliciting accurate responses and quickly providing personalized information (Petosa, et al., 1986; Marciano, 1985). Ellis and Raines (1983) enthusiastically describe and discuss how a microcomputer program estimates risk age and presents information they believe motivates behavior change. The microcomputer-based health risk appraisal program "Wellness-Check" developed by the Rhode Island Department of Health Promotion (1984) has been used in 47 of the 50 states and in Canada. Information concerning the program has been sent

to over 33 foreign countries. Since 1983 when the program was available to organizations outside Rhode Island, over 300 of the computer software programs have been sold to agencies and professionals throughout the world. The "Wellness-Check" health risk appraisal program was the nation's first microcomputer-based HRA (Marciano, 1985).

Goulding and Peterson (1983) used an HRA specifically targeted for seventh grade students, but it has also been used for students in high school and college. "I'm a Health Nut" was developed by the St. Paul Public School District #625 and St. Paul Division of Public Health, Minnesota, during 1979-1982. This HRA's use is intended to effect a significant change in unhealthy behavior and to reinforce positive health practices. Distribution of "I'm a Health Nut" includes health fairs, adolescent health clinics and alternative educational centers.

The "Teenage Health Risk Inventory" (HRI) is a microcomputer program containing demographic questions, core health risk questions, plus the option for the HRA user to add 10 additional questions. The HRI questionnaire utilizes items which are weighted to calculate a health score, and interval level statistical procedures (mean) are employed. The student participant is provided with a health score ranging from zero to one-hundred. Health scores are used to place the student participant into one of four risk categories which include: Excellent (85-100), fair (70-84), risky (55-69), and hazardous (0-54).

The HRI questionnaire items include closed response questions such as: Have any of your friends or classmates committed suicide?

[1] Yes [2] No

The HRI questionnaire items include multiple choice questions such as: How often do you brush you teeth?

[1] Every day [3] A couple times a week

[2] Almost every day [4] Once a week or less

The purpose of HRI is to measure and assess health behavior; it is not necessary to define what "zero order health behavior" means in order to do so. The HRI is used to assess health behavior and mainly to compare individuals with one another (Pusley & Lawlach, 1986). A special feature of this program allows for appropriate referral personnel, such as a school nurse or counselor, to be included on the printout for high risk teens needing assistance (Pursley & Lambach, 1986). Current trends suggest that the use of HRAs by school health and safety educators will increase.

HRAs and School Children

The use of HRAs is most appropriate in settings where students receive long-term and comprehensive health education (Wagner, et al., 1982; Hyner & Welby, 1985; Petosa, et al., 1986). Doerr and Hutchins (1981), in their review of the technical characteristics of HRA instruments and behavioral change motivation abilities, state that individuals given a health risk assessment within a supportive educational environment do better than individuals exposed to only the printed results of a health risk appraisal.

Petosa, et al. (1986) outline the following recommendations for educators planning to use HRA as part of a comprehensive health education program for school-age children:

1. Health educators should evaluate carefully the scientific accuracy of the HRA they are considering for use in the classroom.

2. Students should be instructed regarding the assumptions, scientific bases, and limitations of HRAs so that they may make informed decisions regarding those lifestyle recommendations provided to them by the HRA printout.

3. Health educators should consider seriously the educational value of HRA for children in elementary grades, especially when risk ages are calculated. Degree of risk or a "risk score" may be more appropriate. Students who cannot comprehend the basic concepts should not be required to complete an HRA.

4. Risk reduction recommendations produced by HRAs should supplement, but not replace, students' decision-making regarding health-related practices. The health educator is responsible for providing a comprehensive picture of the complex relationship between lifestyle habits and health.

5. Lifestyle recommendations made for school-age children based on HRA assessment should be considered speculative and conditional.

6. Little is known about the intellectual, emotional, or motivational impact of HRAs, particularly with school-age populations. Negative reinforcement is a foundational assumption of the HRA approach to health-related behavior change. Negative reinforcement alone may

not be the most effective approach to long-term health-related behavior change.

7. Extensive validity and reliability studies are needed as HRAs are designed for school-age children (Petosa, et al., 1986, pp. 54-55).

The research on HRAs and HRA applications in the classroom alongside microcomputer technology for school-age populations is not definitive. This, indeed, represents a need for more sophisticated studies while at the same time "recognizes there is sufficient evidence to justify continuing interest in the development of the tool" (Doerr & Hutchins, 1981, p. 306).

IV. Summary

This chapter consists of a review of literature related to the study. It was divided into three categories. Part I contained a review of literature as it relates to health problems of school age children. The emphasis was on the major causes of mortality and morbidity among school age children. Part II consisted of review of literature related to an overview of HRAs focusing upon the theoretical, historical, and developmental use of HRAs with emphasis upon use in the educational setting. Microcomputer technology with regard to HRA use in the classroom was reviewed in Part III.

CHAPTER III

METHODOLOGY

I. Overview

The purpose of the study was to develop a specialized instrument designed to identify health and safety risk factors of school-age children in grades three, four, and five in selected Tennessee public schools during the school year 1989. This study also focused on the establishment of initial instrument reliability and internal consistency. The methodology used in the study is discussed in this chapter in the following sections: Instrumentation, Study Methodology, Pilot Study, Data Tabulation, Data Analysis, and Summary.

II. Instrumentation

An in-class microcomputer health and safety assessment program, "The Tennessee School Health and Safety Profile" (TSHSP) questionnaire, was designed, developed, and used to collect data. The questionnaire was developed through a joint cooperative effort among the Tennessee Department of Education, The Tennessee Department of Health and Environment-Health Promotion and Chronic Disease Control Section, and the Department of Health, Leisure and Safety at The University of Tennessee at Knoxville. The program consists of a microcomputer software program written and developed by senior HRA programmers from Healthtech, Inc. (in the state of Rhode Island) specially designed computer answer cards (which assure confidentiality and anonymity),

reusable questionnaires (including the format on 35 mm slides), and an in-class videotape production outlining the steps and procedures of the TSHSP. The "Tennessee School Health and Safety Profile" questionnaire and microcomputer program were designed for use with school-age children in grades three, four, and five.

Scaling and Scoring

The questionnaire consists of 58 items eliciting information pertaining to health and safety risk behavior. These risk behaviors include the following areas: demographics, weight, diet and eating habits, dental hygiene, physical fitness, substance use, tobacco use, bicycle and seat belt safety, home fire safety, childhood growth and development, AIDS information, self-esteem and self acceptance, water safety and hazardous activities (SHEE, 1985; HRI, 1985; Fortune, 1988).

The TSHSP is comprised of independent items whereby a student participant's response to an item is unrelated to her response to another item. The student responds to each item freely with a range of two or more responses from which she can choose one (Kerlinger, 1986; Groulund, 1985). There are two general forms of independent agreement-disagreement items utilized in the TSHSP: (1) those permitting one of two possible responses; and (2) those permitting one of three or more possible responses. An example of an agreement-disagreement item (1) is:

#4. "Do you know hot to swim and stay afloat in water that is over your head?"

[1] Yes

[2] No

An example of an agreement-disagreement item (2) is:

#37. "How often do you brush your teeth?"

[1] Twice a day or more [3] Not every day

[2] Once a day [4] Almost never

The students chose one of the supplied responses to self-report their behavior (see Appendix B).

The scoring system of the TSHSP yields interpretable and quantitative data congruent with the scoring system and capable of scaled interpretation. In item #1, "Do you wear a seatbelt when you ride in a car or truck?"--

[1] Yes, all the time [3] Almost never

[2] Sometimes I do

A student responding [1] would score a +3 on safety. A student responding [2] would score a +2 on safety (see Appendix C). A student responding [3] would score a +0 on safety, and, as a unique feature of the TSHSP, a safety message would be signaled in the software program to print the following message on the student's printout: "ALWAYS WEAR SEATBELTS. They may save your life!" The weighted safety responses yield a maximum of 30 points. Likewise, the weighted health responses yield a maximum of 70 points. Students taking the TSHSP are able to score 100 points based on self-reported responses to the weighted health and safety items.

After the questionnaire had been completed by the student, the data were entered into the computer through the specially designed

computer answer cards read by the optical mark reader, which eliminated the reading of the students' response by anyone other than the student respondent. The optical mark reader (OMR) was linked to the serial port of an in-class lap-top computer. Each student participant then received immediate feedback regarding health and safety practices using a weighted numerical score (based on 100). Individual scores were then illustrated by three separate bar graphs denoting a safety score, a health score, and a total overall score. These were followed by 1-13 short messages identifying helpful and unhelpful health and safety practices based upon the students' self reporting (see Appendix A). The software program provided on-site frequency tabulation through the menu selection including three summary reports designed for classroom teachers and school administrators.

Efforts were made to establish the validity of the instrument. During the development stage of the TSHSP program, a round table forum involving a panel of experts in the health and safety areas included in the questionnaire was held. Health educators, physicians, school nurses, and professionals from the Tennessee Department of Education, the Tennessee Department of Health and Environment-Health Promotion and Chronic Disease Control Section, and the Department of Health, Leisure and Safety at The University of Tennessee at Knoxville designed the initial items for inclusion in the questionnaire and reviewed them for accuracy and comprehensiveness. Following revision of the questionnaire pertaining to the length, format, and readability, the completed instrument was field tested. A focus group consisting of a

classroom of fourth grade students evaluated the length, format, readability, and comprehensiveness of the instrument. A subsequent revision was completed which included the students' critique, evaluation, comments and suggestions. After careful jurored evaluation of the questionnaire, the completed instrument was pilot-tested in April, 1989, and retested in May, 1989. The complete implementation of the TSHSP questionnaire in randomly selected Tennessee public schools took place in the months of October, November and December of 1989.

III. Subjects and Data Collection

Researchers in the Department of Health, Leisure and Safety at The University of Tennessee at Knoxville along with the Tennessee Department of Health and Environment-Health Promotion and Chronic Disease Control Section designed the sampling procedure and collected the data during the 1989-90 school year (October 30, 1989 to December 6, 1989). The sample consisted of third, fourth, and fifth grade students from 16 randomly selected Tennessee public schools from across the state. A total of 986 third, fourth, and fifth grade students comprised the sample size. The population consisted of the 1989-90 school enrollment of third, fourth, and fifth grade students across the state of Tennessee. Accordingly, the study population consisted of 986 students; 457 females and 529 males, 733 white and 253 nonwhite students, 443 students from urban areas and 543 students from rural areas, and 307 third graders, 340 fourth graders, and 339 fifth graders.

The sixteen public schools were randomly selected as a representative sample of third, fourth and fifth grade students across the state of Tennessee. The random selection of the schools was based upon the following criteria: (1) The three (3) major grand geographical divisions of the state of Tennessee (East, Central, and West); (2) The number of inhabitants in a county (greater than 100,000; 50,000-99,999; 25,000-49,999; 10,000-24,999; and less than 10,000) using U.S. Office of Management and Budget (1985), and U.S. Department of Commerce, Bureau of the Census (1980 and 1987) data; and (3) The inclusion of schools which held grades three, four, and five within the same school facility. (This delimitation was due to the need for close proximity of classrooms during data gathering and assessment.) Using the table of random numbers, fifteen separate counties were randomly selected--one county from each of the three grand divisions and five categories based on the number of inhabitants within the county. Hence, a three-by-five random selection incorporating fifteen counties was determined. One school with intact third, fourth and fifth grades was randomly selected from each of the fifteen counties state-wide. One classroom each of third, fourth, and fifth grades was randomly selected from each school. A total of 45 classrooms was included in the state-wide assessment. It was noted, however, that one school with a fifth grade not intact with the third or fourth grades in the same facility was included in the study. The only fifth grade classrooms within the county were located in a separate building as part of the junior high school. This fifth grade classroom comprised the sixteenth school in the study.

The "Tennessee School Health and Safety Profile" questionnaire was administered with representatives from each county health department whose school was randomly selected. Health educators and school nurses from the Tennessee Department of Health and Environment-Health Promotion and Chronic Disease Control Section were present for the administration of the TSHSP. Permission to administer the questionnaire was obtained from the Commissioner of the Department of Education in Tennessee, the Commissioner of the Department of Health and Environment in Tennessee, the superintendents from each county or city school district, and from the principal of each school.

The data collection procedures were outlined and explained to the students through the viewing of an eight minute instructional videotape written and produced by the Department of Health, Leisure and Safety and the Center for Video and Photography at The University of Tennessee at Knoxville. The following information was given:

1. An explanation on the Tennessee School Health and Safety study.
2. Explanation of how to complete the "Tennessee School Health and Safety Profile" questionnaire.
3. The student subjects' anonymity and confidentiality were assured.

The videotape was used to introduce the study and to establish a standardized set for each of the third, fourth and fifth grade classrooms assessed state-wide.

IV. Pilot Study

During the Spring of 1989 (April 6 and 7 and May 10 and 17), the "Tennessee School Health and Safety Profile" questionnaire was pilot tested in six fourth grade classrooms; three in a predominantly nonwhite urban grade school and three in a predominantly white urban grade school. Both schools were in a medium size southeastern city school system. The pilot study was conducted in order "to document the value of computerized health risk assessment in two dissimilar schools" (Pursley, Neutens, Bolton, and Dewey, p. 11, 1987; Fortune, p. 41, 1988). Questionnaires were administered to a sample consisting of 160 fourth grade students. Health educators from the Department of Health and Environment-Health Promotion and Chronic Disease Control Section were present in the classrooms to document and critique the TSHSP study and to facilitate recommendations for improvement.

The study population of the predominantly white urban grade school consisted of 94 (58.7%) respondents, 56 (59.6%) females and 38 (40.4%) males. This study population had a 82.2 percent white and a 13.8 percent nonwhite student population. The study population of the predominantly nonwhite urban grade school consisted of 66 (41.3 percent) students, 35 (53.0 percent) females, and 31 (47.0 percent) males. This study population had a 13.6 percent white and a 86.4 percent nonwhite student population.

Each of the three classrooms of fourth graders in both schools were introduced to the TSHSP study by the videotape message. The students were given identical questionnaires and were assured

confidentiality and anonymity through the use of the optical mark reader and individual student computer answer cards. An in-class lap-top computer, optical mark reader, videotape and VCR and questionnaires were present in each of the six classrooms assessed. Students received immediate feedback through the printout which contained their own individual health and safety profile scores based upon self-reported health and safety behaviors.

The results of the pilot study disclosed the following information: (1) the mean health scores were different between the students from a predominantly white urban grade school (78.97) and predominantly nonwhite urban grade school (71.89), with scores ranging from 56 to 92 and 44 to 88, respectively; (2) the variance was greater among the students from the predominantly nonwhite school (standard deviation--9.24) than the variance of the students from the predominantly white school (standard deviation--7.61); (3) a higher percent (54.3%) of students from the predominantly white school were categorized into the good category than the percent (18.2%) of students from the predominantly nonwhite school, while a much higher percent (31.8%) of students from the predominantly nonwhite school were in the risky category than the percent (10.6%) of students from the predominantly white school. A higher percent (3.0%) of the students from the predominantly nonwhite school were in the hazardous category while a higher percent (2.1%) of the students from the predominantly white school were in the excellent category. The percent of students in the fair category were 33 percent for the predominantly white school

and 47.0 percent for the predominantly nonwhite school; (4) these findings were significant at the .001 level of significance when chi square was applied; (5) based on the findings, it seems that students in both the predominantly white and nonwhite schools reveal the need for additional health and safety education related to exercise, dental hygiene, AIDS information, and home fire safety; (6) additionally, both student populations presented a striking percentage of students who either sometimes or often have felt that life was not worth living, with 36 percent of the students reporting this in the predominantly white school and 55 percent in the predominantly nonwhite schools; (7) and lastly, a greater percent (36%) of students from the predominantly nonwhite school did not know how to swim.

In order to match test and retest results, the fourth grade students were asked to place their initials and those of their classroom teacher on the reverse side of their answer card. These cards were collected separately from the questionnaires in order to maintain confidentiality. After matching test and retest computer answer cards, the students' initials were removed.

Based upon the findings from the two dissimilar schools, the following conclusions were inferred: (1) "Microcomputer programs are useful for research, assessment, and intervention applications in connection with school health programs" (Pursley, et al., p. 15, 1987; Fortune, p. 43, 1988); (2) ". . . microcomputer programs can be used to identify differences between populations with known differences of health status" (Pursley, et al., p. 14, 1987; Fortune, p. 43, 1988);

and (3) ". . . there is sufficient evidence to justify continuing interest in the development of the tool" (Doerr and Hutchins, p. 306, 1981).

V. Pilot-Study Test-Retest

According to Petosa, et al. (1986), extensive validity and reliability studies are needed as health risk appraisals are designed for school-age children. However, the research on HRAs and their application in the classroom alongside microcomputer technology for school-age populations is not definitive. Operationally, two methods of estimating reliability for the "Tennessee School Health and Safety Profile" questionnaire were employed: test-retest and internal consistency. Test-retest reliability coefficients were obtained using Pearson Product-Moment Correlation Coefficient for safety, health and overall total scores by comparing pilot study test-retest scores in safety, health, and those overall. Internal consistency measures were employed with data generated by the pilot study. Cronbach Coefficient Alpha was applied to health and safety items to test for item homogeneity.

Procedures

Both schools were revisited approximately four weeks following the initial pilot test. However, only two fourth grade classrooms from each of the two schools were reassessed due to the time constraints expressed by school officials from both schools. The TSHSP procedures were repeated in these four classrooms.

Test-Retest Measurements

The test-retest reliability of the "Tennessee School Health and Safety Profile" questionnaire was determined by comparing the responses from the first questionnaire administration (April 6 and 7) with the second administration (May 10 and 17) among the four classrooms of fourth grade students from two dissimilar schools. Correlation coefficients were computed for health scores, safety scores, and overall total scores using the Statistical Analysis System (SAS) at the Computer Center at The University of Tennessee at Knoxville. Pearson Product-Moment Correlation Coefficient for health, safety, and overall total scores are listed in Table 1.

Table 1. Test-Retest Reliability Results Based on Pearson Product-Moment Correlation Coefficient (N=85).

Content Area	r
Test-Retest Total Scores	.62
Test-Retest Health Scores	.63
Test-Retest Safety Scores	.32

Internal Consistency Measurements

Questionnaire items utilized in the scoring of health behaviors were placed in the category of health. Items utilized in the scoring of safety behaviors were placed in the category of safety. Internal consistency reliability coefficients were computed for health items and

safety items using the Statistical Analysis System (SAS) at the Computer Center at The University of Tennessee at Knoxville. Cronbach Coefficient Alpha was applied to health and safety groups and the results are listed in Table 2 and Table 3.

The dotted line in Table 2 indicates that if item #2 were deleted, the coefficient alpha of the safety category as a whole would increase from .50 to .51. Conversely, if item #1 were deleted, the coefficient alpha of the safety category as a whole would decrease from .50 to .44.

The dotted line in Table 3 indicates that if items #12, #24, #33, #34, and #44 were deleted, the coefficient alpha of the health category as a whole would increase from .61 to .63; .61 to .62; .61 to .63; .61 to .64; and .61 to .63, respectively.

Discussion

Potential sources contributing to low reliability in the test-retest safety scores of the "Tennessee School Health and Safety Profile" questionnaire include:

1. Too few safety items may have been written. With few items, chance error looms large; conversely, with more items, chance error looms less large (Kerlinger, 1986). More items would also increase the probability of accurate measurement.

2. Items may be ambiguous. An ambiguous item permits error variance to permeate because students may interpret the item differently. For example:

#6 "If a good friend dared you to do something dangerous or bad, what would you do?

Table 2. Internal Consistency Correlation Analysis Based on Cronbach Coefficient Alpha for Safety Items (N=160).

Deleted Item		Cronbach Coefficient Alpha
#1	Do you wear a seat belt?	.44
#3	Carry a knife?	.50
#4	Do you know how to swim?	.48
#5	Home alone without adult supervision?	.46
#6	Being dared to do something dangerous by a friend?	.48
#47	Do you have smoke alarm in home?	.49
#48	Do you have a fire escape plan in home?	.47
#49	In a vehicle with a driver who had been drinking?	.47
#50	Do you know about emergency 911?	.47
#2	Do you wear a helmet when bike riding?	.51

Estimated category r = .50

Table 3. Internal Consistency Correlation Analysis Based on Cronbach Coefficient Alpha for Health Items (N=160).

Deleted Item		Cronbach Coefficient Alpha
#9	How often exercise and play?	.59
#11	How often get enough sleep?	.59
#13	Ever used chewing tobacco?	.61
#16	Ever used alcohol?	.58
#18	Ever used marijuana/cocaine?	.59
#20	Are you pleased with your body?	.61
#21	Do you like yourself?	.58
#22	Who do you talk to when you have a problem?	.60
#25	Ever felt like life not worth living?	.60
#27	How often eat breakfast?	.58
#29	How often eat lunch from cola/candy machines?	.59
#30	How often eat junk food?	.60
#31	How often eat fast food?	.60
#35	How often eat fruits/vegetables?	.58
#36	How often eat breads/cereals?	.60
#37	How often brush teeth?	.59
#38	How often visit the dentist?	.60
#39	How often floss teeth?	.61
#12	Ever smoked cigarettes?	.63
#24	Ever felt left out from friends?	.62
#34	How often eat fish, chicken, turkey?	.64
#44	Ever heard of AIDS?	.63

Estimated category r = .61

#3 "Do you carry a knife?"

Student interpretation of "something dangerous or bad" in Item #8 or "carry" in Item #3 would tend to be random, and according to Kerlinger (1986), would increase error variance and decrease reliability.

3. Other sources contributing to instrument unreliability may be poor recall by student respondent of the specific content.

#27 "How often do you eat breakfast?"

#34 "How often eat fish, chicken, turkey?"

4. The student's perception of confidentiality and the social sensitivity of some of the items will influence reliability.

#13 "Have you ever chewed tobacco?"

#17 "Has anyone ever asked you to try marijuana (pot), cocaine or crack?"

Even when anonymity and confidentiality are ensured, students may still not understand the importance of the data gathered and if the study is deemed important enough to the extent that the student may be willing to sacrifice some privacy (Rubinson and Neutens, 1987).

Lastly, Ferguson and Takane (1989) note that regardless of the time interval separating the initial test and retest, varying environmental conditions such as noise, temperature, and home life may affect the result obtained. Varying physiological factors such as fatigue, hunger, and illness may exert an influence. Brown (1970) suggests that the most difficult source of measurement error to evaluate and control are those inherent in the test-taker (Hill, 1989).

The correlation analysis Cronbach Coefficient Alpha, when applied to both the health and safety item categories yielded the following items that, if deleted, would increase the homogeneity of the categories of health and safety:

#2 "Wearing a helmet when bike riding?" - safety

#12 "Ever smoked cigarettes?" - health

#24 "Ever felt left out from your friends?" - health

#33 "How often eat meat (bologna, hot dogs)?" - health

#34 "How often eat fish, chicken, turkey?" - health

#44 "Have you ever heard of AIDS?" - health

A potential source contributing to the unreliability and inaccuracy for interpretation of the homogeneity of the health and safety items appears to be the moderate to low variability among the observations for these items. According to Glass and Hopkins ". . . the greater the variability among the observations, the greater the value of r" (1984, p. 92). For item #12, 97 percent of the students responded "never" to the item. This item had such limited variance to correlate.

However, for the establishment of baseline data and the identification of major health and safety risk behaviors among third, fourth and fifth grade students, items #2, #12, #24, #33, #34 and #44 were included in the state-wide assessment.

VI. Data Tabulation

After the TSHSP questionnaire was completed by the students, the data were entered into the computer through the optical mark reader linked to the serial port of the microcomputer. Immediate printouts containing safety, health, and overall total scores were provided. Positive health and safety behaviors were identified along with recommended behavioral changes for each student. Students could achieve a maximum of 30 points on safety, 70 points on health, and an overall total of 100 points. The calculated scores placed the students in one of the following health and safety risk categories: excellent (90-100), good (80-89), fair (70-79), risky (50-69), and hazardous (0-49).

VII. Data Analysis

The primary statistical method used to describe the students' health and safety risk behaviors was to compute the questionnaire responses in terms of percentages and frequencies. The mean, mode, and standard deviation of the health and safety risk scores were calculated. Cross tabulations were constructed on the following variables: grade (three, four and five), gender (male and female), geographical area (urban and rural), race (white and nonwhite), and health and safety risk categories (excellent, good, fair, risky and hazardous).

Chi-square was utilized to determine whether observations of health and safety risk behaviors between and within groups were

statistically significant. The Chi-square coefficient was calculated using health and safety risk categories versus gender, health and safety risk categories versus grade, health and safety risk categories versus race, and health and safety risk categories versus geographical area. The Kolmogorov-Smirnov one sample test was implemented to determine whether the distribution of health and safety risk scores was a normal distribution. The Analysis of Variance (ANOVA) was used in determining significance among the set of means for third, fourth, and fifth grade health and safety risk scores when the following assumptions were met: (1) randomness, (2) normality, (3) independent samples, and (4) homogeneity of variance. Bartlett's test for homogeneity of variance for independent samples was used. The non-parametric Kruskal-Wallis One-Way-Analysis of Variance (or H test--equivalent to Chi-square) was used when the ANOVA could not be applied to independent samples when the assumptions of randomness, independence, normality or homogeneity were not satisfied. The .05 level of significance was used as the decision rule governing all statistical tests and applications.

VIII. Summary

In 1989, the Tennessee Department of Health and Environment-Health Promotion and Chronic Disease Control Section, along with the Department of Health, Leisure and Safety at The University of Tennessee at Knoxville, initiated a research project to design and develop an instrument to collect data on the health and safety risk behaviors of

third, fourth and fifth grade students in Tennessee. The role of the researcher was to collaborate jointly with the Tennessee Department of Health and Environment-Health Promotion and Chronic Disease Control Section and the Department of Health, Leisure and Safety at The University of Tennessee at Knoxville, in the design and development of the instrument, the videotape production, the state-wide random sampling methodology and procedures, the gathering of data statewide, and the analysis of the data. Presentation of the findings in documentary form to the Tennessee Department of Health and Environment-Health Promotion and Chronic Disease Control Section was afforded upon completion of the research study.

The study sought to establish the initial reliability and internal consistency of the instrument and to identify major health and safety risk factors among Tennessee third, fourth, and fifth grade students. The sample under study was randomly selected from sixteen schools located in fifteen different counties also randomly selected from west, central, and east Tennessee. The type of sampling plan followed was cluster sampling. Tests of significance of difference involved Chi-square, Kolmogorov-Smirnov one sample test, ANOVA, and Kruskal-Wallis One-Way Analysis of Variance (H test--equivalent to Chi-square). The .05 level of significance was used as the decision rules governing statistical tests conducted in the research.

CHAPTER IV

ANALYSIS OF THE DATA

I. Introduction

The chapter was designed to present and analyze data that were collected through the administration of an in-class computerized health and safety risk questionnaire entitled: "The Tennessee School Health and Safety Profile." The purpose of the research effort was to establish initial reliability of the instrument and to identify health and safety risk factors for school-age children attending selected Tennessee public schools as third, fourth or fifth graders.

The data were collected from 986 students during the school year 1989-90. The data were coded and entered into the Virtual Address Extension (VAX) program at The University of Tennessee Computer Center and analyzed with the Statistical Analysis System (SAS). Data were exported from the "Tennessee School Health and Safety Profile" software program and imported into Epi info (version 4.0) for tabulation and analysis.

The chapter is organized into the following sections: (1) The Introduction, (2) Demographic Description of the Sample, (3) Data Description of Health and Safety Risk Scores, (4) Data Description of Health and Safety Risk Categories, (5) Data Description of Selected Health and Safety Risk Factors, (6) Analysis of Hypotheses, (7) Summary of the Data, and (8) Subscale Analysis.

II. Sample Description

Race

The sample consisted of 733 white students or 74.3 percent, 154 black students or 15.6 percent, and 99 students (or 10.0%) were classified as others. The students classified as others included three Hispanics, ten Asians, fifty-four Native American Indians, and thirty-four students indicated other for their race identification. The description of the sample by race is presented in Table 4. The number of Hispanic, Asian, Native American Indian, and other respondents were combined with those of the black students. The data were categorized as nonwhite students. The terms white and nonwhite were used throughout the text when referring to race. In comparing the study population with Tennessee's population of children under 18 in 1988, Tennessee's children under 18 were 77.9 percent white and 22.1 percent nonwhite.

Gender

The sample was composed of 457 female students or 46.3 percent of the total number of participants while 529 or 53.7 percent of the total number of participants were male students. This information is presented in Table 5. In comparing the study population with Tennessee's population of children under 18 in 1988, Tennessee's children under 18 were 51.3 percent male and 48.7 percent female.

Table 4. Number and Percent of Sample By Race and Gender (N=986).

Category	Combined		Female		Male	
	Number	Percent	Number	Percent	Number	Percent
Race						
White	733	74.3	336		397	
Black	154	15.6	82		72	
Hispanic	3	0.3	0		3	
Asian	10	1.0	2		8	
Indian	54	5.5	22		32	
Other	32	3.2	15		17	
TOTAL	986	100.0	457		529	
Race						
White	733	74.3	336	34.1	397	40.3
Black	154	15.6	82	8.3	72	7.3
Other	99	10.0	39	3.9	60	6.1
TOTAL	986	99.9*	457	46.3	529	53.7

* = Due to rounding error.

Table 5. Number and Percent of Sample by Grade and Gender (N=986).

Category	Category		Female		Male	
	Number	Percent	Number	Percent	Number	Percent
Third Grade	307	31.1	146	14.8	161	16.3
Fourth Grade	340	34.5	164	16.6	176	17.9
Fifth Grade	339	34.4	147	14.9	192	19.5
TOTAL	986	100.0	457	46.3	529	53.2

Grade

A total of 307 (31.1%) third grade students were surveyed in Tennessee public schools. A total of 340 (34.5%) students were fourth graders and a total of 339 (34.4%) students were fifth graders. This distribution is shown in Table 6. Of the 307 third grade students, 146 (47.6%) were females and 161 (52.4%) were males. Of the 340 fourth grade students, 164 (48.2%) were females and 176 (51.8%) were males. Of the 339 fifth grade students, 147 (43.4%) were females and 192 (56.6%) were males.

Geographical Area

Of the 986 students in the study population, 443 (44.9%) attended schools in urban areas and 543 (55.9%) attended schools in rural areas. The distribution is presented in Table 7. In comparing the study population with the state population, Tennessee is 60.4% urban and 39.6% rural.

III. Summary of Health and Safety Risk Scores

Data Analysis of health and safety risk scores was based on an in-class health and safety risk questionnaire which consisted of 50 items plus 8 demographic items (questionnaire shown in Appendix B). The questionnaire included the following areas: (1) safety items consisting of ten questions, (2) exercise and fitness consisting of four questions, (3) alcohol and other drugs comprising nine questions, (4) self esteem consisting of six questions, (5) eating habits and diet comprising eleven items, (6) dental hygiene consisting of five items,

Table 6. Number and Percent of Sample According to Grade (N=986).

Grade	Number	Percent
Third	307	31.1
Fourth	340	34.5
Fifth	339	34.4
TOTAL	986	100.0

Table 7. Number and Percent of Sample According to Geographical Area (N=986).

Geographical Area	Number	Percent
Urban	443	44.9
Rural	543	55.1
TOTAL	986	100.0

(7) family life consisting of three questions, and (8) AIDS education consisting of two questions.

In order to calculate the health score, the values of each weighted response were used to determine a final score. To calculate the safety score, the value of each weighted response was used to determine a final score. The final overall score was determined through the combined weighted scores in safety and health (see Appendix C for scoring of each item).

The health and safety scores of the student respondents were arranged according to frequency and percentage distribution. The mean score, standard deviation, mode and range were computed and are shown in Table 8. Health and safety risk scores ranged from 18 to 97 points with a range of 79. The mean health and safety risk score was 74.31 with a standard deviation of 10.05 and a mode of 75. The results of the research study indicated that on the average, the school-age children (third, fourth and fifth graders) in the state of Tennessee fall in the fair health and safety risk category.

In order to determine whether the distribution of the health and safety risk scores was a normal distribution, the Kolmogorov-Smirnov (K-S) one-sample test was applied. The following null hypothesis was tested:

H_0: There is a normal distribution of health and safety risk scores among the students.

H_1: The distribution of health and safety risk scores is a non-normal distribution among the students.

Table 8. Summary of Respondents' Health and Safety Risk Scores.

Scores	Frequency	Percentage	Cumulative Frequency	Cumulative %
18	1	0.1	1	0.1
30	1	0.1	2	0.2
34	1	0.1	3	0.3
39	1	0.1	4	0.4
41	1	0.1	5	0.5
42	1	0.1	6	0.6
43	1	0.1	7	0.7
44	1	0.1	8	0.8
45	2	0.2	10	1.0
46	1	0.1	11	1.1
47	3	0.3	14	1.4
48	1	0.1	15	1.5
49	1	0.1	16	1.6
50	3	0.3	19	1.9
51	1	0.1	20	2.0
52	5	0.5	25	2.5
53	3	0.3	28	2.8
54	5	0.5	33	3.3
55	5	0.5	38	3.9
56	4	0.4	42	4.3
57	8	0.8	50	5.1
58	9	0.9	59	6.0
59	15	1.5	74	7.5
60	9	0.9	83	8.4
61	20	2.0	103	10.4
62	8	0.8	111	11.3
63	19	1.9	130	31.2
64	19	1.9	149	15.1
65	24	2.4	173	17.5
66	22	2.2	195	19.8
67	24	2.4	219	22.2
68	33	3.3	252	25.6
69	31	3.1	283	28.7
70	36	3.7	319	32.4
71	33	3.3	352	35.7
72	48	4.9	400	40.6
73	28	2.8	428	43.4
74	41	4.2	469	47.6
75	54	5.5	523	53.0
76	27	2.7	550	55.8
77	44	4.5	594	60.2
78	37	3.8	631	64.0
79	40	4.1	671	68.1
80	35	3.5	706	71.6
81	36	3.7	742	75.3
82	38	3.9	780	79.1
83	33	3.3	813	82.5
84	31	3.1	844	85.6
85	31	3.1	875	88.7
86	12	1.2	887	90.0
87	13	1.3	900	91.3
88	24	2.4	924	93.7
89	13	1.3	937	95.0
90	18	1.8	955	96.9
91	9	0.9	964	97.8
92	6	0.6	970	98.4
93	5	0.5	975	98.9
94	5	0.5	980	99.4
95	1	0.1	981	99.5
96	2	0.2	983	99.7
97	3	0.3	986	100.0

Total N = 986; maximum score = 97; minimum score = 18; mean score = 74.31; mode = 75; range = (18-97) = 79; standard deviation = 10.05.

The table K-S value was .0433 and the calculated K-S value was .150, which was greater than the table value (see Table 9). Thus, the null hypothesis was rejected at the .05 level of significance. The health and safety risk scores were not normally distributed among the students.

The mean score for female students was 75.83 with a standard deviation of 9.17 and a mode of 75. The health and safety risk scores ranged from 39 to 97 points (see Table 10). The male students' mean score was 72.99 with a standard deviation of 10.58. Health and safety risk scores ranged from 18 to 97 points.

Students in the third grade had a mean score of 76.5 with a standard deviation of 9.917 while third grade female students had a mean score of 78.37 with a standard deviation of 8.79 and third grade males had a mean score of 74.81 with a standard deviation of 10.58. The third graders, female third graders, and male third graders had modes of 82, 82, and 70, respectively. The range of health and safety risk scores for third graders was 18 to 97 points, while the health and safety risk scores for the female third graders ranged from 54 to 97 points and 18 to 94 points for male third grade students (see Table 10). The mean score for fourth graders was 74.03 with a standard deviation of 10.13, while the mean scores for female fourth graders and male fourth graders were 75.68 and 72.50, respectively, with standard deviation of 8.75 and 11.08, respectively. The fourth graders, female fourth graders, and male fourth graders had modes of 75, 83, and 75, respectively. The range of health and safety risk scores for fourth

Table 9. Kolmogorov-Smirnov Goodness-of-Fit Test (N=986).

Critical K-S Value	Calculated K-S Value
.0433	.150

K-S = .150, $p < .05$, n = 986.

Table 10. Summary of Mean Health and Safety Risk Scores, Mode, Range, and Standard Deviation (N=986).

Groups	Range	Mean	Mode	Standard Deviation
All Students	(18-97) = 79	74.31	75	10.05
Females	(39-97) = 58	75.83	75	9.17
Males	(18-97) = 79	72.99	72	10.587
Third Graders	(18-97) = 79	76.50	82	9.917
Females	(54-97) = 43	78.37	82	8.79
Males	(18-94) = 76	74.81	70	10.58
Fourth Graders	(30-97) = 67	74.03	75	10.13
Females	(54-93) = 39	75.68	83	8.75
Males	(30-97) = 67	72.50	75	11.08
Fifth Graders	(30-95) = 56	72.59	72	9.746
Females	(39-94) = 55	73.48	75	9.407
Males	(42-95) = 53	71.90	72	9.96
White Students	(41-97) = 56	74.56	75	9.573
Females	(48-97) = 49	76.44	75	8.80
Males	(41-97) = 56	72.97	72	9.91
Black Students	(34-94) = 60	74.28	77	10.63
Females	(39-94) = 55	74.13	77	10.10
Males	(34-94) = 60	74.45	77	11.27
Hispanic Students	(63-94) = 31	74.33	63	14.74
Females	0	0	0	0
Males	(63-91) = 28	74.33	63	14.74
Asian Students	(50-79) = 29	72.4	78	8.55
Females	(71-74) = 3	72.5	71	2.12
Males	(50-74) = 24	72.3	78	9.66
American Indian	(18-90) = 72	70.68	74	13.77
Females	(54-90) = 36	73.45	64	9.669
Males	(18-90) = 72	68.78	69	15.864
Other	(51-93) = 42	75.28	75	10.17
Females	(54-93) = 39	75.40	76	10.92
Males	(51-88) = 37	75.17	75	9.716
Urban Students	(30-97) = 67	75.71	82	9.73
Females	(39-97) = 58	76.40	83	9.40
Males	(30-97) = 67	75.06	75	9.93
Rural Students	(18-96) = 78	73.27	75	10.12
Females	(48-96) = 48	71.50	75	10.71
Males	(18-95) = 77	75.42	72	8.88

graders was 30 to 97 points, while the health and safety risk scores for the female fourth graders and male fourth graders ranged from 54 to 93 and 30 to 97, respectively (see Table 10).

The mean score for fifth graders was 72.59 with a standard deviation of 9.74, while the mean scores for female fifth graders and male fifth graders were 73.48 and 71.90, respectively, with standard deviation of 9.407 and 9.96, respectively. The fifth graders, female fifth graders, and male fifth graders had modes of 72, 75, and 72, respectively. The range of health and safety risk scores for the fifth graders was 39 to 95 points, while the health and safety risk scores for the female fifth graders and male fifth graders ranged from 39 to 94 and 42 to 95, respectively (see Table 10).

The mean score for white students was 74.56 with a standard deviation of 10.13, while the mean scores for female white students and male white students were 76.44 and 72.97, respectively, with standard deviation of 8.80 and 9.91, respectively. The white students, female and male white students had modes of 75, 75, and 72, respectively. The range of health and safety risk scores for white students was 41 to 97 points, while the health and safety risk scores for the female white students and male white students ranged from 48 to 97 and 41 to 97, respectively (see Table 10).

The mean score for black students was 74.28 with a standard deviation of 10.63, while the mean scores for female black students and male black students were 74.13 and 74.45, respectively, with standard deviation of 10.10 and 11.27, respectively. The black students, female

and male black students had modes of 77, 77, and 77, respectively. The range of health and safety risk scores for black students was 34-94 points, while the health and safety risk scores for the female black and male black student ranged from 39-94 and 34-94, respectively (see Table 10).

The mean score for Hispanic students was 74.33, with a standard deviation of 14.74. The mean score for male Hispanic students was 74.33. There were no female Hispanic students identified. The standard deviation for the male Hispanic students was 14.74. The male Hispanic students had a mode of 63 and a range of 63 to 94 points (see Table 10).

The mean score for Asian students was 72.4 with a standard deviation of 8.55, while the mean scores for female Asian students and male Asian students were 72.5 and 72.3, respectively, with standard deviation of 2.12 and 9.66, respectively. The Asian students, female and male Asian students had modes of 78, 71, and 78, respectively. The range of health and safety risk scores for Asian students was 50 to 79 points, while the health and safety risk scores for the female Asian and male Asian student ranged from 71-74 and 50-74, respectively (see Table 10).

The mean score for American Indian students was 70.68 with a standard deviation of 13.77, while the mean scores for female American Indian and male American Indian were 73.45 and 68.78, respectively, with standard deviation of 9.669 and 15.864, respectively. The American Indian students, female and male American Indian students, had

modes of 74, 64, and 69, respectively. The range of health and safety risk scores for American Indian students was 18 to 90 points, while the health and safety risk scores for female American Indian and male American Indian students ranged from 54 to 90 and 18 to 90, respectively (see Table 10).

The mean score for students identified as others was 75 with a standard deviation of 10.17, while the mean scores for female other and male other were 75.40 and 75.17, with standard deviation of 10.92 and 9.71, respectively. The other students, female and male other students had modes of 75, 76, and 75, respectively. The range of health and safety risk scores for others was 51 to 93 points, while the health and safety risk scores for female others and male others ranged from 54-93 and 51 to 88, respectively (see Table 10).

Students from rural areas and urban areas had mean scores of 73.27 and 75.71, respectively, with standard deviation of 10.12 and 9.73, respectively. Students from rural areas had a mode of 75 with scores ranging from 18 to 96 points. Students from urban areas had a mode of 82 with scores ranging from 30 to 97 points (see Table 10).

Female students from rural and urban areas had mean scores of 71.50 and 76.40, respectively, with standard deviations of 10.71 and 9.40, respectively. Female students from rural areas had a mode of 75 with scores ranging from 48 to 96 points. Female students from urban areas had a mode of 83 with scores ranging from 39-97 points (see Table 10).

Male students from rural and urban areas had mean scores of 75.42 and 75.06, respectively, with standard deviations of 8.88 and 9.93, respectively. Male students from rural areas had a mode of 72 with scores ranging from 18 to 95 points. Male students from urban areas had a mode of 75 with scores ranging from 30 to 97 points (see Table 10).

Analysis of the health and safety risk scores according to gender, grade, race, and geographical area revealed that on the average the groups were categorized into the fair health and safety risk category.

IV. Data Description of Health and Safety Risk Categories

In this section, the health and safety risk categories were presented and selected variables were analyzed by cross tabulation. Chi-square was applied to determine whether the findings were significant at the .05 level of significance. Those variables analyzed were grade, gender, race, and geographical area. These variables were cross tabulated with the health and safety risk categories (excellent, good, fair, risky, and hazardous).

The health and safety risk categories of all students combined are presented in Table 11. The students were categorized by percent into the following health and safety risk categories: 5.0 percent were in the excellent category, followed by 27.0 percent in the good category, 39.3 percent in the fair category, 27.1 in the risky category, and 1.6 percent in the hazardous category.

Table 11. Health and Safety Risk Categories of All Students (N=986).

Health Risk Categories	Frequency	Percent
Excellent (90-100)	49	5.0
Good (80-89)	266	27.0
Fair (70-79)	388	39.3
Risky (50-69)	267	27.1
Hazardous (0-49)	16	1.6
TOTAL	986	100.0

Cross tabulations of grade (third, fourth and fifth) with health risk categories are presented in Table 12. According to their health and safety risk scores, the following percent of third grade students was categorized into the four health and safety risk categories: 5.9 percent in the excellent category, 35.5 percent in the good category, 37.8 percent in the fair category, 19.5 percent in the risky category, and 1.3 percent in the hazardous category. According to their health and safety risk scores, the following percent of fourth grade students were categorized into the four health and safety risk categories: 4.7 percent in the excellent category, 27.1 percent in the good category, 37.6 percent in the fair category, 29.1 percent in the risky category, and 1.5 percent in the hazardous category. Based upon their health and safety risk scores, the fifth grade students were also categorized into the following health and safety risk categories: 4.4 percent was in the excellent category, 19.2 percent in the good category, 42.5 percent in the fair category, 31.9 percent in the risky category, and 2.0 percent in the hazardous category. There were not any major differences among the students in the excellent and hazardous categories. However, as the percentages of students in the good category decrease over the grade spans, the percentages of students in the fair category increases.

A larger percent of fifth grade students were categorized into the risky category than the third and fourth grade students. There was a significant difference between third, fourth and fifth grade students regarding the health and safety risk categories at the .05 level of significance when Chi-square was applied.

Table 12. Health and Safety Risk Categories by Grade.

Health and Safety Risk Categories	Third	Fourth	Fifth
Excellent (90-100)	18 (5.9%)	16 (4.7%)	15 (4.4%)
Good (80-89)	109 (35.5%)	92 (27.1%)	65 (19.2%)
Fair (70-79)	116 (37.8%)	128 (37.6%)	144 (42.5%)
Risky (50-69)	60 (19.5%)	99 (29.1%)	108 (31.9%)
Hazardous (0-49)	4 (1.3%)	5 (1.5%)	7 (12.0%)
TOTAL	307 (100%)	340 (100%)	339 (100%)

$x^2 = 28.96$, df = 6**, $p < .05$, N=986.

**Risky and Hazardous categories combined.
Expected cell frequencies < 5.

It should be noted that when the expected frequency in one or more cells was less than five, the collapsing of cells in a logical combination to qualify for a legitimate Chi-square application was done (Champion, 1981, p. 226).

The results of cross tabulations of gender (males and females) with health and safety risk categories are presented in Table 13. There was a notable difference between males and females in the excellent category, 3.4 percent for males, and 6.8 percent for females. For the good category, 24.4 percent consisted of male students compared to 30.0 percent of female students. A small percent difference was found for the male and female students whose health and safety scores placed them in the fair category (males--39.7%, females--38.9%). Twenty-nine percent of the male students were in the risky category compared to 23.9 percent of the female students. For the hazardous category, 2.6 percent consisted of the male students compared to .4 percent of female students. There was a significant difference between male and females regarding the health and safety risk categories at the .05 level of significance when Chi-square was applied.

The results of cross tabulation of race with health and safety risk categories are presented in Table 14. For the white students, 5.0 percent were in the excellent category, followed by 27.4 percent in the good category, 39.7 percent in the fair category, 26.6 percent in the risky category, and 1.2 percent in the hazardous category. The nonwhite students were categorized by percent into the following categories: 4.7 percent in the excellent category, 25.7 percent in the

Table 13. Third, Fourth, and Fifth Graders' Health and Safety Risk Categories According to Gender.

Health and Safety Risk Categories	Males	Females
Excellent (90-100)	18 (3.4%)	31 (6.8%)
Good (80-89)	129 (24.4%)	137 (30.0%)
Fair (70-79)	210 (39.7%)	178 (38.9%)
Risky (50-69)	158 (29.9%)	109 (23.9%)
Hazardous (0-49)	14 (2.6%)	2 (.4%)
TOTAL	529 (100%)	457 (100%)

$x^2 = 14.29579$, df = 3**, $p < .05$, N=986.

**Risky and Hazardous categories were combined.
Expected cell frequencies < 5.

Table 14. Health and Safety Categories by Race.

Health and Safety Risk Categories	White	Nonwhite
Excellent (90-100)	37 (5.0%)	12 (4.7%)
Good (80-89)	201 (27.4%)	65 (25.7%)
Fair (70-79)	291 (39.7%)	97 (38.3%)
Risky (50-69)	195 (26.6%)	72 (28.5%)
Hazardous (0-49)	9 (1.2%)	7 (2.8%)
TOTAL	733 (99.9%)*	253 (100%)

*Due to rounding error.

x^2 1.087, df = 3**, not significant at $p < .05$, N=986.

**Risky and Hazardous categories combined.
Expected cell frequencies < 5.

good category, 38.3 percent in the fair category, 28.5 percent in the risky category, and 2.8 percent in the hazardous category. No significant difference was found at the .05 level of significance when Chi-square was applied to the cross tabulations of race and health and safety risk categories.

Table 15 shows the cross tabulations of geographical area (urban and rural) with health and safety risk categories. For the students from urban areas, 6.5 percent were in the excellent category, followed by 30.2 percent in the good category, 38.1 percent in the fair category, 23.7 percent in the risky category and 1.4 percent in the hazardous category. The students from the rural areas were placed in the following health and safety risk categories according to percent: 3.7 percent in the excellent category, 24.5 percent in the good category, 40.5 percent in the fair category, 29.7 percent in the risky category, and 1.7 percent in the hazardous category. A higher percentage of students from urban areas were classified in the excellent category (6.5%) when compared to the students from the rural areas (3.7%). A higher percent of the students from rural areas (29.7%) were classified in the risky category when compared to the students from the urban areas (23.7%). When Chi-square was applied, there was a significant difference between students from urban and rural areas regarding the health and safety categories at the .05 level of significance.

Table 16 shows the cross tabulations of gender and grade (third grade males and third grade females) with the health and safety risk

Table 15. Health and Safety Risk Categories by Urban/Rural Subjects.

Health and Safety Risk Categories	Urban	Rural
Excellent (90-100)	29 (6.5%)	20 (3.7%)
Good (80-89)	134 (30.2%)	133 (24.5%)
Fair (70-79)	169 (38.1%)	220 (40.5%)
Risky (50-69)	105 (23.7%)	161 (29.7%)
Hazardous (0-49)	6 (1.4%)	9 (1.7%)
TOTAL	443 (99.9%)*	543 (100.1%)*

*Due to rounding error.

$x^2 = 10.69914$, df = 3**, $p < .05$, N=986.

**Risky and Hazardous categories combined.
Expected cell frequencies < 5.

Table 16. Third Grade Health and Safety Risk Categories by Gender.

Health and Safety Risk Categories	Third Grade Males	Third Grade Females
Excellent (90-100)	5 (3.1%)	13 (8.9%)
Good (80-89)	51 (31.7%)	58 (39.7%)
Fair (70-79)	66 (41.0%)	50 (34.2%)
Risky (50-69)	35 (21.7%)	25 (17.1%)
Hazardous (0-49)	4 (2.5%)	0 (0%)
TOTAL	161 (100%)	146 (99.9%)*

*Due to rounding error.

$x^2 = 8.562$, df = 3**, $p < .05$, N=307.

**Risky and Hazardous categories combined.
Expected cell frequencies < 5.

categories. There was a significant difference at the .05 level of significance between third grade male students and third grade female students regarding health and safety risk categories when Chi-square was applied. A higher percent (8.9%) of the third grade female students were in excellent category when compared to the third grade male students (3.1%). A higher percent (39.7%) of the third grade female students were in the good category than the third grade males (31.7%). However, a higher percent (41.0%) of the third grade male students were in the fair category than the third grade females (34.2%). A higher percent of third grade male students were classified into the risky category (21.7%) when compared to the females (17.1%). No third grade female students were in the hazardous category while 2.5 percent of the third grade males were classified into the hazardous category.

Table 17 shows the cross tabulations of fourth grade male students' scores and fourth grade female students' scores with the health and safety risk categories. No significant difference between the two gender groups was found regarding the health and safety risk categories at the .05 level of significance when Chi-square was applied.

Table 18 presents cross tabulations of fifth grade male students' scores and fifth grade female students' scores with the health and safety risk categories. No significant differences between the two gender groups was found regarding the health and safety risk categories at the .05 level of significance when Chi-square was applied.

Table 17. Fourth Grade Health and Safety Risk Categories by Gender.

Health and Safety Risk Categories	Fourth Grade Males	Fourth Grade Females
Excellent (90-100)	8 (4.6%)	8 (4.9%)
Good (80-89)	43 (24.4%)	49 (29.9%)
Fair (70-79)	63 (35.8%)	65 (39.6%)
Risky (50-69)	57 (32.4%)	42 (25.6%)
Hazardous (0-49)	5 (2.8%)	0 (0%)
TOTAL	176 (100%)	164 (100%

$x^2 = 2.849$, df = 3**, not significant at $p < .05$, N=340.

**Risky and Hazardous categories combined.
Expected cell frequencies < 5.

Table 18. Fifth Grade Health and Safety Risk Categories by Gender.

Health and Safety Risk Categories	Fifth Grade Males	Fifth Grade Females
Excellent (90-100)	5 (2.6%)	10 (6.8%)
Good (80-89)	35 (18.2%)	30 (20.4%)
Fair (70-79)	81 (42.2%)	63 (42.9%)
Risky (50-69)	66 (34.4%)	42 (28.6%)
Hazardous (0-49)	5 (2.6%)	2 (1.4%)
TOTAL	192 (100%)	147 (100.1%)*

*Rounding error.

$x^2 = 4.750$, df = 3**, not significant at $p < .05$, N=339.

**Risky and Hazardous categories combined.
Expected cell frequencies < 5.

Table 19 presents cross tabulations of third grade female students' scores and fourth grade female students' scores with the health and safety risk categories. No significant difference between the two gender groups was found regarding the health and safety risk categories at the .05 level of significance when Chi-square was applied.

Table 20 shows cross tabulations of fourth grade female students' scores and fifth grade female students' scores with the health and safety risk categories. No significant difference between the two gender groups was found regarding the health and safety risk categories at the .05 level of significance when Chi-square was applied.

Table 21 presents the cross tabulations of third grade female students' scores and fifth grade female students' scores with the health and safety risk categories. There was a significant difference between third grade female students and fifth grade female students regarding the health and safety risk categories at the .05 level of significance when Chi-square was applied. A higher percent of third grade female students (8.9%) were in the excellent category than the percent of fifth grade female students (6.8%). A higher percent of third grade female students (39.7%) were in the good category than the percent of fifth grade female students (20.4%). However, a greater percent of fourth grade female students (42.9%) were classified in the fair category when compared to the third grade female students (34.2%). Likewise, fourth grade female students had a higher percent (28.6%) classified in the risky category when compared to the third grade

Table 19. Female Health and Safety Risk Categories by Grades 3 and 4.

Health and Safety Risk Categories	Third Grade Females	Fourth Grade Females
Excellent (90-100)	13 (8.9%)	8 (4.9%)
Good (80-89)	58 (39.7%)	49 (29.9%)
Fair (70-79)	50 (34.2%)	65 (39.6%)
Risky (50-69)	25 (17.1%)	42 (25.6%)
Hazardous (0-49)	0 (0%)	0 (0%)
TOTAL	146 (99.9%)*	164 (100%)

*Due to rounding error.

x^2 = 7.1965, df = 3**, not significant at $p < .05$, N=310.

**Risky and Hazardous categories combined.
Expected cell frequencies < 5.

Table 20. Female Health and Safety Risk Categories by Grades 4 and 5.

Health and Safety Risk Categories	Fourth Grade Females	Fifth Grade Females
Excellent (90-100)	8 (4.9%)	10 (6.8%)
Good (80-89)	49 (29.9%)	30 (20.4%)
Fair (70-79)	65 (39.6%)	63 (42.9%)
Risky (50-69)	42 (25.6%)	42 (28.6%)
Hazardous (0-49)	0 (0%)	2 (1.4%)
TOTAL	164 (100%)	147 (100.1%)*

*Due to rounding error.

$x^2 = 3.9521$, df = 3**, not significant at $p < .05$, N=311.

**Risky and Hazardous categories combined.
Expected cell frequencies < 5.

Table 21. Female Health and Safety Risk Categories by Grades 3 and 5.

Health and Safety Risk Categories	Third Grade Females	Fifth Grade Females
Excellent (90-100)	13 (8.9%)	10 (6.8%)
Good (80-89)	58 (39.7%)	30 (20.4%)
Fair (70-79)	50 (34.2%)	63 (42.9%)
Risky (50-69)	25 (17.1%)	42 (28.6%)
Hazardous (0.49)	0 (0%)	2 (1.4%)
TOTAL	146 (99.9%)*	147 (100.1%)

*Due to rounding error.

$x^2 = 16.024$, df = 3**, $p < .05$, N=393.

**Risky and Hazardous categories combined.
Expected cell frequencies < 5.

female students (17.1%). No third grade female students were classified in the hazardous category, while the fourth grade female students with 1.4 percent were classified.

Table 22 presents cross tabulations of third grade male students' scores and fourth grade male students' scores with the health and safety risk categories. No significant difference between the two gender groups was found regarding the health and safety risk categories at the .05 level of significance when Chi-square was applied.

Table 23 shows cross tabulations of fourth grade male students' scores and fifth grade male students' scores with the health and safety risk categories. No significant difference between the two gender groups was found regarding the health and safety risk categories at the .05 level of significance when Chi-square was applied.

Cross tabulations of the third grade male students' scores and fifth grade male students' scores with the health and safety risk categories are presented in Table 24. There was a significant difference between the two gender groups regarding the health and safety risk categories at the .05 level of significance where Chi-square was applied. A higher percent (3.1%) of the third grade male students were in the excellent category than the percent of fifth grade male students (2.6%). A higher percent (31.7%) of third grade male students were classified in the good category when compared to the fifth grade male students (18.2%). Forty-one percent of the third grade male students were in the fair category compared to 42.2 percent of the fifth grade male students. However, a higher percent (34.4%) of

Table 22. Male Health and Safety Risk Categories by Grades 3 and 4.

Health and Safety Risk Categories	Third Grade Males	Fourth Grade Males
Excellent (90-100)	5 (3.1%)	8 (4.6%)
Good (80-89)	51 (31.7%)	43 (24.4%)
Fair (70-79)	66 (41.0%)	63 (35.8%)
Risky (50-69)	35 (21.7%)	57 (32.4%)
Hazardous (0-49)	4 (2.5%)	5 (2.8%)
TOTAL	161 (100%)	176 (100%)

$x^2 = 6.024$, df = 3**, not significant at $p < .05$, N=337.

**Risky and Hazardous categories combined.
Expected cell frequencies < 5.

Table 23. Male Health and Safety Risk Categories by Grades 4 and 5.

Health and Safety Risk Categories	Fourth Grade Males	Fifth Grade Males
Excellent (90-100)	8 (4.6%)	5 (2.6%)
Good (80-84)	43 (24.4%)	35 (18.2%)
Fair (70-79)	63 (35.8%)	81 (42.2%)
Risky (50-69)	57 (32.4%)	66 (34.4%)
Hazardous (0-49)	5 (2.8%)	5 (2.6%)
TOTAL	176 (100%)	192 (100%)

$x^2 = 3.683$, df = 3**, not significant at $p < .05$, N=368.

**Risky and Hazardous categories combined.
Expected cell frequencies < 5.

Table 24. Male and Health and Safety Risk Categories by Grades 3 and 5.

Health and Safety Risk Categories	Third Grade Males	Fifth Grade Males
Excellent (90-100)	5 (3.1%)	5 (2.6%)
Good (80-89)	51 (31.7%)	35 (18.2%)
Fair (70-79)	66 (41.0%)	81 (42.2%)
Risky (50-69)	35 (21.7%)	66 (34.4%)
Hazardous (0-49)	4 (2.5%)	5 (2.6%)
TOTAL	161 (100%)	192 (100%)

x^2 = 10.8678, df = 2**, $p < .05$, N=353.

**Excellent and Good categories combined.
Risky and Hazardous categories combined.
Expected cell frequencies < 5.

fifth grade male students were classified in the risky category compared to 21.7 percent of the third grade male students. Both groups were very similar in percent of male students in the hazardous category with 2.5 percent of the third grade male students and 2.6 percent of the fifth grade male students.

Table 25 presents cross tabulations of female students' scores from urban areas and female students' scores from rural areas with health and safety risk categories. There was no significant difference between female students from urban areas and female students from rural areas regarding the health and safety risk categories at the .05 level of significance when Chi-square was applied.

Cross tabulations of male students' scores from urban areas and male students' scores from rural areas with health and safety risk categories are shown in Table 26. When Chi-square was applied, there was no significant difference between male students from urban areas and male students from rural areas regarding the health and safety risk categories at the .05 level of significance.

Table 27 presents the cross tabulations of male students' scores from rural areas and female students' scores from rural areas with health and safety risk categories. There was a significant difference between the two gender groups at the .05 level of significance when Chi-square was applied. Rural female students had a higher percent (5.3%) classified into the excellent category compared with the rural male students (2.3%). A higher percent (27.5%) of rural female students were in the good category than the rural male students

Table 25. Female Health and Safety Risk Categories by Geographical Area.

Health and Safety Risk Categories	Urban Females	Rural Females
Excellent (90-100)	18 (8.5%)	13 (5.3%)
Good (80-89)	71 (33.5%)	67 (27.5%)
Fair (70-79)	72 (34.0%)	105 (43.0%)
Risky (50-69)	50 (23.6%)	58 (23.8%)
Hazardous (0-49)	1 (.5%)	1 (.4%)
TOTAL	212 (100.1%)*	244 (100%)

*Due to rounding error.

x^2 = 5.437919, df = 3**, not significant at $p < .05$, N=456.***

**Risky and Hazardous categories combined.
Expected cell frequencies < 5.

***N-1 error.

Table 26. Male Health and Safety Risk Categories by Geographical Area.

Health and Safety Risk Categories	Urban Males	Rural Males
Excellent (90-100)	11 (4.8%)	7 (2.3%)
Good (80-89)	63 (27.3%)	66 (22.1%)
Fair (70-79)	97 (42.0%)	115 (38.5%)
Risky (50-69)	55 (23.8%)	103 (34.4%)
Hazardous (0-49)	5 (2.2%)	8 (2.7%)
TOTAL	231 (100.1%)*	299 (100%

*Due to rounding error.

x^2 = 9.1882, df = 4, not significant at $p < .05$, N=530.**

**N-1 error.

Table 27. Rural Students' Health and Safety Risk Categories by Gender.

Health and Safety Risk Categories	Rural Males	Rural Females
Excellent (90-100)	7 (2.3%)	13 (5.3%)
Good (80-89)	66 (22.1%)	67 (27.5%)
Fair (70-79)	115 (38.5%)	105 (43.0%)
Risky (50-69)	103 (34.4%)	58 (23.8%)
Hazardous (0-49)	8 (2.7%)	1 (.4%)
TOTAL	299 (100%)	244 (100%)

$x^2 = 12.72763$, df = 3*, $p < .05$, N=543.

*Risky and Hazardous categories combined.
Expected frequencies < 5.

(22.1%). Forty-three percent of the rural female students were classified in the fair category compared to 38.5 percent of the rural male students. However, a higher percent (34.4%) of rural male students were classified into the risky category than the rural female students (23.8%). A higher percent (2.7%) of the rural male students were in the hazardous category than the percent of female students from rural areas (.4%).

Table 28 presents the findings of the cross tabulation of male students from urban areas and female students from urban areas with the health and safety risk categories. The findings for the two gender groups were not significant at the .05 level of significance when Chi-square was applied.

Table 29 shows the findings of the cross tabulation of white males' scores and nonwhite males' scores with the health and safety risk categories. The findings for the two groups were not significant at the .05 level of significance when Chi-square was applied.

Table 30 presents cross tabulations of white female students' scores and nonwhite female students' scores with the health and safety risk categories. The difference between the two groups regarding the health and safety risk categories was not significant at the .05 level of significance when Chi-square was applied.

In Table 31 cross tabulations of white male students' scores and white female students' scores with the health and safety risk categories are presented. A higher percent (7.1%) of white female students were in the excellent category than the percent for white

Table 28. Urban Students' Health and Safety Risk Categories by Gender.

Health and Safety Risk Categories	Urban Males	Urban Females
Excellent (90-100)	11 (4.8%)	18 (8.5%)
Good (80-89)	63 (27.3%)	71 (33.5%)
Fair (70-79)	97 (42.0%)	72 (34.0%)
Risky (50-69)	55 (23.8%)	50 (23.6%)
Hazardous (0-49)	5 (2.2%)	1 (.5%)
TOTAL	231 (100.1%)*	212 (100.1%)*

*Due to rounding error.

x^2 = 5.790976, df = 3**, not significant at $p < .05$, N=443.

**Risky and Hazardous categories combined.
Expected cell frequencies < 5.

Table 29. Male Students' Health and Safety Risk Categories by Race.

Health and Safety Risk Categories	White Males	Nonwhite Males
Excellent (90-100)	13 (3.3%)	5 (3.8%)
Good (80-89)	95 (23.9%)	34 (25.8%)
Fair (70-79)	157 (39.5%)	53 (40.1%)
Risky (50-69)	124 (31.2%)	34 (25.8%)
Hazardous (0-49)	8 (2.0%)	6 (4.5%)
TOTAL	397 (99.9%)*	132 (100%)

*Due to rounding error.

x^2 = .469, df = 2**, not significant at $p < .05$, N=529.

**Excellent and Good categories combined.
Risky and Hazardous categories combined.
Expected cell frequencies < 5.

Table 30. Female Students' Health and Safety Risk Categories by Race.

Health and Safety Risk Categories	White Females	Nonwhite Females
Excellent (90-100)	24 (7.1%)	7 (5.8%)
Good (80-89)	106 (31.6%)	31 (25.6%)
Fair (70-79)	134 (39.9%)	44 (36.4%)
Risky (50-69)	71 (21.1%)	38 (31.4%)
Hazardous (0-49)	1 (.3%)	1 (.8%)
TOTAL	336 (100%)	121 (100%)

$x^2 = 5.841525$, df = 3*, not significant at $p < .05$, N=457.

*Risky and Hazardous categories combined.
Expected cell frequencies < 5.

Table 31. White Students' Health and Safety Risk Categories by Gender.

Health and Safety Risk Categories	White Males	White Females
Excellent (90-100)	13 (3.3%)	24 (7.1%)
Good (80-89)	95 (23.9%)	106 (31.6%)
Fair (70-79)	157 (39.5%)	134 (39.9%)
Risky (50-69)	124 (31.2%)	71 (21.1%)
Hazardous (0-49)	8 (2.0%)	1 (.3%)
TOTAL	397 (99.9%)*	336 (100%)

*Due to rounding error.

x^2 = 18.38814, df = 3**, $p < .05$, N=733.

**Risky and Hazardous categories combined.
Expected cell frequencies < 5.

males (3.3%). White female students had a higher percent (31.6%) classified in the good category when compared to white male students (23.9%). There was not much difference between white female students and white male students classified in the fair category, 39.9 percent and 39.5 percent, respectively. White males, however, had a higher percent (31.2%) classified into the risky category when compared to the white female students (21.1%). Two percent of the white male students were in the hazardous category compared with 3 percent of the white female students. The differences between the two gender groups regarding the health and safety risk categories were significant at the .05 level of significance when Chi-square was applied.

Table 32 presents cross tabulation of nonwhite male students' scores and nonwhite female students' scores with the health and safety risk categories. The difference between the two gender groups regarding the health and safety risk categories was not significant at the .05 level of significance when Chi-square was applied.

Cross tabulations of third grade students' scores from rural areas and fourth grade students' scores from rural areas with the health and safety risk categories are presented in Table 33. There was a significant difference between the groups regarding the health and safety risk categories at the .05 level of significance when Chi-square was applied. A higher percent of the rural third grade students was in the excellent and fair categories (6.6% and 33.3%, respectively) than the rural fourth grade students (1.7% and 22.2%, respectively). A higher percent of the rural fourth grade students were in the fair and

Table 32. Nonwhite Students' Health and Safety Risk Categories by Gender.

Health and Safety Risk Categories	Nonwhite Males	Nonwhite Females
Excellent (90-100)	5 (3.8%)	7 (5.8%)
Good (80-89)	34 (25.8%)	31 (25.6%)
Fair (70-79)	53 (40.1%)	44 (36.4%)
Risky (50-69)	34 (25.8%)	38 (31.4%)
Hazardous (0-49)	6 (4.5%)	1 (.8%)
TOTAL	132 (100%)	121 (100%)

x^2 = .842837, df = 3*, not significant at $p < .05$, N=253.

*Risky and Hazardous categories combined.
Expected cell frequencies < 5.

Table 33. Rural Students' Health and Safety Risk Categories by Grades 3 and 4.

Health and Safety Risk Categories	Third Grade Rural	Fourth Grade Rural
Excellent (90-100)	11 (6.6%)	3 (1.7%)
Good (80-89)	56 (33.3%)	40 (22.2%)
Fair (70-79)	65 (38.7%)	75 (41.7%)
Risky (50-69)	34 (20.2%)	59 (32.8%)
Hazardous (0-49)	2 (1.2%)	3 (1.7%)
TOTAL	168 (100%)	180 (100.1%)*

*Due to rounding error.

x^2 = 12.44962, df = 2**, $p < .05$, N-348.

**Excellent and Good categories combined.
Risky and Hazardous categories combined.
Expected cell frequencies < 5.

risky categories (41.7% and 32.8%, respectively) than the rural third grade students (38.7% and 20.2%, respectively). There was not a major difference between third grade rural students and fourth grade rural students in the hazardous category, 1.2 percent and 1.7 percent, respectively.

Table 34 presents a cross tabulation of fourth grade students' scores from rural areas and fifth grade students' scores from rural areas with the health and safety risk categories. The difference between the two groups regarding the health and safety risk categories was not significant at the .05 level of significance when Chi-square was applied.

Table 35 shows cross tabulations of third grade students' scores from rural areas and fifth grade students' scores from rural areas with the health and safety risk categories. The differences between third grade rural students and fifth grade rural students regarding the health and safety risk categories were significant at the .05 level of significance when Chi-square was applied.

Cross tabulations of third grade students' scores from urban areas and fourth grade students' scores from urban areas with health and safety risk categories are presented in Table 36. The difference between the two groups regarding the health and safety risk categories was not significant at the .05 level of significance where Chi-square was applied.

Table 37 shows findings from the cross tabulation of fourth grade students' scores from urban areas and fifth grade students' scores from

Table 34. Rural Students' Health and Safety Risk Categories by Grades 4 and 5.

Health and Safety Risk Categories	Fourth Grade Rural	Fifth Grade Rural
Excellent (90-100)	3 (1.7%)	6 (3.1%)
Good (80-89)	40 (22.2%)	37 (19.0%)
Fair (70-89)	75 (41.7%)	80 (41.0%)
Risky (50-69)	59 (32.8%)	68 (34.9%)
Hazardous (0-49)	3 (1.7%)	4 (2.0%)
TOTAL	180 (100.1%)*	195 (100%)

*Due to rounding error.

x^2 = .3958138, df = 2**, not significant at $p < .05$, N=374.

**Excellent and Good categories combined.
Risky and Hazardous categories combined.
Expected cell frequencies < 5.

Table 35. Rural Students' Health and Safety Risk Categories by Grades 3 and 5.

Health and Safety Risk Categories	Third Grade Rural	Fifth Grade Rural
Excellent (90-100)	11 (6.6%)	6 (3.1%)
Good (80-89)	56 (33.3%)	37 (19.0%)
Fair (70-79)	65 (38.7%)	80 (41.0%)
Risky (50-69)	34 (20.2%)	68 (34.9%)
Hazardous (0-49)	2 (1.2%)	4 (2.0%)
TOTAL	168 (100%)	195 (100%)

$x^2 = 16.98977$, df = 3*, $p < .05$, N=363.

*Risky and Hazardous categories combined.
Expected cell frequencies < 5.

Table 36. Urban Students' Health and Safety Risk Categories by Grades 3 and 4.

Health and Safety Risk Categories	Third Grade Urban	Fourth Grade Urban
Excellent (90-100)	7 (5.0%)	13 (8.1%)
Good (80-89)	53 (37.6%)	52 (32.3%)
Fair (70-79)	53 (37.6%)	54 (33.5%)
Risky (50-69)	26 (18.4%)	40 (24.8%)
Hazardous (0-49)	2 (1.4%)	2 (1.2%)
TOTAL	141 (100%)	161 (99.9%)*

*Due to rounding error.

$x^2 = 3.30$, df = 3**, not significant at $p < .05$, N=302.

**Risky and Hazardous categories combined.
Expected cell frequencies < 5.

Table 37. Urban Students' Health and Safety Risk Categories by Grades 4 and 5.

Health and Safety Risk Categories	Fourth Grade Urban	Fifth Grade Urban
Excellent (90-100)	13 (8.1%)	9 (6.4%)
Good (80-89)	52 (32.3%)	29 (20.6%)
Fair (70-79)	54 (33.5%)	62 (44.1%)
Risky (50-69)	40 (24.8%)	39 (27.7%)
Hazardous (0-49)	2 (1.2%)	2 (1.4%)
TOTAL	161 (99.9%)*	141 (100%)

*Due to rounding error.

x^2 = 6.526028, df = 3**, not significant at $p < .05$, N=302.

**Risky and Hazardous categories combined.
Expected cell frequencies < 5.

urban areas with the health and safety risk categories. The differences between the two groups regarding the health and safety risk categories was not significant at the .05 level of significance when Chi-square was applied.

Cross tabulations of third grade students' scores from urban areas and fifth grade students' scores from urban areas with health and safety risk categories are shown in Table 38. There was a significant difference between the groups regarding the health and safety risk categories at the .05 level of significance when Chi-square was applied. Fifth grade students from urban areas had a higher percent of students (6.4%) in the excellent category than the percent of third grade students in urban areas (5.0%). A higher percent of third grade students from urban areas (37.6%) were classified in the good category compared to 20.6 percent of the fifth grade students from urban areas. However, the fifth grade students from urban areas had a higher percent of students in both the fair and risky categories, 44.1 percent and 27.7 percent, respectively, when compared to third grade students from urban areas, 37.6 percent and 18.4 percent, respectively. Both groups had 1.4 percent of their students in the hazardous category.

Table 39 presents a cross tabulation of third grade students' scores from urban areas and third grade students' scores from rural areas with the health and safety risk categories. The difference between the two groups regarding the health and safety risk categories was not significant at the .05 level of significance when Chi-square was applied.

Table 38. Urban Students' Health and Safety Risk Categories by Grades 3 and 5.

Health and Safety Risk Categories	Third Grade Urban	Fifth Grade Urban
Excellent (90-100)	7 (5.0%)	9 (6.4%)
Good (80-89)	53 (37.6%)	29 (20.6%)
Fair (70-79)	53 (37.6%)	62 (44.1%)
Risky (50-69)	26 (18.4%)	39 (27.7%)
Hazardous (0-49)	2 (1.4%)	2 (1.4%)
TOTAL	141 (100%)	141 (100%)

*Due to rounding error.

x^2 = 10.42801, df = 3**, $p < .05$, N=282.

**Risky and Hazardous categories combined.
Expected cell frequencies < 5.

Table 39. Third Graders Health and Safety Risk Categories by Urban/Rural Areas.

Health and Safety Risk Categories	Third Grade Urban	Third Grade Rural
Excellent (90-100)	7 (5.0%)	11 (6.6%)
Good (80-89)	53 (37.6%)	56 (33.3%)
Fair (70-79)	53 (37.6%)	65 (38.7%)
Risky (50-69)	26 (18.4%)	34 (20.2%)
Hazardous (0-49)	2 (1.4%)	2 (1.2%)
TOTAL	141 (100%)	168 (100%)

x^2 = .8389788, df = 3*, not significant at $p < .05$, N=309.**

*Risky and Hazardous categories combined.
Expected cell frequencies < 5.

**N+2 error.

Table 40 presents findings from the cross tabulation of third grade students' scores from urban areas and fourth grade students' scores from rural areas with the health and safety risk categories. A higher percent (5.0%) of third grade students from urban areas were classified in the excellent category when compared with the fourth grade students from rural areas (1.7%). Fourth grade students from rural areas had a lower percent (22.2%) of students in the good category when compared to the third grade students from urban areas (37.6%). Fourth grade students from rural areas had higher percentages of students in both the fair and risky category (41.7% and 32.8%, respectively) when compared with the third grade students from urban areas (37.6% and 18.4%, respectively). There as a significant difference between the groups regarding the health and safety risk categories at the .05 level of significance when Chi-square was applied.

Table 41 presents findings from the cross tabulation of third grade urban students' scores and fifth grade rural students' scores with the health and safety risk categories. A higher percent (37.6%) of third grade rural students were in the good category compared to the fifth grade rural students (19.0%). A higher percent (34.9%) of fifth grade rural students were in the risky category when compared with the third grade students from urban areas (18.4%). There was a significant difference between the groups regarding the health and safety risk categories at the .05 level of significance when Chi-square was applied.

Table 40. Third and Fourth Graders Health and Safety Risk Categories by Urban/Rural Areas.

Health and Safety Risk Categories	Third Grade Urban	Fourth Grade Rural
Excellent (90-100)	7 (5.0%)	3 (1.7%)
Good (80-89)	53 (37.6%)	40 (22.2%)
Fair (70-79)	53 (37.6%)	75 (41.7%)
Risky (50-69)	26 (18.4%)	59 (32.8%)
Hazardous (0-49)	2 (1.4%)	3 (1.7%)
TOTAL	141 (100%)	180 (100.1%)*

*Due to rounding error.

$x^2 = 14.91334$, df = 2**, $p < .05$, N=321.

**Excellent and Good categories combined.
Risky and Hazardous categories combined.
Expected cell frequencies < 5.

Table 41. Third and Fifth Graders Health and Safety Risk Categories by Urban/Rural Areas.

Health and Safety Risk Categories	Third Grade Urban	Fifth Grade Rural
Excellent (90-100)	7 (5.0%)	6 (3.1%)
Good (80-89)	53 (37.6%)	37 (19.0%)
Fair (70-79)	53 (37.6%)	80 (41.0%)
Risky (50-69)	26 (18.4%)	68 (34.9%)
Hazardous (0-49)	2 (1.4%)	4 (2.0%)
TOTAL	141 (100%)	195 (100%)

$x^2 = 19.58999$, df = 3*, $p < .05$, N=336.

*Risky and Hazardous categories combined.
Expected cell frequencies < 5.

Table 42 presents the cross tabulation findings between fourth grade students' scores from urban areas and third grade students' scores from rural areas with the health and safety risk categories. The difference between the two groups regarding the health and safety risk categories was not significant at the .05 level of significance when Chi-square was applied.

Table 43 presents cross tabulation of fourth grade students scores from urban areas and fourth grade students' scores from rural areas with the health and safety risk categories. A higher percent (8.1%) of fourth grade students from urban areas were in the excellent category when compared with fourth grade students from rural areas (1.7%). Likewise, fourth grade students from urban areas had a higher percent (32.3%) of students in the good category than fourth grade students from rural areas (22.2%). A higher percent of students in both the fair and risky category (41.7% and 32.8%, respectively) were found among the rural fourth grade students compared with the urban fourth grade students (33.5% and 24.8%, respectively). Both groups were similar in the percent of students classified into the hazardous category, urban areas with 1.2 percent and rural areas with 1.7 percent. There was a significant difference between the groups regarding the health and safety categories at the .05 level of significance when Chi-square was applied.

Table 44 presents findings of the cross tabulation of fourth grade students' scores from urban areas and fifth grade students' scores from rural areas with the health and safety risk categories. A higher

Table 42. Fourth and Third Graders Health and Safety Risk Categories by Urban/Rural Areas.

Health and Safety Risk Categories	Fourth Grade Urban	Third Grade Rural
Excellent (90-100)	13 (8.1%)	11 (6.6%)
Good (80-89)	52 (32.3%)	56 (33.3%)
Fair (70-79)	54 (33.5%)	65 (38.7%)
Risky (50-69)	40 (24.8%)	34 (20.2%)
Hazardous (0-49)	2 (1.2%)	2 (1.2%)
TOTAL	161 (99.9%)*	168 (100%)

*Due to rounding error.

x^2 = 1.644969, df = 3**, not significant at $p < .05$, N=329.

**Risky and Hazardous categories combined.
Expected cell frequencies < 5.

Table 43. Fourth Graders Health and Safety Risk Categories by Urban/Rural Areas.

Health and Safety Risk Categories	Fourth Grade Urban	Fourth Grade Rural
Excellent (90-100)	13 (8.1%)	3 (1.7%)
Good (80-89)	52 (32.3%)	40 (22.2%)
Fair (70-79)	54 (33.5%)	75 (41.7%)
Risky (50-69)	40 (24.8%)	59 (32.8%)
Hazardous (0-49)	2 (1.2%)	3 (1.7%)
TOTAL	161 (99.9%)*	180 (100.1%)*

*Due to rounding error.

x^2 = 14.06499, df = 3**, p < .05, N=341.***

**Risky and Hazardous categories combined.
Expected cell frequencies < 5.

***N+1 error.

Table 44. Fourth and Fifth Graders Health and Safety Risk Categories by Urban/Rural Areas.

Health and Safety Risk Categories	Fourth Grade Urban	Fifth Grade Rural
Excellent (90-100)	13 (8.1%)	6 (3.1%)
Good (80-89)	52 (32.3%)	37 (19.0%)
Fair (70-79)	54 (33.5%)	80 (41.0%)
Risky (50-69)	40 (24.8%)	68 (34.9%)
Hazardous (0-49)	2 (1.2%)	4 (2.0%)
TOTAL	161 (99.9%)*	195 (100%)

*Due to rounding error.

$x^2 = 14.93559$, df = 3**, $p < .05$, N=356.

**Risky and Hazardous categories combined.
Expected cell frequencies < 5.

percent of fourth grade students from urban areas were classified in the excellent and good category (8.1% and 32.3%, respectively) when compared to fifth grade students from rural areas (3.1% and 19.0%, respectively). Fifth grade students from rural areas had higher percentages in the fair, risky, and hazardous categories (41.0%, 34.9%, and 2.0%, respectively) than the fourth grade students from urban areas (33.5%, 24.8%, and 1.2%, respectively). There was a significant difference between the groups regarding the health and safety risk categories at the .05 level of significance when Chi-square was applied.

Table 45 shows the cross tabulations of fifth grade students' scores from urban areas and third grade students' scores from rural areas with the health and safety risk categories. The differences between the two groups regarding the health and safety risk categories was not significant at the .05 level of significance when Chi-square was applied.

Table 46 presents the cross tabulation of fifth grade students' scores from urban areas and fourth grade students' scores from rural areas with the health and safety risk categories. The differences between the two groups regarding the health and safety risk categories was not significant at the .05 level of significance when Chi-square was applied.

Table 47 presents findings from the cross tabulation of fifth grade students' scores from urban areas and fifth grade students' scores from rural areas with the health and safety risk categories.

Table 45. Third and Fifth Graders Health and Safety Risk Categories by Urban/Rural Areas.

Health and Safety Risk Categories	Fifth Grade Urban	Third Grade Rural
Excellent (90-100)	9 (6.4%)	11 (6.6%)
Good (80-89)	29 (20.6%)	56 (33.3%)
Fair (70-79)	62 (44.1%)	65 (38.7%)
Risky (50-69)	39 (27.7%)	34 (20.2%)
Hazardous (0-49)	2 (1.4%)	2 (1.2%)
TOTAL	141 (100%)	168 (100%)

x^2 = 6.865206, df = 3*, not significant at $p < .05$, N=309.

*Risky and Hazardous categories combined.
Expected cell frequencies < 5.

Table 46. Fifth and Fourth Graders Health and Safety Risk Categories by Urban/Rural Areas.

Health and Safety Risk Categories	Fifth Grade Urban	Fourth Grade Rural
Excellent (90-100)	9 (6.4%)	3 (1.7%)
Good (80-89)	29 (20.6%)	40 (22.2%)
Fair (70-79)	62 (44.1%)	75 (41.7%)
Risky (50-69)	39 (27.7%)	59 (32.8%)
Hazardous (0-49)	2 (1.4%)	3 (1.7%)
TOTAL	141 (100%)	180 (100.1%)*

*Due to rounding error.

x^2 = 4.819114, df = 3**, not significant at $p < .05$, N=301.

**Risky and Hazardous categories combined.
Expected cell frequencies < 5.

Table 47. Fifth Graders Health and Safety Risk Categories by Urban/Rural Areas.

Health and Safety Risk Categories	Fifth Grade Urban	Fifth Grade Rural
Excellent (90-100)	9 (6.4%)	6 (3.1%)
Good (80-89)	29 (20.6%)	37 (19.0%)
Fair (70-79)	62 (44.1%)	80 (41.0%)
Risky (50-69)	39 (27.7%)	68 (34.9%)
Hazardous (0-49)	2 (1.4%)	4 (2.0%)
TOTAL	141 (100%)	195 (100%)

x^2 = 3.774739, df = 3*, not significant at $p < .05$, N=336.**

*Risky and Hazardous categories combined.
Expected cell frequencies < 5.

**N-3 error.

The differences between the two groups regarding the health and safety risk categories was not significant at the .05 level of significance when Chi-square was applied.

Table 48 shows the cross tabulation findings of white students' scores from rural areas and nonwhite students' scores from rural areas with the health and safety risk categories. The differences between the two groups regarding the health and safety risk categories was not significant at the .05 level of significance when Chi-square was applied.

Table 49 presents findings from the cross tabulation of white students' scores from urban areas and nonwhite students' scores from urban areas with the health and safety risk categories. The differences between the two groups regarding the health and safety risk categories was not significant at the .05 level of significance when Chi-square was applied.

Table 50 presents cross tabulations of white students' scores from urban areas and white students' scores from rural areas with the health and safety risk categories. A higher percent of urban white students (6.7%) were classified in the excellent category when compared with the rural white students (4.1%). However, rural white students had a higher percentage in the hazardous category (1.3%) compared with the urban white students (.7%). The differences between urban white students and rural white students regarding the health and safety risk categories were significant at the .05 level of significance when Chi-square was applied.

Table 48. Rural Students' Health and Safety Risk Categories by Race.

Health and Safety Risk Categories	White Rural	Nonwhite Rural
Excellent (90-100)	19 (4.1%)	1 (1.2%)
Good (80-89)	110 (23.8%)	23 (28.4%)
Fair (70-79)	193 (41.8%)	27 (33.3%)
Risky (50-69)	134 (29.0%)	27 (33.3%)
Hazardous (0-49)	6 (1.3%)	3 (3.7%)
TOTAL	462 (100%)	81 (99.9%)*

*Due to rounding error.

$x^2 = 2.281$, df = 2**, not significant at $p < .05$, N=543.

**Excellent and Good categories combined.
Risky and Hazardous categories combined.
Expected cell frequencies < 5.

Table 49. Urban Students' Health and Safety Risk Categories by Race.

Health and Safety Risk Categories	White Urban	Nonwhite Urban
Excellent (90-100)	18 (6.7%)	11 (6.4%)
Good (80-89)	92 (34.1%)	42 (24.3%)
Fair (70-79)	98 (36.3%)	71 (41.0%)
Risky (50-69)	60 (22.2%)	45 (26.0%)
Hazardous (0-49)	2 (.7%)	4 (2.3%)
TOTAL	270 (100%)	173 (100%)

$x^2 = 5.19216$, df = 3*, not significant at $p < .05$, N=443.

*Risky and Hazardous categories combined.
Expected cell frequencies < 5.

Table 50. White Students' Health and Safety Risk Categories by Urban/Rural Area.

Health and Safety Risk Categories	Urban Whites	Rural Whites
Excellent (90-100)	18 (6.7%)	19 (4.1%)
Good (80-89)	92 (34.1%)	110 (23.8%)
Fair (70-79)	98 (36.3%)	193 (41.8%)
Risky (50-69)	60 (22.2%)	134 (29.0%)
Hazardous (0-49)	2 (.7%)	6 (1.3%)
TOTAL	270 (100%)	462 (100%)

$x^2 = 13.31924$, df = 3*, $p < .05$, N=732.**

*Risky and Hazardous categories combined.
Expected cell frequencies < 5.

**N-1 error.

Table 51 presents findings from the cross tabulation of nonwhite students' scores from urban areas and the nonwhite students' scores from rural areas with the health and safety risk categories. The difference between the two groups regarding the health and safety risk categories was not significant at the .05 level of significance when Chi-square was applied. Although there were not significant differences found, rural nonwhites had a lower percent in the excellent category when compared with urban nonwhites (1.2% and 6.4%, respectively).

Table 52 shows the cross tabulation of white third grade students' scores and nonwhite third grade students' scores with the health and safety risk categories. Although no significant differences between these two groups were found regarding the health and safety categories at the .05 level of significance when Chi-square was applied, nonwhite students in the third grade had a higher percent in the hazardous category (4.8%) when compared with white students in the third grade (0%).

Table 53 presents the findings of the cross tabulation of white fourth grade students' scores and nonwhite fourth grade students' scores with the health and safety risk categories. The differences between the groups regarding the health and safety risk categories were not significant at the .05 level of significance when Chi-square was applied. Yet a much higher percent of nonwhite fourth grade students was classified into the excellent and good categories (5.1% and 32.9%, respectively) when compared with white fourth grade students (4.6% and 25.7%, respectively).

Table 51. Nonwhite Students' Health and Safety Risk Categories by Urban/Rural Area.

Health and Safety Risk Categories	Urban Nonwhites	Rural Nonwhites
Excellent (90-100)	11 (6.4%)	1 (1.2%)
Good (80-89)	42 (24.3%)	23 (28.4%)
Fair (70-79)	71 (41.0%)	27 (33.3%)
Risky (50-69)	45 (26.0%)	27 (33.3%)
Hazardous (0-49)	4 (2.3%)	3 (3.7%)
TOTAL	173 (100%)	81 (99.9%)*

*Due to rounding error.

x^2 = 2.21449, df = 2**, not significant at $p < .05$, N=254.***

**Excellent and Good categories combined.
Risky and Hazardous categories combined.
Expected cell frequencies < 5.

***N+1 error.

Table 52. Third Graders' Health and Safety Risk Categories by Race.

Health and Safety Risk Categories	Third Grade Whites	Third Grade Nonwhites
Excellent (90-100)	16 (7.2%)	2 (2.4%)
Good (80-89)	81 (36.3%)	29 (34.5%)
Fair (70-79)	86 (38.6%)	29 (34.5%)
Risky (50-69)	40 (17.9%)	20 (23.8%)
Hazardous (0-49)	0 (0%)	4 (4.8%)
TOTAL	223 (100%)	84 (100%)

x^2 4.212036, df = 2*, not significant at $p < .05$, N=307.

*Excellent and Good categories combined.
Risky and Hazardous categories combined.
Expected cell frequencies < 5.

Table 53. Fourth Graders' Health and Safety Risk Categories by Race.

Health and Safety Risk Categories	Fourth Grade Whites	Fourth Grade Nonwhites
Excellent (90-100)	12 (4.6%)	4 (5.1%)
Good (80-89)	67 (25.7%)	26 (32.9%)
Fair (70-79)	103 (39.5%)	24 (30.4%)
Risky (50-69)	75 (28.7%)	24 (30.4%)
Hazardous (0-49)	4 (1.5%)	1 (1.3%)
TOTAL	261 (100%)	79 (100.1%)*

*Due to rounding error.

x^2 = 2.500754, df = 2**, not significant at $p < .05$, N=340.

**Excellent and Good categories combined.
Risky and Hazardous categories combined.
Expected cell frequencies < 5.

Table 54 shows the findings of the cross tabulation of white fifth grade students' scores and nonwhite fifth grade students' scores with the health and safety risk categories. The differences between the groups regarding the health and safety risk categories were not significant at the .05 level of significance when Chi-square was applied. However, a higher percent of nonwhite fifth graders (6.7%) were classified into the excellent category when compared with white fifth graders (3.6%).

Cross tabulations of white students' scores in the third grade and white students' scores in the fourth grade with the health and safety risk categories are presented in Table 55. There was a significantly higher percent of white fourth grade students in the risky category (28.7%) compared with the white third grade students (17.9%). There was a significant difference between the groups regarding the health and safety risk categories at the .05 level of significance when Chi-square was applied.

Table 56 presents cross tabulations of white fourth grade students' scores and white fifth grade students' scores with the health and safety risk categories. When Chi-square was applied, there was no significant difference between the groups regarding the health and safety risk categories at the .05 level of significance.

Table 57 shows the findings of the cross tabulation of white third grade students' scores and white fifth grade students' scores with the health and safety risk categories. A higher percent of white third grade students (7.2%) were classified in the excellent category when

Table 54. Fifth Graders' Health and Safety Risk Categories by Race.

Health and Safety Risk Categories	Fifth Grade Whites	Fifth Grade Nonwhites
Excellent (90-100)	9 (3.6%)	6 (6.7%)
Good (80-89)	53 (21.3%)	18 (20.0%)
Fair (70-79)	102 (41.0%)	38 (42.2%)
Risky (50-69)	80 (32.1%)	26 (28.9%)
Hazardous (0-49)	5 (2.0%)	2 (2.2%)
TOTAL	249 (100%)	90 (100%)

x^2 = .2882406, df = 2*, not significant at $p < .05$, N=339.

*Excellent and Good categories combined.
Risky and Hazardous categories combined.
Expected cell frequencies < 5.

Table 55. White Students' Health and Safety Risk Categories by Grades 3 and 4.

Health and Safety Risk Categories	Third Grade Whites	Fourth Grade Whites
Excellent (90-100)	16 (7.2%)	12 (4.6%)
Good (80-89)	81 (36.3%)	67 (25.7%)
Fair (70-79)	86 (38.6%)	103 (39.5%)
Risky (50-69)	40 (17.9%)	75 (28.7%)
Hazardous (0-49)	0 (0%)	4 (1.5%)
TOTAL	223 (100%)	261 (100%)

$x^2 = 13.30491$, df = 3*, $p < .05$, N=484.

*Risky and Hazardous categories combined.
Expected cell frequencies < 5.

Table 56. White Students' Health and Safety Risk Categories by Grades 4 and 5.

Health and Safety Risk Categories	Fourth Grade Whites	Fifth Grade Whites
Excellent (90-100)	12 (4.6%)	9 (3.6%)
Good (80-89)	67 (25.7%)	53 (21.3%)
Fair (70-79)	103 (39.5%)	102 (41.0%)
Risky (50-69)	75 (28.7%)	80 (32.1%)
Hazardous (0-49)	4 (1.5%)	5 (2.0%)
TOTAL	261 (100%)	249 (100%)

$x^2 = 2.005052$, df = 3*, not significant at $p < .05$, N=510.

*Risky and Hazardous categories combined.
Expected cell frequencies < 5.

Table 57. White Students' Health and Safety Risk cAtegories by Grades 3 and 5.

Health and Safety Risk Categories	Third Grade Whites	Fifth Grade Whites
Excellent (90-100)	16 (7.2%)	9 (3.6%)
Good (80-89)	81 (36.3%)	53 (21.3%)
Fair (70-79)	86 (38.6%)	102 (41.0%)
Risky (50-69)	40 (17.9%)	80 (32.1%)
Hazardous (0-49)	0 (0%)	5 (2.0%)
TOTAL	223 (100%)	249 (100%)

$x^2 = 24.01311$, df = 3*, $p < .05$, N=472.

*Risky and Hazardous categories combined.
Expected cell frequencies < 5.

compared with the white fifth grade students (3.6%). A lower percent of white third grade students (17.9%) were in the risky category when compared to the white fifth grade students (32.1%). Two percent of the white fifth grade students were in the hazardous category while no white third grade students were classified in the hazardous category. These findings were significant when Chi-square was applied to the health and safety risk categories at the .05 level of significance.

Table 58 presents cross tabulations of nonwhite third grade students' scores and nonwhite fourth grade students' scores with the health and safety risk categories. When Chi-square was applied, there was no significant difference between the groups regarding the health and safety risk categories at the .05 level of significance.

In Table 59 cross tabulations of nonwhite fourth grade students' scores and nonwhite fifth grade students' scores with the health and safety risk categories are presented. There was no significant difference between the groups regarding the health and safety risk categories at the .05 level of significance when Chi-square was applied.

Cross tabulations of nonwhite third grade students' scores and nonwhite fifth grade students' scores with the health and safety risk categories are presented in Table 60. When Chi-square was applied, there was no significant difference between the groups regarding the health and safety risk categories at the .05 level of significance.

Table 61 presents cross tabulation findings of white female students' scores in third grade and nonwhite female students' scores in

Table 58. Nonwhite Students' Health and Safety Risk Categories by Grades 3 and 4.

Health and Safety Risk Categories	Third Grade Nonwhites	Fourth Grade Nonwhites
Excellent (90-100)	2 (2.4%)	4 (5.1%)
Good (80-89)	29 (34.5%)	26 (32.9%)
Fair (70-79)	29 (34.5%)	24 (30.4%)
Risky (50-69)	20 (23.8%)	24 (30.4%)
Hazardous (0-49)	4 (4.8%)	1 (1.3%)
TOTAL	84 (100%)	79 (100.1%)*

*Due to rounding error.

x^2 = .35546, df = 2**, not significant at $p < .05$, N=163.

**Excellent and Good categories combined.
Risky and Hazardous categories combined.
Expected cell frequencies < 5.

Table 59. Nonwhite Students' Health and Safety Risk Categories to Grades 4 and 5.

Health and Safety Risk Categories	Fourth Grade Nonwhites	Fifth Grade Nonwhites
Excellent (90-100)	4 (5.1%)	6 (6.7%)
Good (80-89)	26 (32.9%)	18 (20.0%)
Fair (70-79)	24 (30.4%)	38 (42.2%)
Risky (50-69)	24 (30.4%)	26 (28.9%)
Hazardous (0-49)	1 (1.3%)	2 (2.2%)
TOTAL	79 (100.1%)*	90 (100%)

*Due to rounding error.

$x^2 = 3.295755$, df = 2**, not significant at $p < .05$, N=169.

**Excellent and Good categories combined.
Risky and Hazardous categories combined.
Expected cell frequencies < 5.

Table 60. Nonwhite Students' Health and Safety Risk Categories by Grades 3 and 5.

Health and Safety Risk Categories	Third Grade Nonwhites	Fifth Grade Nonwhites
Excellent (90-100)	2 (2.4%)	6 (6.7%)
Good (80-89)	29 (34.5%)	18 (20.0%)
Fair (70-79)	29 (34.5%)	38 (42.2%)
Risky (50-69)	20 (23.8%)	26 (28.9%)
Hazardous (0-49)	4 (4.8%)	2 (2.2%)
TOTAL	84 (100%)	90 (100%)

x^2 = 2.20328, df = 2*, not significant at $p < .05$, N=174.

*Excellent and Good categories combined.
Risky and Hazardous categories combined.
Expected cell frequencies < 5.

Table 61. Third Grade Females' Health and Safety Risk Categories by Race.

Health and Safety Risk Categories	White Third Grade Females	Nonwhite Third Grade Females
Excellent (90-100)	12 (10.6%)	1 (3.0%)
Good (80-89)	44 (38.9%)	14 (42.4%)
Fair (70-79)	39 (34.5%)	11 (33.3%)
Risky (50-69)	18 (15.9%)	7 (21.2%)
Hazardous (0-49)	0 (0%)	0 (0%)
TOTAL	113 (99.9%)*	33 (99.9%)*

*Due to rounding error.

x^2 = .5150938, df = 2**, not significant at $p < .05$, N=146.

**Excellent and Good categories combined.
Risky and Hazardous categories combined.
Expected cell frequencies < 5.

third grade with the health and safety risk categories. When Chi-square was applied, there was no significant difference between the groups regarding the health and safety risk categories at the .05 level of significance. Yet, a higher percent of white third grade females (10.6%) were classified in the excellent category when compared with the nonwhite third grade females (3.0%). Also, a higher percent of nonwhite third grade females (21.2%) were in the risky category when compared with the white third grade females (15.9%).

In Table 62, cross tabulations of white fourth grade female students' scores and nonwhite fourth grade female students' scores with the health and safety risk categories are presented. Although there was no significant difference between the groups regarding the health and safety risk categories at the .05 level of significance when Chi-square was applied, there was a higher percent of nonwhite fourth grade females (35.9%) in the risky category when compared with the white fourth grade females (22.4%).

Cross tabulations of white fifth grade female students' scores and nonwhite fifth grade female students' scores with the health and safety risk categories are presented in Table 63. When Chi-square was applied, there was no significant difference between the groups regarding the health and safety risk categories at the .05 level of significance.

Table 64 presents cross tabulation findings of white third grade male students' scores and nonwhite third grade male students' scores with the health and safety risk categories. Although there was no

Table 62. Fourth Grade Females' Health and Safety Risk Categories by Race.

Health and Safety Risk Categories	White Fourth Grade Females	Nonwhite Fourth Grade Females
Excellent (90-100)	6 (4.8%)	2 (5.1%)
Good (80-89)	39 (31.2%)	10 (25.6%)
Fair (70-79)	52 (41.6%)	13 (33.3%)
Risky (50-69)	28 (22.4%)	14 (35.9%)
Hazardous (0-49)	0 (0%)	0 (0%)
TOTAL	125 (100%)	39 (99.9%)*

*Due to rounding error.

x^2 = 2.861141, df = 2**, not significant at $p < .05$, N=164.

**Excellent and Good categories combined.
Risky and Hazardous categories combined.
Expected cell frequencies < 5.

Table 63. Fifth Grade Females' Health and Safety Risk Categories by Race.

Health and Safety Risk Categories	White Fifth Grade Females	Nonwhite Fifth Grade Females
Excellent (90-100)	6 (6.1%)	4 (8.2%)
Good (80-89)	23 (23.5%)	7 (14.3%)
Fair (70-79)1	43 (43.9%)	20 (40.8%)
Risky (50-69)	25 (25.5%)	17 (34.7%)
Hazardous (0-49)	1 (1.0%)	1 (2.0%)
TOTAL	98 (100%)	49 (100%)

x^2 = 1.820292, df = 2*, not significant at $p < .05$, N=147.

*Excellent and Good categories combined.
Risky and Hazardous categories combined.
Expected cell frequencies < 5.

Table 64. Third Grade Males' Health and Safety Risk Categories by Race.

Health and Safety Risk Categories	White Third Grade Males	Nonwhite Third Grade Males
Excellent (90-100)	4 (3.6%)	1 (2.0%)
Good (80-89)	37 (33.6%)	14 (27.5%)
Fair (70-79)	47 (42.7%)	19 (37.3%)
Risky (50-69)	22 (20.0%)	13 (25.5%)
Hazardous (0-49)	0 (0%)	4 (7.8%)
TOTAL	110 (99.9%)*	51 (100.1%)*

*Due to rounding error.

$x^2 = 3.430864$, df = 2**, not significant at $p < .05$, N=161.

**Excellent and Good categories combined.
Risky and Hazardous categories combined.
Expected cell frequencies < 5.

significant difference between the groups regarding the health and safety risk categories at the .05 level of significance when Chi-square was applied, there was a higher percent of nonwhite third grade males in the hazardous category (7.8%) when compared with the white third grade males (0%).

In Table 65 cross tabulations of white fourth grade male students' scores and nonwhite fourth grade male students' scores with the health and safety risk categories are shown. When Chi-square was applied, there was no significant difference between the groups regarding the health and safety risk categories at the .05 level of significance.

Cross tabulation findings for white fifth grade male students' scores and nonwhite fifth grade male students' scores with the health and safety risk categories are presented in Table 66. No significant differences between the groups regarding the health and safety risk categories at the .05 level of significance when Chi-square was applied were found; however, 53.7 percent of the nonwhite fifth grade males were classified in the fair category while 39.1 percent of the white fifth grade males were classified in the same category.

Table 67 presents cross tabulation findings of white third grade students' scores from urban areas and nonwhite third grade students' scores from urban areas with the health and safety risk categories. When Chi-square was applied, there was no significant difference between the groups regarding the health and safety risk categories at the .05 level of significance.

Table 65. Fourth Grade Males' Health and Safety Risk Categories by Race.

Health and Safety Risk Categories	White Fourth Grade Males	Nonwhite Fourth Grade Males
Excellent (90-100)	6 (4.4%)	2 (5.0%)
Good (80-89)	28 (20.6%)	15 (37.5%)
Fair (70-79)	51 (37.5%)	12 (30.0%)
Risky (50-69)	47 (34.6%)	10 (25.0%)
Hazardous (0-49)	4 (2.9%)	1 (2.5%)
TOTAL	136 (100%)	40 (100%)

x^2 = 4.629801, df = 2*, not significant and $p < .05$, N=176.

*Excellent and Good categories combined.
Risky and Hazardous categories combined.
Expected cell frequencies < 5.

Table 66. Fifth Grade Males' Health and Safety Risk Categories by Race.

Health and Safety Risk Categories	White Fifth Grade Males	Nonwhite Fifth Grade Males
Excellent (90-100)	3 (2.0%)	2 (4.9%)
Good (80-89)	30 (19.9%)	5 (12.1%)
Fair (70-79)	59 (39.1%)	22 (53.7%)
Risky (50-69)	55 (36.4%)	11 (26.8%)
Hazardous (0-49)	4 (2.6%)	1 (2.4%)
TOTAL	151 (100%)	41 (100%)

x^2 = 2.818058, df = 2*, not significant at $p < .05$, N=192.

*Excellent and Good categories combined.
Risky and Hazardous categories combined.
Expected cell frequencies < 5.

Table 67. Urban Third Graders' Health and Safety Risk Categories by Race.

Health and Safety Risk Categories	White Third Grade Urban	Nonwhite Third Grade Urban
Excellent (90-100)	5 (6.1%)	2 (3.4%)
Good (80-89)	35 (42.7%)	18 (30.5%)
Fair (70-79)	29 (35.4%)	24 (40.7%)
Risky (50-69)	13 (15.8%)	13 (22.0%)
Hazardous (0-49)	0 (0%)	2 (3.4%)
TOTAL	82 (100%)	59 (100%)

$x^2 = 3.625929$, df = 2*, not significant at $p < .05$, N=141.

*Excellent and Good categories combined.
Risky and Hazardous categories combined.
Expected cell frequencies < 5.

In Table 68 cross tabulations of white fourth grade students' scores from urban areas and nonwhite fourth grade students' scores from urban areas with the health and safety risk categories are presented. When Chi-square was applied, there was no significant differences between the groups regarding the health and safety risk categories at the .05 level of significance.

Cross tabulation findings for white fifth grade students' scores from urban areas and nonwhite fifth grade students' scores from urban areas are shown in Table 69. When Chi-square was applied, there was no significant difference between the groups regarding the health and safety risk categories at the .05 level of significance.

Table 70 presents the cross tabulation of white third grade students' scores from rural areas and nonwhite third grade students' scores from rural areas with the health and safety risk categories. No significant differences between groups regarding the health and safety risk categories at the .05 level of significance when Chi-square was applied were found; however, there were no nonwhite third grade rural students classified in the excellent category when compared to 7.9 percent of the white third grade students from rural areas.

In Table 71 cross tabulations of white fourth grade students' scores from rural areas and nonwhite fourth grade students' scores from rural areas are presented. Although no significant differences between groups regarding the health and safety risk categories at the .05 level of significance when Chi-square was applied were found, there were no nonwhite fourth grade students from rural areas classified in the

Table 68. Urban Fourth Graders Health' and Safety Risk Categories by Race.

Health and Safety Risk CAtegories	White Fourth Grade Urban	Nonwhite Fourth Grade Urban
Excellent (90-100)	9 (8.2%)	4 (7.8%)
Good (80-89)	38 (34.5%)	14 (27.5%)
Fair (70-79)	39 (35.5%)	15 (29.4%)
Risky (50-69)	23 (20.9%)	17 (33.3%)
Hazardous (0-49)	1 (.9%)	1 (2.0%)
TOTAL	110 (100%)	51 (100%)

$x^2 = 3.281886$, df = 2*, not significant at $p < .05$, N=161.

*Excellent and Good categories combined.
Risky and Hazardous categories combined.
Expected cell frequencies < 5.

Table 69. Urban Fifth Graders' Health and Safety Risk Categories by Race.

Health and Safety Risk Categories	White Fifth Grade Urban	Nonwhite Fifth Grade Urban
Excellent (90-100)	4 (5.1%)	5 (7.9%)
Good (80-89)1	19 (24.4%)	10 (15.9%)
Fair (70-79)	30 (38.5%)	32 (50.8%)
Risky (50-69)	24 (30.8%)	15 (23.8%)
Hazardous (0-49)	1 (1.3%)	1 (1.6%)
TOTAL	78 (100.1%)*	63 (100%)

*Due to rounding error.

x^2 = 2.152957, df = 2**, not significant at $p < .05$, N=141.

**Excellent and Good categories combined.
Risky and Hazardous categories combined.
Expected cell frequencies < 5.

Table 70. Rural Third Graders' Health and Safety Risk Categories by Race.

Health and Safety Risk Categories	White Third Grade Rural	Nonwhite Third Grade Rural
Excellent (90-100)	11 (7.9%)	0 (0%)
Good (80-89)	46 (32.9%)	10 (35.7%)
Fair (70-79)	57 (40.7%)	8 (28.6%)
Risky (50-69)	26 (18.6%)	8 (28.6%)
Hazardous (0-49)	0 (0%)	2 (7.1%)
TOTAL	140 (100.1%)*	28 (100%)

*Due to rounding error.

x^2 = 4.2355, df = 2**, not significant at $p < .05$, N=168.

**Excellent and Good categories combined.
Risky and Hazardous categories combined.
Expected cell frequencies < 5.

Table 71. Rural Fourth Graders' Health and Safety Risk Categories by Race.

Health and Safety Risk Categories	White Fourth Grade Rural	Nonwhite Fourth Grade Rural
Excellent (90-100)	3 (2.0%)	0 (0%)
Good (80-89)	29 (19.1%)	11 (39.3%)
Fair (70-79)	65 (42.8%)	10 (35.7%)
Risky (50-69)	52 (34.2%)	7 (25.0%)
Hazardous (0-49)	3 (2.0%)	0 (0%)
TOTAL	152 (100.1%)*	28 (100%)

*Due to random error.

$x^2 = 4.431049$, df = 2**, not significant at $p < .05$, N=180.

**Excellent and Good categories combined.
Risky and Hazardous categories combined.
Expected cell frequencies < 5.

excellent category when compared with the white fourth grade students from rural areas (2.0%).

Cross tabulation findings for white fifth grade students' scores from rural areas and nonwhite fifth grade students' scores from rural areas with the health and safety risk categories are presented in Table 72. Despite the finding that there was no significant difference between groups regarding the health and safety risk categories at the .05 level of significance when Chi-square was applied, 48 percent of the nonwhite fifth grade students from rural areas were classified in the risky category when compared with the white fifth grade students from rural areas (32.9%).

Table 73 presents a summary of those cross tabulations of the health and safety risk categories by grade, gender, race, and geographical area (Tables 11-72) that were significant at the .05 level of significance when Chi-square was applied.

V. Data Description of Selected Health and Safety Risk Factors

The description of selected health and safety risk factors of all Tennessee third, fourth, and fifth grade students who participated in this research and selected groups according to gender, grade, race, and geographical area was presented. One of the systematic features of "The Tennessee School Health and Safety Profile" computer software program is its capacity to compile a quick summary profile of selected risk factors based upon the 50 questions in the questionnaire. The

Table 72. Rural Fifth Graders' Health and Safety Risk Categories by Race.

Health and Safety Risk Categories	White Fifth Grade Rural	Nonwhite Fifth Grade Rural
Excellent (90-100)	5 (2.9%)	1 (4.0%)
Good (80-89)	35 (20.6%)	2 (8.0%)
Fair (70-79)	71 (41.8%)	9 (36.0%)
Risky (50-69)	56 (32.9%)	12 (48.0%)
Hazardous (0-49)	3 (1.8%)	1 (4.0%)
TOTAL	170 (100%)	25 (100%)

$x^2 = 3.255802$, df = 2*, not significant at $p < .05$, N=195.

*Excellent and Good categories combined.
Risky and Hazardous categories combined.
Expected cell frequencies < 5.

Table 73. Summary of Cross Tabulations of Health and Safety Risk Categories by Grade, Gender, Race, and Geographical Area Where $p < .05$.

Variables	x^2
1. Grades (3, 4, 5)	28.96
2. Male and Female (3, 4, 5)	14.29
3. Urban and Rural Students (3, 4, 5)	10.69
4. Third Grade Males and Females	8.56
5. Third and Fifth Grade Females	16.02
6. Third and Fifth Grade Males	10.87
7. Rural Males and Females	12.73
8. White Males and Females	18.39
9. Third and Fourth Grade Rural Students	12.45
10. Third and Fifth Grade Rural Students	16.99
11. Third and Fifth Grade Urban Students	10.43
12. Third Grade Urban and Fourth Grade Rural	14.91
13. Third Grade Urban and Fifth Grade Rural	19.59
14. Urban and Rural Fourth Grade Students	14.06
15. Urban Fourth and Rural Fifth Grade Students	14.94
16. White Urban and Rural Students	13.32
17. Third and Fourth Grade White Students	13.30
18. Third and Fifth Grade White Students	24.01

quick summary consists of 26 risk factors (see Table 74). According to Connell, Turner & Mason (1986) and Mason & McGinnis (1985), injury, self esteem, depression, suicide, and diet are felt as areas of concern that can be ameliorated through school health and safety programs. The use of the seat belt was addressed since accidents, particularly vehicular accidents, are the major cause of mortality for childhood, adolescent, and young adult populations and traffic fatalities are often linked to lack of seat belt use (AMA, 1986; NCHS, 1987; Petusa, et al., 1986; Roberts, Elkins & Royal, 1984; Fortune, 1988). Additionally, those questions addressing dental hygiene and AIDS were addressed. The following nine risk factors were selected: (1) almost never wear seat belt, (2) do not know how to swim, (3) left at home without supervision, (4) sometimes or often feel life is not worth living, (5) eat junk food daily, (6) never floss their teeth, (7) do not know how AIDS is spread, (8) no smoke alarm in home, and (9) no fire escape plan in the home. These nine risk factors were addressed in this section.

Risk Factors for All Students, Grades 3-5.

Table 74 presents the selected health and safety risk factors of the Tennessee children who participated in this research. It was found that 10 percent almost never wear a seat belt. Twenty-eight percent of the children surveyed do not know how to swim. It was further reported that 17 percent of the children are left at home without supervision. Approximately 38 percent sometimes or often felt that life was not worth living. Junk food is consumed daily by 18 percent of the

Table 74. Selected Health and Safety Risk Factors for All Students (N=986).

Factors	N	%
1. Almost never wear seat belt.	101	10.2
2. Carry a knife	152	15.4
3. Don't know how to swim	280	28.3
4. Left at home without supervision	172	17.4
5. Almost never play or get exercise	70	7.1
6. Watch TV or play video games 6 or more hours per day	190	19.2
7. Don't get enough sleep	158	16.0
8. Smoke cigarettes	40	4.1
9. Use chewing tobacco	18	2.0
10. Drink alcohol	22	2.2
11. Have tried marijuana	21	2.1
12. Very unhappy with their body	59	6.0
13. No one to talk to about problems	85	9.0
14. Sometimes or often feel life not worth living	370	37.5
15. Don't eat breakfast every day	65	6.6
16. Eat junk food daily	181	18.3
17. Eat at fast food restaurants weekly	105	10.6
18. Don't brush their teeth daily	203	20.6
19. Don't see dentist regularly	292	29.6
20. Never floss their teeth	655	66.4
21. Have not heard of AIDS	46	4.7
22. Don't know how to get AIDS	489	49.6
23. Afraid they might get AIDS	825	83.7
24. No smoke alarm in home	231	23.4
25. No fire escape plan	181	18.4
26. Don't know about 911	111	11.3
Number of Students	986	

children. A high percent of the students (66%) never floss their teeth. Interestingly, a high percent of the students (50%) do not know how the disease AIDS is spread. It was further reported that 23 percent of the children have no smoke alarm in the home, and, additionally, 18 percent have no fire escape plan for the home.

Risk Factors According to Gender

Table 75 illustrates the selected health and safety risk factors according to gender. Approximately 12.5 percent of the male students almost never wear a seat belt while 7.7 percent of the female students almost never wear a seat belt. It was further reported that 26.6 percent of the male students and 30.4 percent of the female students do not know how to swim. A higher percent of male students (19.4%) are left at home without supervision compared to the female students left at home without supervision (15.0%). While 39.3 percent of the male students sometimes or often felt life was not worth living, 35.4 percent of the female students felt this way. A lower percent of female students eat junk food daily (15.5%) compared to the male students (20.8%). A high percent of both male and female students do not floss their teeth, but a higher percent of the males (69.2%) do not floss daily compared to the percent of females (63.2%). Female students showed a higher percent (54.0%) of those not knowing how AIDS is spread compared to the percent of males (46.0%). No smoke alarm in the home was reported by 24.7 percent of the females and 22.3 percent of the male students. Additionally, 19.4 percent of the male students reported no fire escape plan alongside 17.1 percent of the female

Table 75. Selected Health and Safety Risk Factors by Gender (N=986).

Risk Factors	Males N	Males %	Females N	Females %
1. Almost never wear seat belt	66	12.5	35	7.7
2. Carry a knife	143	27.0	9	2.0
3. Don't know how to swim	141	26.6	139	30.4
4. Left at home without supervision	103	19.4	69	15.0
5. Almost never play or get exercise	39	7.4	31	6.8
6. Watch TV or play video games 6 or more hours per day	115	21.7	75	16.4
7. Don't get enough sleep	107	20.2	51	11.2
8. Smoke cigarettes	30	5.6	10	2.2
9. Use chewing tobacco	18	3.4	0	0.0
10. Drink alcohol	17	3.2	5	1.1
11. Have tried marijuana	16	3.0	5	1.1
12. Very unhappy with their body	36	6.8	23	5.0
13. No one to talk to about problems	54	10.2	31	6.8
14. Sometimes or often feel life not worth living	208	39.3	162	35.4
15. Don't eat breakfast every day	39	7.3	26	5.7
16. Eat junk food daily	110	20.8	71	15.5
17. Eat at fast food restaurants weekly	69	13.0	36	7.8
18. Don't brush their teeth daily	122	23.1	83	18.2
19. Don't see dentist regularly	169	31.9	123	26.9
20. Never floss their teeth	366	69.2	289	63.2
21. Have not heard of AIDS	25	4.7	21	4.6
22. Don't know how to get AIDS	242	46.0	247	54.0
23. Afraid they might get AIDS	440	83.2	385	84.2
24. No smoke alarm in home	118	22.3	113	24.7
25. No fire escape plan	103	19.4	78	17.1
26. Don't know about 911	61	11.5	50	10.9
Number of Students	529		457	
TOTAL		986		

students reporting. The results indicate that health and safety education efforts should be concentrating in dental hygiene, water safety, and AIDS education for all students, with additional concentration in home and fire safety, self esteem, and seat belt education.

Risk Factors According to Grade

The selected risk factors according to grade are presented in Table 76. A higher percent of fifth graders reported left at home without supervision (23.0%), sometimes or often felt like life was not worth living (41.0%), eat junk food daily (20.9%), and never flossing their teeth (71.1%) when compared to the fourth grade (25.8%, 13.5%, 39.4%, 19.4%, and 36.1%, respectively) and the third grade (38.1%, 16.6%, 31.9%, 14.6%, and 14.6%). A higher percent of fourth grade students reported no fire escape plan (19.7%) when compared to the fifth grade (18.8%) and the third grade (16.3%). However, a higher percent of third grade students reported not knowing how the disease AIDS is spread (55.7%) when compared to fourth graders (54.7%) and the fifth graders (38.9%). The results of the study revealed a progressive increase in health and safety risk behaviors as the students advance in grade level (see Table 76 for other risk factors).

Risk Factors According to Race

The selected risk factors according to race are presented in Table 77. White students had a higher percent in the following health

Table 76. Selected Health and Safety Factors by Grade (N=986).

Risk Factors	Third N	Third %	Fourth N	Fourth %	Fifth N	Fifth %
1. Almost never wear seat belt	19	6.1	45	13.2	37	10.9
2. Carry a knife	30	9.7	51	15.0	71	20.9
3. Don't know how to swim	117	38.1	87	25.5	76	22.4
4. Left at home without supervision	48	15.6	46	13.5	78	23.0
5. Almost never play or get exercise	25	8.1	28	8.2	17	5.0
6. Watch TV/video games more than 6 hours/day	50	16.3	76	22.3	64	18.8
7. Don't get enough sleep	47	15.3	57	16.8	54	15.9
8. Smoke cigarettes	7	2.2	13	3.8	20	5.8
9. Use chewing tobacco	4	1.3	7	2.0	7	2.1
10. Drink alcohol	0	0	7	2.0	15	4.4
11. Have tried marijuana	3	1.0	8	2.5	10	2.9
12. Unhappy with body	15	4.8	27	7.9	17	5.0
13. No one to talk to about problems	12	3.9	36	10.5	37	10.9
14. Sometimes or often feel life not worth living	97	31.6	134	39.4	139	41.0
15. Don't eat breakfast every day	12	3.9	22	6.4	31	9.1
16. Eat junk food daily	44	14.3	66	19.4	71	20.9
17. Eat fast food weekly	40	13.0	28	8.2	37	10.9
18. Don't brush teeth daily	58	18.9	74	21.7	71	20.9
19. Don't see dentist regularly	101	32.8	93	27.3	98	28.9
20. Never floss teeth	193	62.9	221	65.0	241	71.1
21. Have not heard of AIDS	23	7.4	16	4.7	7	2.1
22. Don't know how AIDS is spread	171	55.7	186	54.7	132	38.9
23. Afraid they might get AIDS	283	92.1	284	83.5	258	76.1
24. No smoke alarm in home	72	23.4	81	23.8	78	23.0
25. No fire escape plan	50	16.3	67	19.7	64	18.8
26. Don't know about 911	23	7.4	47	13.8	41	12.1
Number of Students	307		340		339	
TOTAL			986			

Table 77. Selected Health and Safety Risk Factors by Race (N=986).

Health and Safety Risk Factors	White N	White %	Nonwhite N	Nonwhite %
1. Almost never wear seat belt	76	10.4	25	9.9
2. Carry a knife	127	17.3	25	9.9
3. Don't know how to swim	177	24.1	103	40.7
4. Left at home without supervision	125	17.1	47	18.6
5. Almost never play or get exercise	43	5.9	27	10.7
6. Watch TV/video games more than 6 hours/day	127	17.3	63	24.9
7. Don't get enough sleep	107	14.6	51	20.2
8. Smoke cigarettes	26	3.5	14	5.5
9. Use chewing tobacco	13	1.8	5	2.0
10. Drink alcohol	16	2.2	6	2.0
11. Have tried marijuana	8	1.1	13	5.1
12. Unhappy with body	40	5.5	19	7.5
13. No one to talk to about problems	58	7.9	27	10.7
14. Sometimes or often feel life not worth living	259	35.3	111	43.9
15. Don't eat breakfast every day	47	6.4	18	7.1
16. Eat junk food daily	131	17.9	50	19.8
17. Eat fast food weekly	68	9.3	37	14.6
18. Don't brush teeth daily	163	22.2	40	15.9
19. Don't see dentist regularly	203	27.7	89	35.1
20. Never floss teeth	507	69.2	148	58.5
21. Have not heard of AIDS	34	4.6	12	4.7
22. Don't know how AIDS is spread	377	51.4	112	44.3
23. Afraid they might get AIDS	603	82.1	222	87.7
24. No smoke alarm in home	171	23.3	60	23.7
25. No fire escape plan	138	18.8	43	17.0
26. Don't know about 911	86	11.7	25	9.9
Number of Students	733		253	
TOTAL		986		

and safety risk factors than nonwhite students: almost never wearing a seat belt (whites--10.4%, nonwhites--9.9%), do not know how AIDS is spread (whites--51.4%, nonwhites-44.3%), do not have a fire escape plan (whites--18.8%, nonwhites--17.0%), and never flossing teeth (whites--69.2%; nonwhites--58.5%). Nonwhite students had a higher percent in the following health and safety risk factors than white students: not knowing how to swim (nonwhites--40.7%, whites--24.1%), left at home without supervision (nonwhites--18.6%, whites--17.1%), sometimes or often feel life is not worth living (nonwhites--43.9%, whites--35.3%), and eat junk food daily (nonwhites--19.8%, whites--17.9%). Both races were very similar in not having a smoke alarm in the home (whites--23.3%, nonwhites--23.7%). The results of the study suggest that an emphasis on water safety, self esteem, dental hygiene, and AIDS education should be directed toward both nonwhite and white students. However, a stronger emphasis on water safety and dental hygiene should be aimed toward the nonwhite students (see Table 77 for other risk factors).

Risk Factors According to Geographical Area

The selected health and safety risk factors according to urban and rural geographical area are presented in Table 78. A higher percent of students from rural areas almost never wear seat belts (11.8%), do not know how to swim (29.5%), are left at home without supervision (19.1%), eat junk food daily (19.1%), do not know how the disease of AIDS is spread (54.9%), do not have a smoke alarm in the home (28.7%), and do not have a fire escape plan for the home (20.7%) when compared to

Table 78. Selected Health and Safety Risk Factors by Geographical Area (N=986).

Health and Safety Risk Factors	Urban N	Urban %	Rural N	Rural %
1. Almost never wear seat belt	37	8.4	64	11.8
2. Carry a knife	38	8.5	114	21.0
3. Don't know how to swim	120	27.1	160	29.5
4. Left at home without supervision	68	15.3	104	19.1
5. Almost never play or get exercise	33	7.5	37	6.8
6. Watch TV/video games more than 6 hours/day	80	18.1	110	20.3
7. Don't get enough sleep	67	15.1	91	16.8
8. Smoke cigarettes	17	3.8	23	4.2
9. Use chewing tobacco	1	.2	17	3.1
10. Drink alcohol	6	1.4	16	2.9
11. Have tried marijuana	10	2.3	11	2.0
12. Unhappy with body	28	6.3	31	5.7
13. No one to talk to about problems	42	9.4	43	7.9
14. Sometimes or often feel life not worth living	185	41.8	185	34.1
15. Don't eat breakfast every day	28	6.3	37	6.8
16. Eat junk food daily	77	17.4	104	19.1
17. Eat fast food weekly	51	11.5	54	10.0
18. Don't brush teeth daily	77	17.4	126	23.2
19. Don't see dentist regularly	116	26.2	176	32.4
20. Never floss teeth	296	66.8	359	66.1
21. Have not heard of AIDS	17	3.8	29	5.3
22. Don't know how AIDS is spread	191	43.1	298	54.9
23. Afraid they might get AIDS	361	81.5	464	85.4
24. No smoke alarm in home	75	16.9	156	28.7
25. No fire escape plan	72	16.2	109	20.7
26. Don't know about 911	25	5.6	86	15.8
Number of Students	443		543	
TOTAL		986		

students from urban areas (8.4%, 27.1%, 15.3%, 17.4%, 43.1%, 16.9%, and 16.2%, respectively). However, a higher percent of students from urban areas sometimes or often feel life is not worth living (41.8%), and never floss their teeth (66.8%) when compared to the students from rural areas (34.1% and 66.1%, respectively). Although urban and rural students reported risk behaviors similarly in percentages, it appears that for the rural students, health and safety education concentrating in the areas of seat belt use, AIDS education, and home fire safety education are warranted. For the urban as well as rural students, education programs concentrating in self esteem and self concept are needed.

VI. Analysis of Hypotheses

In this section, four research questions were presented and analyzed. The research questions were presented in the form of null hypotheses. The .05 level of significance was the rule governing all statistical procedures.

Null Hypothesis 1

There was no significant difference in the mean health and safety risk scores among third, fourth and fifth grade students.

The one-way analysis of variance (ANOVA) was used in determining significance of difference among the set of means only when the following assumptions were met: (1) randomness, (2) normality, (3) independent samples, and (4) homogeneity of variance. The data met assumptions (1) randomness, (3) independent samples (3, 4, 5 grades)

and, (4) homogeneity of variance. When Bartlett's test for homogeneity was applied at the .05 level of significance, the table x^2 value was 5.99 and the calculated x^2 value was 0.523, which is smaller than the table value (see Table 79). Thus, with $p > .05$, the variances are homogeneous with 95 percent confidence. However, the data did not oblige assumption (2) normality. The Kolmogorov-Smirnov (K-S) one-sample test was applied to determine whether the distribution of the health and safety risk scores and their cumulative frequencies throughout the categories of excellent, good, fair, risky and hazardous were normally distributed. The critical K-S value was .0433 and the calculated K-S value was .150, which is greater than the critical value (see Table 9). Thus, the health and safety scores were not normally distributed among the third, fourth, and fifth grade students. The Chi-square test was also used to assess normality, and, according to Glass (1984), ". . . the critical x^2 value when x^2 is used as a test of normality has J-3 degrees of freedom," and thus, was included as a test of normality. The critical x^2 value was 7.82 with J-3 degrees of freedom, and the calculated x^2 value was 28.96, which is greater than the critical value (see Table 80). Chi-square, when used as a test of normality, determined the health and safety scores to be non-normally distributed among the third, fourth and fifth grade students.

As a caveat, ANOVA results (see Table 81) were not used since the data failed to satisfy the assumption of normality. Rather the non-parametric Kruskal-Wallis H One Way Analysis of Variance (equivalent to Chi-square) was used (Ferguson & Takane, 1989). Chi-square approximations were used and presented in Table 82.

Table 79. Bartlett's Test for Homogeneity of Variance.

Critical x^2 Value	Calculated x^2 Value
5.99	0.523
$p > .05$	

Table 80. Chi-Square Test for Normality.*

Critical Value	x^2 Calculated Value
7.82	28.96
$p < .05$	

*J-3 degrees of freedom.

Table 81. One-Way Analysis of Variance for Student Scores.

Source of Variation	Sum of Squares	Degrees of Freedom	Variance Estimate	F Statistic
Between	2507.020	2	1253.510	12.699
Within	97033.252	983	98.711	
TOTAL	99540.272	985		

F = 12.699, df = 2,985, $p < .05$, N=986.

Table 82. Chi-Square Test for Significance Among Grade Means.

Health and Safety Risk Factors	Third		Fourth		Fifth	
Excellent (90-100)	18	(5.9%)	16	(4.7%)	15	(4.4%)
Good (80-89)	109	(35.5)	92	(27.1%)	65	(19.2%)
Fair (70-79)	116	(37.8%)	128	(37.6%)	144	(42.5%)
Risky (50-69)	60	(19.5%)	99	(29.1%)	108	(31.9%)
Hazardous (0-49)	4	(1.3%)	5	(1.5%)	7	(12.0%)
TOTAL	307	(100%)	340	(100%)	339	(100%)

$x^2 = 28.96$, df = 2, $p < .05$, N=986.

Thus, hypothesis 1 was rejected at the .05 level of significance. The result of the statistical analysis indicated that grade level appears to influence the students' health and safety risk scores, which were based on their self-reported health practices. It is noted, however, that the ANOVA results yielded a F statistic of 12.699 (see Table 81) which is greater than the critical value of 3.00. Hence, a significant difference among grade means was found when the ANOVA was calculated using data which breached the normality assumption.

In rejecting the null hypothesis that there was no significant difference in the mean health and safety risk scores among third, fourth and fifth grade students, the t-test was employed to determine which means differ significantly from which other means. Indeed, when one makes only one t-test with alpha = .05, then alpha is .05. However, according to Glass (1984) and Ferguson & Takane (1989), whenever more than one t-test is made, the probability of one or more Type I errors will be greater than .05. Research has revealed (Glass, Peckham, and Sardens, 1972) that violation of the assumption of normality has almost no practical consequences in using the t-test. Boneau (1960) found that the probability of a Type II error (power) is virtually unaffected by marked non-normality. According to Glass and Hopkins (p. 238, 1984), the condition of normality can be largely disregarded as a prerequisite for using the t-test. The alpha level was decreased to .001 when the t-test was used to determine significance of difference between the mean scores of health and safety risk scores of the following groups: third grade students' scores and

fourth grade students' scores, fourth grade students' scores and fifth grade students' scores, and third grade students' scores and fifth grade students' scores. Table 83 presents the results of the t-test (two-tailed) between third and fourth grade students. The results indicated that the difference between the means of third grade students and fourth grade students was not significant at the .001 level of significance. Table 84 presents the results of the t-test between fourth and fifth grade students. The results indicated that the difference between the health and safety risk score means between fourth grade students and fifth grade students was not significant at the .001 level of significance. Table 85 presents the results of the t-test between third grade students and fifth grade students. The results show that the difference between the health and safety risk score means of third grade students and fifth grade students was significant at the .001 level of significance. Overall, the results indicated that grade level appears to influence the students' health and safety risk scores.

Null Hypothesis 2

There was no significant difference in the mean health and safety risk scores between female and male students.

The result of the t-test between female and male students is presented in Table 86. The results indicated that there was a significant difference at the .05 level of significance between female and male students regarding their health and safety risk score means; and therefore, hypothesis 2 was rejected. The results indicated that

Table 83. Difference in Mean Health and Safety Risk Scores Between Third and Fourth Grade Students (N=647).

Groups	N	Mean	Std. Dev.	t-Value
Third Graders	307	76.50	9.917	3.125
Fourth Graders	340	74.03	10.130	

$t = 3.125 < 3.291$, not significant at $p < .001$.

Table 84. Difference in Mean Health and Safety Risk Scores Between Fourth and Fifth Grade Students (N=679).

Groups	N	Mean	Std. Dev.	t-Value
Fourth Graders	340	74.03	10.13	1.897
Fifth Graders	339	72.59	9.746	

$t = 1.897 < 3.291$, not significant at $p < .001$.

Table 85. Difference in Mean Health and Safety Risk Scores Between Third and Fifth Grade Students (N=646).

Groups	N	Mean	Std. Dev.	t-Value
Third Graders	307	76.50	9.917	5.058*
Fifth Graders	339	72.59	9.746	

$t = 5.058 > 3.291$, $p < .001$.

*Significant at the .001 level.

Table 86. Difference in Mean Health and Safety Risk Scores Between Female and Male Students (N=986).

Groups	N	Mean	Std. Dev.	t-Value
Female Students	457	75.83	9.173	4.471*
Male Students	529	72.99	10.587	

$t = 4.471 > 1.960$, $p < .05$.

*Significant at the .05 level of significance.

gender did influence the students' health and safety risk scores. Gender had an impact upon the health and safety behaviors practiced by the students.

Null Hypothesis 3

There was no significant difference in the mean health and safety risk scores between white and nonwhite students.

The result of the t-test between nonwhite and white students is presented in Table 87. The difference between white and nonwhite students was not significant at the .05 level of significance; and therefore, hypothesis 3 was not rejected. The results indicated that race did not influence the students' health and safety risk scores.

Null Hypothesis 4

There was no significant difference in the mean health and safety risk scores between students from urban areas and students from rural areas.

Table 88 illustrates the result of the t-test between students from urban areas and students from rural areas. It was concluded that the difference between students from urban areas and students from rural areas was significant at the .05 level of significance. Thus, hypothesis 4 was rejected. According to the results, it appears that geographical areas may influence the students' health and safety risk scores.

Table 87. Difference in Mean Health and Safety Risk Scores Between White and Nonwhite Students (N=986).

Groups	N	Mean	Std. Dev.	t-Value
White Students	733	74.563	9.573	1.356
Nonwhite Students	253	73.570	11.32	

$t = 1.356 < 1.960$, not significant at $p < .05$.

Table 88. Difference in Mean Health and Safety Risk Scores Between Urban and Rural Students (N=786).

Groups	N	Mean	Std. Dev.	t-Value
Urban Students	443	75.71	9.73	3.83*
Rural Students	543	73.27	10.12	

$t = 3.83 > 1.960$, $p < .05$.

*Significant at the .05 level of significance.

VII. Summary of Sample Data Analysis

The analyses and interpretation of the sample data were presented in this chapter. The data were generated by the administration of the "Tennessee School Health and Safety Profile" questionnaire to third, fourth and fifth grade Tennessee children during the school year 1989-90. The data were exported from the TSHSP software and imported into the Virtual Address Extension (VAX) program at The University of Tennessee Computer Center and analyzed using the Statistical Analysis System (SAS). The data were also exported from the TSHSP software and imported into the Epi info (version 4.0) epidemiologic data analysis program. The statistical analyses to test for significance of difference included computation of the mean, mode, standard deviation, Chi-square, Kolmogorov-Smirnov one--sample test, one-way analysis of variance (ANOVA), Kruskal-Wallis (H) one-way analysis of variance, Bartlett's Chi-square, and the t-test. The .05 level of significance was used as the decision rule governing statistical tests.

The study population consisted of 986 third, fourth, and fifth grade students--307 (31.1%) third graders, 340 (34.5%) fourth graders, 339 (34.8%) fifth graders, 457 (46.3%) females, 529 (53.7%) males, 733 (74.3%) white students, 253 (25.7%) nonwhite students, 443 (44.9%) students from urban areas, and 543 (55.1%) students from rural areas.

Analysis of the data revealed the following results. On the average, the health and safety practices of Tennessee's children were categorized into the fair health and safety risk category ($\bar{x}$ = 74.3), based upon their health and safety risk scores. The results of cross

tabulations of grade (third, fourth, and fifth), gender (male and female), and geographical area (rural and urban) with the health and safety risk categories were significant when Chi-square was applied. The results of cross tabulation of race (nonwhite and white) with the health and safety risk categories were not significant when Chi-square was applied. The major health and safety risk factors of Tennessee's children were: lack of seat belt use, inability to swim; left at home without supervision, sometimes or often feeling that life was not worth living, eating junk food daily, never flossing teeth, unsure of how the disease AIDS is spread, not having a smoke alarm in the home, and unaware of a fire escape plan for their home. There were significant differences between the mean health and safety risk scores of third and fifth grade students when the t-test was applied at the .001 level of significance. There were significant differences between male and female students, and of students from urban areas and rural areas when the t-test was applied at the .05 level of significance. However, there were no significant differences between the mean health and safety risk scores of nonwhite and white students when the t-test was applied at the .05 level of significance.

VIII. Subscales

Factor analysis is a statistical technique available which can identify and summarize the many inter-relationships that exist among the individual variables within a test or instrument. Preliminary studies involving the design and development of tests and instruments

seek to obtain information on the widest possible variety of variables in order to increase understanding of the inter-relationships and homogeneity of the variables understudy (Kachigan, 1982).

As mentioned, one of the most important uses of factor analysis is in the identification of factors that underlie a large set of variables. By clustering a large number of variables into a smaller homogeneous set (or a new variable--a factor--representing each of these sets, according to Kachigan, 1982) then, the data have been simplified and researchers are more likely to gain insight into the subject matter.

A second important application of factor analysis is its flexibility in being able to extract as few or as many factors from a set of variables. Thus, the first extracted factor typically accounts for a large portion of the variance of the information inherent in the set of variables. Each of the succeeding factors will account for less and less variance. Researchers then can concentrate on those factors which account for the bulk of the variance contained in the entire set of variables (Kachigan, 1982). And, according to Kerlinger (1986), if two or more items within an instrument are substantially correlated, then they, in essence, share variance. The items have common factor variance in that they are measuring something in common.

The purpose for the application of factor analysis on the data generated by the state-wide random assessment were:

1. To identify those factors that underlie a large set of variables;

2. To identify those factors which account for the bulk of the variance contained in the set of variables (subscales).

Results

All 50 items on the "Tennessee School Health and Safety Profile" questionnaire were intercorrelated, yielding the correlation matrix. This R matrix underwent factor analysis with the Principal Components solution followed by a Varimax Orthogonal Rotation which revealed six underlying concepts or dimensions within the 50 items. Items that failed to correlate at .300 were eliminated (Rubinson and Neutens, 1987; Kerlinger, 1986; Kachigan, 1982). Factor analysis, revealed 36 items which measured six factors. The six factors and factor loadings are presented in Table 89.

Factor 1 accounts for approximately 9.9 percent of the variance, followed by Factor 2 with 5.42 percent, Factor 3 with 4.05 percent, Factor 4 with 3.72 percent, Factor 5 with 3.43 percent, and Factor 6 with 3.01 percent. Collectively, these six factors account for 29.53 percent of the total variance inherent in the data.

Discussion

In looking at the stability of the factors, it appears that Factor 1 (Table 89) has a dominant dimension of behaviors that place a child at risk, such as smoking, using alcohol, smokeless tobacco, carrying a knife, smoking marijuana, seat belt use, and being a passenger in a car driven by someone who had been drinking.

Table 89. Rotated Factor Loadings of Health and Safety Items.

Item Content		Factor Loading
Factor 1		
#12	Have you ever smoked cigarettes?	.70
#16	Do you drink alcohol?	.63
#15	When you are older, will you use tobacco?	.60
#13	Have you ever chewed tobacco?	.57
#17	Anyone ever asked you to try marijuana/cocaine?	.53
#3	Do you carry a knife?	.50
#18	Have you ever tried marijuana/cocaine?	.89
#1	Do you wear a seat belt?	.35
#49	Ever ridden in car with driver who had been drinking?	.32
S^2 -- 9.90%		
Factor 2		
#21	Do you like yourself?	.66
#20	Are you pleased with your body?	.62
#25	Have you ever felt life not worth living?	.53
#11	How often do you get enough sleep?	.41
#22	When you have a problem, who do you talk to about it?	.34
#27	How often do you eat breakfast?	.32
S^2 -- 5.42%		
Factor 3		
#30	How often do you eat junk food?	.64
#39	How often use string floss?	.64
#2	Do you wear a safety helmet when bike riding?	.54
#35	How often do you eat fruits/vegetables?	.40
#37	How often do you brush your teeth?	.38
#1	Do you wear seat belt?	.34*
#10	(How much watch TV/video games?)	-.43
S^2 -- 4.05%		
Factor 4		
#38	How often do you go to a dentist?	.57
#4	Do you know how to swim?	.55
#37	How often do you brush your teeth?	.46*
#7	Are you afraid of being hurt by an adult?	.36
#47	Do you have a smoke alarm where you live?	.32

Table 89 (continued)

Item Content		Factor Loading
#1	Do you wear a seat belt?	.30*
#35	How often do you eat fruits/vegetables?	.31*
#6	(Good friend/dare you?)	-.32
S^2 -- 3.72%		
Factor 5		
#42	Parent/teacher/adult talk about differences in boys/girls	.64
#43	Parent/teacher/adult talk about body changes	.63
#45	How do you get AIDS?	.40
(#44)	(Have you ever heard of AIDS?)	-.32
(#48)	(Adult tell about fire escape plan for home?)	-.51
(#50)	(Parent/teacher/adult talk about 911?)	-.51
S^2 -- 3.43%		
Factor 6		
#34	How often eat fish, turkey, chicken?	.59
#33	How often eat meats (bologna, hot dogs, beef)?	.59
#36	How often eat breads/cereals?	.36
(#32)	(How often fix own meals?)	-.32
(#37)	(How often brush your teeth?)	-.37*
(#31)	(Eat at fast food places?)	-.47
S^2 -- 3.01%		

* = Identified on more than 1 factor.

Factor 2 (Table 89) appears descriptively to encompass a dimension of behaviors dealing with self esteem and feeling good about oneself. Interestingly, the behaviors of eating breakfast and getting enough sleep are activities which children may parallel as behaviors that help them to feel good about themselves.

Factor 3 (Table 89) seems somewhat confusing in that a dominant factor underlying the six variables is not apparent. Wearing seat belts and wearing a safety helmet when riding a bike are behaviors that can protect them. Perhaps brushing and flossing teeth may be seen as protecting the teeth from decay after eating junk food and fruits and vegetables. The negative loading of item #10 suggests that watching television for many hours may not be behavior in their best interest health and safety-wise.

Factor 4 (Table 89) appears to bring together behaviors that involve the influence of a parent or an adult. Going to the dentist, learning how to swim, being afraid of an adult (perhaps even the dentist), and a smoke alarm in the home suggest the involvement of an adult. The negative loading on item #6, "If a good friend dared you to do something dangerous or bad, what would you do?" implies that to respond favorably on this item is in converse of the meaning of the factor. In other words, such a negatively loading variable has a meaning opposite that of the factor (Kachigan, 1982). A good friend's dare may be seen as opposite to an adult's influence in health and safety behavior.

Factor 5 (Table 89) suggests a dominant element of specific adult instruction in health and safety. The negative factor loadings of item #44, "Have you ever heard of AIDS?"; item #48, "Has an adult who lives with you ever talked to you about how to get out if there were a fire where you live?"; and #50, "Has a parent, teacher, or other adult ever talked to you about how to make an emergency telephone call (police, fire, ambulance) or 911?" that to not receive information from parents or teachers regarding AIDS, fire safety, and emergency 911 is in direct converse of the meaning of the factor.

Factor 6 (Table 89) appears to assemble a notion of daily nutrition with regard to meats, fish, breads, and chicken with fixing own meals, brushing teeth, and eating at fast food places occurring less than on a daily basis.

Item #1, "Do you wear a seat belt?" was identified on more than one factor and is suspect along with item #35, "How often do you eat fruits and vegetables?", and item #37, "How often do you brush your teeth?" Wearing a safety belt, eating fruits and vegetables, and brushing one's teeth may be separate and dominant factors with meaningful individual interpretation by the children.

As mentioned, the factor analysis techniques are used to analyze interrelationships among a set of variables. This analysis yields groups or clusters of correlating items that describe a basic dimension or trait. It is often employed in methods of construct validation (Kerlinger, 1986; Hill, 1989). Measurement experts inquiring into the construct validity of an instrument seek to explain the variance of

that instrument. A question to ask then is: What factors or constructs account for the variance in the "Tennessee School Health and Safety Profile" questionnaire? Thirty-six variables were identified which measured six factors. These six factors accounted for 29.53 percent of the total variance inherent in the data. The dimensions underlying the six factors include: behaviors that would place a child's health and safety at risk; self-esteem and self acceptance; behaviors leaning toward health and safety protection and risk prevention; parental influence on health and safety behaviors; adult instruction regarding health and safety; and elements of nutrition behavior. The TSHSP seems to distinguish individuals high and low in these six traits.

CHAPTER V

SUMMARY, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

I. Summary

The purpose of the study was to develop an instrument designed to identify health and safety risk factors for children attending selected Tennessee public schools as third, fourth, or fifth graders, to establish initial instrument reliability and internal consistency (the early steps in developing a risk-assessment tool for classroom use) and to provide baseline data for future school health and safety programs in Tennessee. The study specifically sought to address the following questions:

1. What are the major health and safety risk factors for children (third, fourth, and fifth graders) in the state of Tennessee as measured by the "Tennessee School Health and Safety Profile" questionnaire?
2. Are there significant differences for the major health and safety risk factors among third, fourth, and fifth grade students?
3. Are there significant differences for the major health and safety risk factors between male and female students?
4. Are there significant differences for the major health and safety risk factors between white and nonwhite students?

5. Are there significant differences for the major health and safety risk factors between students from rural and urban areas?

The "Tennessee School Health and Safety Profile," a computerized health and safety risk appraisal, was administered to 986 students during the school year 1989-90. The study population consisted of: 307 (31.1%) third grade students, 340 (34.5%) fourth grade students, 339 (34.4%) fifth grade students; 457 (46.3%) females, 529 (53.7% males); 146 (47.6%) third grade females, 161 (52.4%) third grade males, 164 (48.2%) fourth grade females, 176 (51.8%) fourth grade males, 147 (43.4%) fifth grade females, 192 (56.6%) fifth grade males, 733 (74.3%) white students, 253 (25.7%) nonwhite students, 443 (44.9%) students from urban areas, 543 (55.1%) students from rural areas.

The primary statistical methods used to describe the students' health and safety risk behaviors were to compute the student survey responses in terms of frequencies and percentages. The mean, mode, standard deviation of the health and safety risk scores were calculated. Tests of significance of difference included Chi-square, Kolmogorov-Smirnov one sample test, analysis of variance, and $\underline{t}$-test. The .05 level of significance was used as one of the decision rules governing the statistical tests conducted.

II. Findings

Based on the analyses of the data in the research study, the following major findings were revealed. The findings were presented

for all third, fourth, and fifth grade students and then categorized according to grade, gender, race, and geographical area.

The following is a breakdown of the results of all the student subjects' health and safety profiles according to health and safety risk score, health and safety risk categories, and selected health and safety risk factors:

1. The mean health and safety risk score of the 986 Tennessee school children was 74.31 with a standard deviation of 10.05 and a mode of 75.
2. Based on the mean health and safety risk score, the students in the state of Tennessee, on the average, fall into the fair health and safety category.
3. The third, fourth, and fifth grade students were categorized into the following health and safety risk categories: 5.0 percent in the excellent category, 27.0 percent in the good category, 39.3 percent in the fair category, 27.1 percent in the risky category, and 1.6 percent in the hazardous category.
4. Approximately 10 percent of the students almost never wear a seat belt.
5. Approximately 28 percent of the students do not know how to swim.
6. It was revealed that 17.4 percent of the students are left at home without adult supervision.
7. Over one-third of the students sometimes or often feel that life is not worth living.

8. It was revealed that 18.3 percent of the students eat junk food daily.
9. Approximately 66 percent of the students never floss their teeth.
10. Almost half of the students (49.6%) do not know how the disease AIDS is spread.
11. It was found that 23.4 percent of the students do not have a smoke alarm in their homes and 18.4 percent do not have a fire escape plan for their home.
12. A high percentage of students (83.7%) responded that they would be afraid of getting AIDS too if a student in their school had AIDS.

Grade

The following are the results of the analyses of the health and safety profiles of third, fourth, and fifth grade students according to health and safety risk scores, health and safety risk categories, and selected health and safety risk factors.

1. The mean health and safety risk score of third grade students was 76.50 with a standard deviation of 9.92 and a mode of 82. The mean health and safety risk score of fourth grade students was 74.03 with a standard deviation of 10.13 and a mode of 75 while the mean health and safety risk score of fifth grade students was 72.59 with a standard deviation of 9.75 and a mode of 72. Based on the mean health and safety risk scores, the third, fourth, and fifth grade students, on the

average, were categorized into the fair health and safety risk category.

2. The following are the results of cross tabulation of grade (third, fourth, and fifth) with the health and safety risk categories: for the third grade students, 5.9 percent were in the excellent category, followed by 35.5 percent in the good category, 37.8 percent in the fair category, 19.5 percent in the risky category, and 1/3 percent in the hazardous category. The fourth grade students were categorized into the following health and safety categories: 4.7 percent in the excellent category, 27.1 percent in the good category, 37.6 percent in the fair category, 29.1 percent in the risky category, and 1.5 percent in the hazardous category. For the fifth grade students, 4.4 percent were in the excellent category, followed by 19.2 percent in the good category, 42.5 percent in the fair category, 31.9 percent in the risky category, and 2.0 percent in the hazardous category.

3. The results of cross tabulation of grade (third, fourth, and fifth) with health and safety risk categories were significant at the .05 level of significance when Chi-square was applied.

4. Fourth grade students had a higher percent (13.2%) not wearing seat belts than third and fifth grade students (6.1% and 10.9%, respectively).

5. A higher percent of third grade students (38.1%) do not know how to swim when compared to the percent (25.5%) of fourth graders and fifth graders (22.4%).

6. Fifth grade students had a higher percent (23.0%) reporting being left at home without adult supervision when compared with the percent (13.5%) of the fourth graders and third graders (15.6%).

7. A high percent of fifth grade students (41.0%) sometimes or often felt life was not worth living when compared to the percent (31.6%) of third graders and fourth graders (39.4%).

8. A low percent of third grade students (14.3%) and fourth grade students (19.4%) eat junk food daily when compared to fifth grade (20.9%).

9. The percent of fifth grade students (71.1%) who never floss their teeth is much higher than the fourth grade students (36.1%), and the third grade students (62.9%).

10. A higher percent of fourth grade students (54.7%) and third grade students (55.7%) reported they did not know how the disease AIDS is spread when compared with the fifth grade students (38.9%).

11. The percent of students in grades three, four, and five who do not have a smoke alarm in their home is very similar (23.7%, 23.8%, and 23.0%, respectively).

12. Third graders had a lower percent (16.3%) reporting no fire escape plan in the home when compared with the fourth grade and fifth grade (19.7% and 18.8%, respectively).

13. A higher percent of third graders (92.1%) reported that they would be afraid of getting AIDS too if a student in their school had

AIDS, when compared to the fourth grade (83.5%) and fifth grade (76.1%).

14. The one-way analysis of variance and the Kruskal-Wallis one-way analysis of variance revealed the means to differ significantly among third, fourth, and fifth grade students. There was a significant difference between the mean health and safety risk scores of third grade students and fifth grade students when the t-test was applied.

Gender

The following are the results of the analyses of the health and safety profiles of female and male students according to health and safety risk scores, health and safety risk categories, and selected health and safety risk factors:

1. The mean health and safety risk score of female students was 75.83 with a standard deviation of 9.17 and a mode of 75 while the mean health and safety score of male students was 72.99 with a standard deviation of 10.587 and a mode of 72. Based on the mean health and safety risk scores, both the male and the female students, on the average, were categorized into the fair health and safety category.

2. For the female students, 6.8 percent were in the excellent health and safety category, followed by 30.0 percent in the good category, 38.9 percent in the fair category, 23.9 percent in the risky category and 0.4 percent in the hazardous category.

3. The male students were categorized into the following health and safety categories: 3.4 percent were in the excellent category, followed by 24.4 percent in the good category, 39.7 percent in the fair

category, 29.9 percent in the risky category, and 2.6 percent in the hazardous category.

4. The results of cross tabulation of gender (male and female) with health and safety risk categories were significant at the .05 level of significance when Chi-square was applied.

5. It was found that 12.5 percent of the male students and 7.7 percent of the female students almost never wear their seat belt.

6. It was further revealed that 26.6 percent of the male students and 30.4 percent of the female students do not know how to swim.

7. A higher percent of the male students (19.4%) were left at home without supervision when compared with the female students (15.0%).

8. A higher percent of the male students (21.7%) watch television or play video games six or more hours a day when compared with the female students (16.4%).

9. Approximately 5.6 percent of the male students and 2.2 percent of the female students report having smoked cigarettes.

10. It was reported that the percent of male students (3.4% and 3.2%, respectively) using chewing tobacco and drinking alcohol was higher when compared with the female students (0% and 1.1%, respectively).

11. Approximately 39.3 percent of the male students and 35.4 percent of the female students sometimes or often feel life is not worth living.

12. A higher percent of male students (20.8%) eat junk food daily when compared with the female students (15.5%).

13. A high percent of males (69.2%) and females (63.2%) never floss their teeth.

14. A high percent of males (46.0%) and females (54.0%) do not know how the disease AIDS is spread.

15. A high percent of males (83.2%) are females (84.2%) would be afraid of getting AIDS too if a student in their school had AIDS.

16. It was further revealed that 22.3 percent of the male students and 24.7 percent of the female students have no smoke alarm in the home alongside 19.4 percent of the males and 17.1 percent of the females who have no fire escape plan for their home.

17. There was a significant difference between the mean health and safety risk scores of female and male students when the t-test was applied.

Race

This section contains the results of the analyses of the health and safety profiles of nonwhite and white students according to their mean health and safety risk scores, health and safety risk categories, and selected health and safety risk factors:

1. The mean health and safety risk score of nonwhite students was 73.57 with a standard deviation of 11.32 and a mode of 77 while the mean health and safety risk score of white students was 74.56 with a standard deviation of 9.57 and a mode of 75. Based on the mean health

and safety risk scores, both nonwhite and white students, on the average, were categorized into the fair category.

2. For the nonwhite students, 4.7 percent were in the excellent category followed by 25.7 percent in the good category, 38.3 percent in the fair category, 28.5 percent in the risky category and 2.8 percent in the hazardous category.

3. The white students were categorized into the following health and safety risk categories: 5.0 percent in the excellent category, 27.4 percent in the good category, 39.7 percent in the fair category, 26.6 percent in the risky category, followed by 1.2 percent in the hazardous category.

4. The results of the cross tabulation of race (nonwhite and white) with health and safety risk categories was not significant at the .05 level of significance when Chi-square was applied.

5. It was found that 10.4 percent of the white students and 9.9 percent of the nonwhite students almost never wear seat belts.

6. It was further reported that 17.3 percent of the white students carry a knife when compared to 9.9 percent of the nonwhite students.

7. A higher percent of nonwhite students (40.7%) reported the inability to swim when compared with the white students (24.1%).

8. Approximately 17.1 percent of the white students and 18.6 percent of the nonwhite students are left at home without supervision.

9. A higher percent of nonwhite students (24.9%) watch television or play video games more than six hours a day when compared to white students (17.3%).

10. It was further revealed that 5.1 percent of nonwhite students have tried marijuana while 1.1 percent of the white students have also tried marijuana.

11. A high percent of nonwhite students (43.9%) and white students (35.3%) report that sometimes or often life is not worth living.

12. Approximately 17.9 percent of the white students and 19.8 percent of the nonwhite students eat junk food daily.

13. A high percent of nonwhite students (58.5%) and white students (69.2%) report never flossing their teeth.

14. A high percent of white students (51.4%) and nonwhite students (44.3%) do not know how the disease AIDS is spread.

15. Approximately 82.1 percent of the white students and 87.7 percent of the nonwhite students are afraid they might get AIDS too if a student in their school had AIDS.

16. It was further reported that 23.3 percent of the white students and 23.7 percent of the nonwhite students do not have a smoke alarm in the home.

17. Seventeen percent of the nonwhite students do not have a fire escape plan for the home while approximately 18.8 percent of the white students do not have a fire escape plan for the home.

18. There was not a significant difference between the mean health and safety risk scores of nonwhite and white students when the t-test was applied.

Geographical Area

This section contains the results of the analyses of the health and safety profiles of students from rural areas and students from urban areas according to their mean health and safety risk scores, health and safety risk categories, and selected health and safety risk factors:

1. The mean health and safety risk score of students from rural areas was 73.27 with a standard deviation of 10.12 and a mode of 75 while the mean health and safety risk score of students from urban areas was 75.71 with a standard deviation of 9.73 and a mode of 75. Based on the mean health and safety risk scores, students from rural areas and urban areas, on the average, were categorized into the fair health and safety risk category.

2. According to the health and safety risk scores, the students from rural areas were categorized into the following health and safety risk categories: 3.7 percent in the excellent category, followed by 24.5 percent in the good category, 40.5 percent in the fair category, 29.7 percent in the risky category, and 1.7 percent in the hazardous category.

3. Based on the health and safety risk scores, the students from urban areas were categorized into the following health and safety risk categories: 6.5 percent were in the excellent category, followed by 30.2 percent in the good category, 38.1 percent in the fair category, 23.7 percent in the risky category, and finally, 1.4 percent in the hazardous category.

4. The results of cross tabulation of geographical area (rural and urban) with health and safety risk categories were significant at the .05 level of significance when Chi-square was applied.

5. Approximately 11.8 percent of the rural students and 8.4 of the urban students almost never wear their seat belt.

6. A higher percent of rural students (21.0%) report carrying a knife when compared with the urban students (8.5%).

7. It was revealed that 27.1 percent of the urban students and 29.5 percent of the rural students do not know how to swim.

8. It was further reported that 19.1 percent of the rural students and 15.3 percent of the urban students are left at home without supervision.

9. A high percent of urban students (41.8%) and rural students (34.1%) report that sometimes or often they feel that life is not worth living.

10. Approximately 3.1 percent of the rural students reported using smokeless tobacco when compared to .2 percent of the urban students.

11. It was further reported that 2.9 percent of the rural students and 1.4 percent of the urban students have used alcohol.

12. Two percent of the rural students reported having tried marijuana, and 2.3 percent of the urban students reported having tried marijuana.

13. Approximately 17.4 percent of urban students and 19.1 percent of rural students eat junk food daily.

14. A high percent of urban students (66.8%) and rural students (66.1%) never floss their teeth.

15. A high percent of urban students (43.1%) and rural students (54.9%) do not know how the disease AIDS is spread.

16. Approximately 85.4 percent of rural students and 81.5 percent of urban students reported that they would be afraid of getting AIDS too if a student in their school had AIDS.

17. A higher percent of rural students (28.7% and 20.7%, respectively) do not have a smoke alarm in the home and no fire escape plan for their home compared with the urban students (16.9% and 16.2%, respectively).

18. There was a significant difference between the mean health and safety risk scores of students from rural and urban students when the t-test was applied.

Additional Findings

The findings pertain to the cross tabulation of the health and safety risk categories and the following student variables: grade (three, four, and five), gender (male and female), race (white and nonwhite), and geographical area (urban and rural). Chi-square was applied to determine whether the results of the cross tabulations were significant at the .05 level of significance.

1. The result of the cross tabulation of third grade male and female students' scores was significant. A higher percent of third grade female students (8.9%) was in the excellent category than the percent of male third grade students (3.1%).

2. The result of the cross tabulation of fourth grade male and female students' scores was not significant.

3. The result of the cross tabulation of fifth grade male and female students' scores was not significant.

4. The result of the cross tabulation of third grade female and fifth grade female students' scores was significant. A higher percent of fifth grade female students (28.6%) were classified in the risky category compared with the third grade female students (17.1%).

5. The result of the cross tabulation of third grade male and fifth grade male students' scores was significant. A higher percent of fifth grade male students (34.4%) were in the risky category compared to the third grade male students (21.7%).

6. The result of the cross tabulation of urban female and rural female students' scores was not significant.

7. The result of the cross tabulation of urban male and rural male students' scores was not significant.

8. The result of the cross tabulation of rural male and female students' scores was significant. A higher percent of rural females (5.3%) were classified in the excellent category compared to the rural male students (2.3%).

9. The result of the cross tabulation of urban male and female students' scores was significant. A higher percent of urban female students (8.5%) were classified in the excellent category compared to the urban male students (4.8%).

10. The result of the ross tabulation of white and nonwhite male students' scores was not significant.

11. The result of the cross tabulation of white and nonwhite female students' scores was not significant.

12. The results of the cross tabulation of white male and female students' scores was significant. A higher percent of white female students (7.1%) were in the excellent category compared to the white male students (3.3%).

13. The result of the cross tabulation of nonwhite male and female students' scores was not significant.

14. The result of the cross tabulation of rural third and fourth grade students' scores was significant. A higher percent of fourth grade students from rural areas (32.8% and 1.7%, respectively) were in the risky and hazardous category compared to the third grade students from rural areas (20.2% and 1.2%, respectively).

15. The result of the cross tabulation of rural fourth and fifth grade students' scores was not significant.

16. The result of the cross tabulation of rural third and fifth grade students' scores was significant. A higher percent of fifth grade students from rural areas (34.9%) were in the risky category compared with the third grade students from rural areas (20.2%).

17. The result of the cross tabulation of urban third and fourth grade students' scores was not significant.

18. The result of the cross tabulation of urban fourth and fifth grade students' scores was not significant.

19. The result of the cross tabulation of urban third and fifth grade students' scores was significant. A higher percent of urban fifth grade students (27.4% and 1.4%, respectively) were in the hazardous and risky categories when compared to the urban third grade students (18.4% and 1.4%, respectively).

20. The result of the cross tabulation of urban third grade and rural third grade students' scores was not significant.

21. The result of the cross tabulation of urban third grade and rural fourth grade students' scores was significant. A higher percent of urban third grade students (5.0%) were in the excellent category compared to the rural fourth grade students (1.7%).

22. The result of the cross tabulation of urban third grade and rural fifth grade students' scores was significant. A much higher percent of rural fifth grade students (34.9%) were in the risky category than were the urban third grade students (18.4%).

23. The result of the cross tabulation of urban and rural fourth grade students' scores was significant. A much higher percent of urban fourth grade students (8.1%) were in the excellent category than were the rural fourth grade students (1.7%).

24. The result of the cross tabulation of urban fourth grade and rural fifth grade students' scores was significant. A higher percent of urban fourth grade students (32.3%) were classified into the good category than were the rural fifth grade students (19.0%).

25. The result of the cross tabulation of urban fifth grade and rural third grade was not significant.

26. The result of the cross tabulation of urban fifth grade with rural fifth grade was not significant.

27. The result of the cross tabulation of rural white and nonwhite students' scores was not significant.

28. The result of cross tabulation of urban white and nonwhite students' scores was not significant.

29. The result of cross tabulation of white urban and rural students' scores was significant. A higher percent of rural white students (29.0% and 1.3%, respectively) were in the risky and hazardous category than the urban white students (22.2% and 0.7%, respectively).

30. The result of cross tabulation of nonwhite urban and rural students' scores was not significant.

31. The result of cross tabulation of white third and fourth grade students' scores was significant. A higher percent of fourth grade white students (28.7%) were in the risky category than were the third grade white students (17.9%).

32. The result of cross tabulation of white third and fifth grade students' scores was significant. A higher percent of white fifth grade students (32.1%) were in the risky category than were white third grade students (17.9%).

33. The result of nonwhite third and fifth grade students' scores were not significant.

34. The result of cross tabulation of third grade white and nonwhite female students' scores was not significant.

35. The result of cross tabulation of fourth grade white and nonwhite female students' scores was not significant.

36. The result of cross tabulation of fifth grade white and nonwhite female students' scores was not significant.

37. The result of cross tabulation of third grade white and nonwhite male students' scores was not significant.

38. The result of cross tabulation of fourth grade white and nonwhite male students' scores was not significant.

39. The result of cross tabulation of fifth grade white and nonwhite male students' scores was not significant.

40. The result of cross tabulation of urban white and nonwhite third grade students' scores was not significant.

41. The result of cross tabulation of urban white and nonwhite fourth grade students' scores was not significant.

42. The result of cross tabulation of urban white and nonwhite fifth grade students' scores was not significant.

43. The result of cross tabulation of the rural white and nonwhite third grade students' scores was not significant.

44. The result of cross tabulation of the rural white and nonwhite fourth grade students' scores was not significant.

45. The result of cross tabulation of the rural white and nonwhite fifth grade students' scores was not significant.

III. Conclusions

1. According to the "Tennessee School Health and Safety Profile" instrument, the overall health and safety of Tennessee children is fair.

2. The grade of the subjects is a factor regarding the major health and safety risk factors in the third and fifth grades. As students progress from third to fifth grade, they increase their practice of risky health and safety behavior.

3. The gender of the subjects is a factor concerning the practice of risky health and safety behaviors, with the males practicing risky health and safety behaviors more so than the females.

4. According to the "Tennessee School Health and Safety Profile" questionnaire, the race of the subjects appears not to be a factor concerning the practice of risky health and safety behaviors. Both white and nonwhite students are practicing risky health and safety behaviors.

5. It was concluded, generally, that the geographical area of the subjects is an influencing factor concerning the major health and safety risk factors. Geographical area also seems to be a factor regarding the health and safety risk categories. Students from rural areas appear more likely to practice risky health and safety behaviors than students from urban areas.

IV. Recommendations

Based upon the findings, conclusion, and literature review of the research study, the following recommendations were made:

1. Follow-up study should be conducted to validate/assess the changes in health and safety beliefs and practices of the third, fourth, and fifth grade students, particularly the fourth grade students.

2. A study that is similar to this research in health and safety assessment should be conducted, using grades six, seven, and eight in the state of Tennessee to further asses risk behaviors specific to grade, gender, race, and geographical area.

3. The collaboration of efforts towards the design and development of a comprehensive health and safety assessment in kindergarten through grade twelve in the state of Tennessee should continue.

4. The data compiled in this research report should be used as a systematic and rational basis for local, regional and state-level discussion and planning to move forward in meeting the identified health and safety needs of Tennessee's school-age children.

CHAPTER VI

EPILOGUE

I. Introduction

The purpose of the study, as stated in Chapter I, was to design and develop an instrument to be used in the identification of major health and safety risk factors of children attending selected Tennessee public schools as either third, fourth or fifth graders; to establish initial reliability of the instrument; and to provide baseline data for future school health and safety programs in Tennessee. The data were collected from 986 students through the administration of "The Tennessee School Health and Safety Profile" questionnaire. In this chapter, the researcher is given the opportunity to express observations encountered in the study and analyses that go beyond the scope of this research. This chapter embodies the following divisions: (1) Introduction, (2) Observations About the Study, (3) Significance of the Study, and (4) Future Research Directions.

II. Observations About the Study

TSHSP Internal Consistency

The internal consistency measurements yielded 38 variables which measured six factors or subscales. Twelve items were overlooked in the analyses. There were six items identified that would increase the internal consistency if removed from the questionnaire. Test-retest reliability for the safety items suggest the need for the inclusion of

additional items in safety to boost the potential for a more reliable safety scale. Modification of the instrument is warranted to help strengthen the reliability and internal consistency of the items and underlying subscales of those factors measured. The TSHSP is a tool for mapping the health and safety behavior of the children in grades three, four, and five. Several of the items on the questionnaire map behavior successfully. Others are mapping not so successfully. The next step is to move towards the improvement of the reliability by removing those items identified as inconsistent, revising those items which appear ambiguous, and including additional items in safety. It is with the understanding, however, that though the TSHSP may be revised to establish a greater consistency over time, there still remain extraneous and extrinsic factors that come into play in a child's mind. Many children are "kids in trouble" with a lack of health and safety knowledge, a lack of parental and familial support, suffering self-concepts, poverty, abuse and illness. These factors may influence a child's self-reporting of behaviors even when an instrument with very acceptable internal consistency and reliability coefficients is used.

Strengths and Weaknesses of the Study

A major strength of this research study was in the cooperation and concerted efforts involving health educators from the Tennessee Department of Health and Environment-Health Promotion and Chronic Disease Control Section in Nashville, the classroom teachers and administrators from the pilot-study schools, and researchers from the

Department of Health, Leisure and Safety at The University of Tennessee, Knoxville. Collaboration of feedback regarding the pilot study efforts was invaluable. Having the assembly of professionals in the pilot-study classrooms to critique, review, and to offer suggestions for improvement on the TSHSP instrumentation, item content, assessment protocol, and student comprehension helped in the identification of those areas in the TSHSP study in need of revision and amelioration before the statewide assessment was to be initiated.

Another major strength of this research study was in the data collection. Data generated by 986 school-age children were collected utilizing the TSHSP software program and the hardware which included the optical mark reader (linked to the serial port of an in-class lap-top computer) which collected and stored the data and provided each student with an immediate printout of their health and safety behavior profile. An eight-minute instructional videotape, professionally produced, was utilized to establish a standardized set of instructions for the students participating in the study. The following information was provided by the videotape instruction: purpose of the study, the research bodies involved, directions on how to complete the TSHSP questionnaire, and information ensuring the students' anonymity and confidentiality.

The optical mark reader (the scanning device) provided an environment for the children to respond honestly and in confidence due to the ability of the OMR to read the students' answer cards electronically. The use of the OMR was a major design consideration in

developing a new software package for elementary students. This study sought to gather valid information in current health and safety behavior by using a questionnaire which elicited self-reported health and safety behavior of the student respondents. A leading concern in self-reported data pertaining to health and safety habits is validity. And, according to Fortune (1988), an advantage in using the optical mark reader for data collection is its ability to provide maximum confidentiality which increases the chance of gathering self-reported data that are valid. Upon scanning of the computer answer card, the computer activated the printer which within seconds, provided individual profiles with no names or ID numbers.

Aggregate group summaries were immediately available to the classroom teacher. The provision of a feedback resource for teachers to enhance the rational basis for planned health and safety intervention strategies was a major strength of the study.

The random sample of counties and schools was a strength of the study. One researcher traveled to fifteen different counties from east to west Tennessee, transporting the hardware in a University of Tennessee minivan. The design of the equipment, too, was a real strength in that the hardware could be moved from room to room very easily. The TSHSP was a brightly-colored and self-contained independent research study on wheels. The children were excited.

Health educators from each county selected and from Nashville were present in each of the classrooms throughout the study. Having a cooperative and involved group of health professionals interacting throughout each step of the TSHSP was a definite strength of the study.

The participation and endorsement of the Commissioner of Tennessee's Department of Education and the Commissioner of Tennessee's Department of Health and Environment allowed for the support and recognition of the importance of the TSHSP study statewide. Their involvement at the top was a true strength of this research study. Use of the videotape and optical mark reader in the data collection along with the random sample and equipment design were the real strengths of this study, but the study had weakness also.

The major weakness of the research study was lack of follow-up provided for the students on the data generated by the students' responses. Teachers could choose to follow-up based on the aggregate group summaries, however, better follow-up was needed. According to Petosa, "The use of HRAs is most appropriate in settings where students receive long-term and comprehensive health education" (et al., p. 54, 1986). As mentioned, the use of HRAs as one-shot screening tools provides limited opportunities for students to actualize new knowledge in modifying or changing behavior which may place their health and safety at-risk.

III. Significance of the Study

For the first time in Tennessee, valid data covering a broad range of health and safety behaviors of third, fourth, and fifth grade students was available for systematic analysis to help identify curriculum needs based upon timely empirical data. The health and safety education programs in schools will have a data-base generated by

Tennessee students rather than extrapolation from national data concerning the health and safety needs of Tennessee's school-age children. The assessment of health and safety behaviors provides information for evaluating the effectiveness of classroom instruction and in identifying strengths and weaknesses of health and safety curricula (Pursley and Obersaat, 1990). The data file too, may be exported for more detailed analyses. Teachers then can target resources to those identified health and safety needs of their students.

The immediate printout given to each student participant was a very important aspect of this study. Students were given something very real, very tangible, in the printouts they received. Positive and negative health and safety behaviors were identified and additional suggestions were rendered to the students regarding ways to improve their health and safety status. According to Fielding (1982), a printout provides a personalized document with information that can be taken home, discussed with family, referred to when desired, and used to pinpoint progress in the improvement of behaviors which may place one's health and safety at risk.

The information gathered through this assessment will be used to better serve the elementary school-age children across the state of Tennessee.

IV. Future Research Direction

Future studies need to focus on how best to address primary prevention strategies based upon sound predictive models which can help

to identify those children at greatest risk for injury, accident, suicide, abuse, neglect, fire harm, hence, premature mortality and morbidity. No comprehensive model exists to link such variables as demographic background factors, parent's health beliefs, parent's child-rearing practices, and the child's actual health to the child's health attitudes, beliefs or behavior (Law and Klepper, 1989). The state of Tennessee can move forward in the assessment of at-risk behavior through a data-base link-up using fiber optics and county-wide to state-wide networking for intervention planning and resource management. The Tennessee School Health and Safety Profile is an avenue to assess health and safety behavior. The state of Tennessee can assemble from a variety of public and private organizations--a team of professionals including parents, teachers, administrators, elected officials, state and local service producers alongside professionals from respective disciplines of health, safety, mental health, social welfare, education, day care, handicapped services, physicians and nurses to develop health and safety objectives for Tennessee's Children for the year 2000--leading to the identification of priority areas to receive emphasis in statewide health and safety policy and planning by both governmental and private groups.

Hopefully, other researchers will be challenged to move forward in the assessment of the health and safety of children, and in the predictive identification of those behaviors underpinning premature morbidity and mortality in children as a result of these findings.

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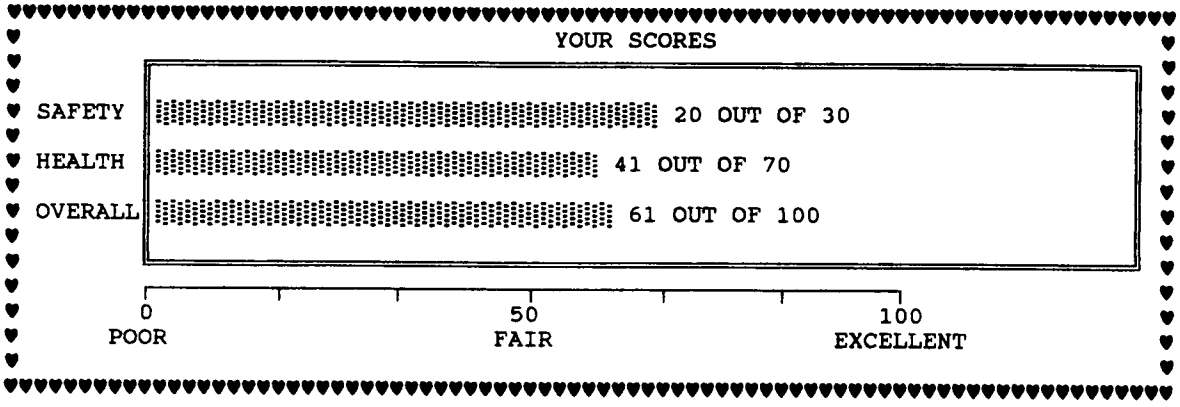
APPENDICES

APPENDIX A

PERSONAL PRINTOUT

TENNESSEE -- SCHOOL HEALTH & SAFETY PROFILE
THIS IS A COMPUTER PROGRAM FOR FUN & LEARNING ABOUT FEELING GOOD!

How you live your life can have a big affect on your HEALTH and SAFETY. Eat right, be safe, don't smoke and don't do drugs, and you can be a STRONGER, HEALTHIER person.



Good for you. You did well in these areas:

- ☺ NOT SMOKING
- ☺ NO ALCOHOL
- ☺ NO DRUGS
- ☺ YOU LIKE YOURSELF
- ☺ FIRE SAFETY

You can do even better by:

- ALWAYS WEAR SEATBELTS, wearing them may save your life!
- Learn how to SWIM!
- Every BODY needs regular exercise. Try it, you will LOOK and FEEL better!
- Good dental health is very important. BRUSH and FLOSS your teeth EVERY day.
- In case of an EMERGENCY CALL 911 to get HELP.

SUMMARY

☺☺ There are changes YOU can make that can help you to live longer. Think about your health. Make GOOD HEALTH and SAFETY habits A WAY OF LIFE!

TALK TO YOUR FOLKS ABOUT THESE IMPORTANT TOPICS & SHOW THIS TO THEM !!

To Students, Parents and Teachers:

The Tennessee School Health and Safety Profile has four main goals:

1. To help raise individual student awareness of personal health and safety behavior;
2. To encourage discussion and open communication between parents and children regarding health and safety behavior;
3. To assist classroom teachers in knowing more about their pupils' health and safety behavior;
4. To assist in raising parents' and teachers' awareness of the importance for maintaining a healthy and safe school environment.

The information gathered by a state-of-the-art assessment will be used to better serve the elementary school children across our state. Participation is voluntary and individual responses are completely confidential. Only summaries of results will be analyzed.

We want to be the first to help our children develop an awareness of good health and safety practices. Thank you for your participation.

Charles E. Smith, Commissioner
Tennessee Department of
Education

J. W. Luna, Commissioner
Tennessee Department of
Health and Environemnt

APPENDIX B

TSHSP QUESTIONNAIRE AND COMPUTER CARD

Welcome to

TENNESSEE SCHOOL HEALTH & SAFETY PROFILE





Grades 3,4&5

To Students, Parents and Teachers:

The Tennessee School Health and Safety Profile has four main goals:

1. To help raise individual student awareness of personal health and safety behavior;
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Charles E. Smith, Commissioner
Tennessee Department of Education

J. W. Luna, Commissioner
Tennessee Department of Health and Environemnt

Tennessee School Health & Safety Profile
Grades 3, 4, and 5

Directions: Mark answers on the ANSWER CARD only - please DO NOT write on this paper. Use a #2 pencil only, mark in the circle, and erase any stray Marks.
Do mark like this: ● Do not mark like this: ⊘ ⊗ ◉

These questions ask about your health and safety habits and will give you a computer printout based on your answers. Do NOT put your name anywhere on these pages or answer card. NO ONE will know what you answered.

Please answer EVERY question, but give only one ANSWER per question.

PART 1

1. Do you wear a seatbelt when you ride in a car or truck?

   (1) Yes, all the time
   (2) Sometimes I do
   (3) Almost never

2. Do you wear a safety helmet when you ride a bike?

   (1) Yes, most the time
   (2) Sometimes
   (3) Almost never
   (4) I don't ride a bike.

3. Do you carry a knife?

   (1) Yes, most of the time
   (2) Sometimes
   (3) Almost never
   (4) Never

4. Do you know how to swim and stay afloat in water that is over your head?

   (1) Yes
   (2) No

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5. How often are you at home alone, or only with a younger brother or sister around?

(1) Often
(2) Sometimes
(3) Never

6. If a good friend dared you to do something that was dangerous or bad, what would you do?

(1) I would let my friend go first
(2) I would do it
(3) I would walk away from my friend
(4) I would tell my friend no
(5) I am not sure

7. Are you afraid of being hurt by an adult?

(1) Often
(2) Sometimes
(3) Never

8. Have you missed any full days from school in the last two weeks?

(1) Yes, but I was ill
(2) Yes, I just felt like not going
(3) Yes, I missed for other reasons
(4) No

9. How often do you run and play or exercise?

(1) Almost everyday
(2) 4 or 5 times a week
(3) 2 or 3 times a week
(4) Almost never
(5) I can't run and play because of medical reasons

10. How much do you watch TV or play video games?

(1) Less than 1 hour a day
(2) 1 or 2 hours a day
(3) 3, 4, or 5 hours a day
(4) More than 5 hours a day
(5) Hardly ever

11. How often do you feel you get enough sleep?

(1) Almost everyday
(2) Sometimes
(3) Hardly ever

12. Have you ever smoked cigarettes?

(1) I smoke now - more than one pack of cigarettes each week.
(2) I smoke now, but less than a pack of cigarettes each week.
(3) I used to smoke, but I quit.
(4) I've smoked cigarettes once or twice, but only to try them.
(5) No, I've never smoked cigarettes, not even to try them.

<turn page>

13. Have you ever chewed tobacco?

(1) Yes, and I use it now
(2) I used to use it, but I quit
(3) Yes, I tried it a few times
(4) No, I never even tried it

14. Do you feel that "chewing or dipping" [tobacco] is safer then smoking?

(1) Yes
(2) No

15. When you are older, do you think you will ever smoke or chew tobacco?

(1) Yes
(2) Maybe
(3) No

16. Do you drink beer, wine, or other alcohol [other than at church or synagogue]?

(1) Yes, at least once a week
(2) Yes, but only once a month or less
(3) Yes, I only tried it a few times
(4) No

17. Has anyone ever asked you to try marijuana [pot], cocaine, or crack?

(1) Yes
(2) No

18. Have you ever tried marijuana [pot], cocaine, or crack?

(1) Yes
(2) No

19. If one of your friends used marijuana [pot], cocaine, or crack only once, do you think it would hurt their health?

(1) Yes
(2) No

20. How would you describe yourself? When I look at my body in the mirror, I usually feel:

(1) Very pleased
(2) Pleased
(3) A little unhappy
(4) Very unhappy

21. Do you like yourself?

(1) Most of the time
(2) Sometimes
(3) Almost never

<turn page>

22. When you have a problem, who do you usually talk to about it?

(1) No one
(2) My mom or dad
(3) My teacher
(4) A good adult friend
(5) A good friend about my own age

23. How important is it for you to be like your friends?

(1) Very important
(2) Sometimes important
(3) Not very important

24. Do you feel left out from your friends?

(1) Often
(2) Sometimes
(3) Never

25. In the past 6 months, have you ever felt that your life was not worth living?

(1) Often
(2) Sometimes
(3) Never

26. Do you think your eating habits are important to your health?

(1) Yes
(2) No

27. How often do you eat breakfast?

(1) Everyday
(2) Almost everyday
(3) Sometimes
(4) Almost never

28. How often do you eat the lunch fixed at your school?

(1) Everyday
(2) Almost everyday
(3) Sometimes
(4) Almost never

29. Do you eat lunch from cola and candy machines at school?

(1) Everyday
(2) Almost everyday
(3) Sometimes
(4) Almost never; or do not have machines at school

30. How often do you eat "junk-food" [chips, candies, cookies, colas]?

(1) Everyday
(2) Almost everyday
(3) Sometimes
(4) Almost never

<turn page>

31. How often do you eat from fast-food places like Burger King or McDonalds?

(1) Everyday
(2) Almost everyday
(3) Sometimes
(4) Almost never

32. How often do you have to fix your own meals?

(1) Everyday
(2) Almost everyday
(3) Sometimes
(4) Almost never

33. How often do you eat meats like hamburger, beef, pork, bologna, hot dogs?

(1) Everyday
(2) Almost everyday
(3) Sometimes
(4) Almost never

34. How often do you eat fish, turkey, or chicken?

(1) Everyday
(2) Almost everyday
(3) Sometimes
(4) Almost never

35. How often do you eat fruits and vegetables?

(1) More than once a day
(2) Once a day
(3) Sometimes
(4) Almost never

36. How often do you eat breads and cereals?

(1) More than once a day
(2) Once a day
(3) Sometimes
(4) Almost never

37. How often do you brush your teeth?

(1) Twice a day or more
(2) Once a day
(3) Not everyday
(4) Almost never

38. How often do you go to a dentist?

(1) Twice a year
(2) Once a year
(3) Only when my teeth hurt
(4) Never

39. How often do you clean your teeth with string floss?

(1) More than once a day
(2) Once a day
(3) Not every day
(4) Never

<turn page>

40. Do your gums bleed when you brush or floss your teeth?

(1) Often
(2) Sometimes
(3) Hardly ever
(4) Never

41. Is gum disease a danger at your age?

(1) Yes
(2) No
(3) I'm not sure

42. Has a parent, teacher or other adult ever talked to you about how boys and girls are different?

(1) Yes
(2) No

43. Has a parent, teacher or other adult ever talked to you about how body changes take place in boys and girls as they grow up?

(1) Yes
(2) No

44. Have you ever heard of AIDS?

(1) Yes
(2) No

45. How do you think a person gets AIDS?

(1) Drug needles and sex only
(2) Being coughed on by someone with AIDS
(3) Eating foods fixed by someone with AIDS
(4) All the above
(5) I'm not sure

46. If another student in your school had AIDS, would you be afraid of getting AIDS too?

(1) Yes
(2) No
(3) I'm not sure

47. Do you have a smoke alarm where you live?

(1) Yes
(2) No
(3) I'm not sure

<turn page>

48. Has an adult who lives with you ever talked to you about how to get out if there was a fire where you live?

(1) Yes
(2) No

49. Have you ridden in a car or truck with a driver who had been drinking too much alcohol?

(1) Yes
(2) No

50. Has a parent, teacher, or other adult ever talked to you about how to make an emergency telephone call (police, fire, ambulance) or 911?

(1) Yes
(2) No

PART 2

A. Are you a ...

(1) Boy
(2) Girl

B. What group do you think you belong in?

(1) White
(2) Black
(3) Hispanic
(4) Asian
(5) American Indian
(6) Other

C. What have your grades been in the last year?

(1) Mostly A's and B's or Excellent (E)
(2) Mostly B's and C's or Satisfactory (S)
(3) Mostly C's and D's or Needs Improvement (I)
(4) Mostly D's and F's or Unsatisfactory (U)

D. Who do you now live with?

(1) Both mom and dad
(2) My mom
(3) My dad
(4) A relative [aunt, uncle, grandmother, grandfather]
(5) Other

E. How many people live in your house?

(1) 1,2,3
(2) 4,5,6
(3) 7 or more

<turn page>

F. Where do you live?

(1) House
(2) Apartment or Condo
(3) Mobile Home
(4) Other (Housing Project)

G. How is your weight compared to friends your own age?

(1) Just right
(2) Too heavy
(3) Too thin
(4) I'm not sure

GRADE (mark one):

(1) 3rd grade
(2) 4th grade
(3) 5th grade

If you have a blue sheet of paper in your booklet, answer the bonus questions NOW!

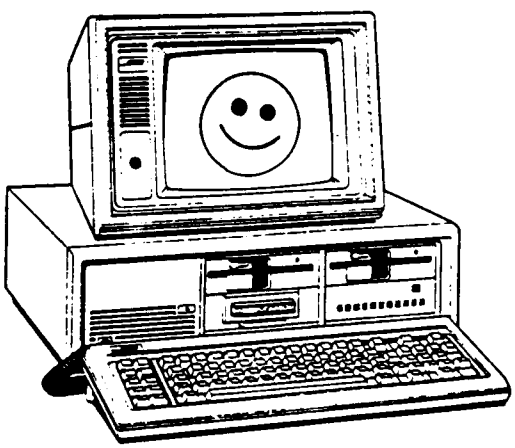
HINT: Bonus Box At Bottom of Answer Card.

YOU ARE FINISHED ... THANK YOU!

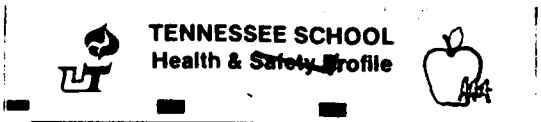
CHECK YOUR ANSWER CARD FOR MISTAKES AND ERASE ANY STRAY MARKS.

TAKE YOUR ANSWER CARD TO THE COMPUTER TO GET YOUR PRINTOUT.

IT IS MADE JUST FOR YOU!



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TENNESSEE SCHOOL Health & Safety Profile

MARKING INSTRUCTIONS
- USE A NO. 2 PENCIL ONLY
- ERASE CHANGES COMPLETELY

RIGHT ○ ● ○ WRONG ⊘ ⊗ ◐

PART 1

1.	①	②	③			26.	①	②	
2.	①	②	③	④		27.	①	②	③	④
3.	①	②	③	④		28.	①	②	③	④
4.	①	②				29.	①	②	③	④
5.	①	②	③			30.	①	②	③	④
6.	①	②	③	④	⑤	31.	①	②	③	④
7.	①	②	③			32.	①	②	③	④
8.	①	②	③	④		33.	①	②	③	④
9.	①	②	③	④	⑤	34.	①	②	③	④
10.	①	②	③	④	⑤	35.	①	②	③	④
11.	①	②	③			36.	①	②	③	④
12.	①	②	③	④	⑤	37.	①	②	③	④
13.	①	②	③	④		38.	①	②	③	④
14.	①	②				39.	①	②	③	④
15.	①	②	③			40.	①	②	③	④
16.	①	②	③	④		41.	①	②	③	
17.	①	②				42.	①	②		
18.	①	②				43.	①	②		
19.	①	②				44.	①	②		
20.	①	②	③	④		45.	①	②	③	④	⑤
21.	①	②	③			46.	①	②	③		
22.	①	②	③	④	⑤	47.	①	②	③		
23.	①	②	③			48.	①	②			
24.	①	②	③			49.	①	②			
25.	①	②	③			50.	①	②			

PART 2

A	①	②				
B	①	②	③	④	⑤	⑥
C	①	②	③	④		
D	①	②	③	④	⑤	
E	①	②	③			
F	①	②	③	④		
G	①	②	③	④		

GRADE: (mark one) 3rd ○ 4th ○ 5th ○

BONUS QUESTION SECTION

A	①	②	③	④	⑤	E	①	②	③	④	⑤
B	①	②	③	④	⑤	F	①	②	③	④	⑤
C	①	②	③	④	⑤	G	①	②	③	④	⑤
D	①	②	③	④	⑤	H	①	②	③	④	⑤

CP90573

ID # _____

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Acknowledgments

A special thanks go to several health professionals who assisted in the preparation of this version 1.0 of the Tennessee Health and Safety Profile questionnaire. Four persons who were major contributors to the initial draft include Gary Zelizer, Marilyn Ontiveros, Jim Dewey and Mary Adams. Numerous staff members of the Health Services Bureau, Tennessee State Department of Health and Environment, contributed questionnaire items dealing with their respective discipline. Also, Commissioner J. W. Luna and Commissioner Charles E. Smith provided the crucial leadership in supporting the development of this questionnaire and the accompanying computer software. This project was made possible with support provided to the Department of Health, Leisure, and Safety, University of Tennessee, Knoxville, by the Tennessee Department of Health and Environment. Finally, the children from Hixson and Charles Bell Elementary Schools, located in Chattanooga, provided both information and feedback essential to bring this project to fruition.

APPENDIX C

SCORING SEQUENCE

```
TION:
CLS
SCOR=0 :SCORS=0:SCORH=1

S QUESTIONS - 1,2,3,4,5,6,47,48,49,50

= 1 THEN SCORS=SCORS+3
= 2 THEN SCORS=SCORS+2

= 1 OR Q(2) = 4 THEN SCORS=SCORS+3
= 2 THEN SCORS=SCORS+2

= 4 THEN SCORS=SCORS+3
= 3 THEN SCORS=SCORS+2

= 1 THEN SCORS=SCORS+3

= 3 THEN SCORS=SCORS+3
 2 THEN SCORS=SCORS+2

 3 OR Q(6) = 4 THEN SCORS=SCORS+3
 5 THEN SCORS=SCORS+2

= 1 THEN SCORS=SCORS+3
= 3 THEN SCORS=SCORS+2

= 1 THEN SCORS=SCORS+3

= 2 THEN SCORS=SCORS+3

= 1 THEN SCORS=SCORS+3

 QUESTIONS - 9-44 (EXCLUDING 10,15,19,23,26,28,32,40-43)

 1 THEN SCORH=SCORH+3
 2 THEN SCORH=SCORH+2

= 1 THEN SCORH=SCORH+3
= 2 THEN SCORH=SCORH+2

= 4 OR Q(12) = 5 THEN SCORH=SCORH+3
= 3 THEN SCORH=SCORH+2

= 3 OR Q(13) = 4 THEN SCORH=SCORH+3
= 2 THENIF Q(16) = 4 THEN SCORH=SCORH+3
= 3 THEN SCORH=SCORH+2

= 2 THEN SCORH=SCORH+3

= 1 THEN SCORH=SCORH+3
= 2 THEN SCORH=SCORH+2
= 3 THEN SCORH=SCORH+1

= 1 THEN SCORH=SCORH+3
= 2 THEN SCORH=SCORH+2

= 1 THEN SCORH=SCORH+3

  3 THEN SCORH=SCORH+3
= 2 THEN SCORH=SCORH+2
```

```
IF Q(25) = 3 THEN SCORH=SCORH+3
IF Q(25) = 2 THEN SCORH=SCORH+2

I    27) = 1 THEN SCORH=SCORH+3
IF Q(27) = 2 THEN SCORH=SCORH+2
IF Q(27) = 3 THEN SCORH=SCORH+1

IF Q(29) = 4 THEN SCORH=SCORH+3
IF Q(29) = 3 THEN SCORH=SCORH+2
IF Q(29) = 2 THEN SCORH=SCORH+1

IF Q(30) = 4 THEN SCORH=SCORH+3
IF Q(30) = 3 THEN SCORH=SCORH+2

IF Q(31) = 4 THEN SCORH=SCORH+3
IF Q(31) = 3 THEN SCORH=SCORH+2

IF Q(33) = 4 THEN SCORH=SCORH+3
IF Q(33) = 3 THEN SCORH=SCORH+2

IF Q(34) = 1 THEN SCORH=SCORH+3
IF Q(34) = 2 THEN SCORH=SCORH+2

IF Q(35) = 1 THEN SCORH=SCORH+3
IF Q(35) = 2 THEN SCORH=SCORH+2
IF Q(35) = 3 THEN SCORH=SCORH+1

IF Q(36) = 1 THEN SCORH=SCORH+3
I    36) = 2 THEN SCORH=SCORH+2
I,  _(36) = 3 THEN SCORH=SCORH+1

IF Q(37) = 1 THEN SCORH=SCORH+3
IF Q(37) = 2 THEN SCORH=SCORH+2
IF Q(37) = 3 THEN SCORH=SCORH+1

IF Q(38) = 1 THEN SCORH=SCORH+3
IF Q(38) = 2 THEN SCORH=SCORH+2

IF Q(39) = 1 THEN SCORH=SCORH+3
IF Q(39) = 2 THEN SCORH=SCORH+2
IF Q(39) = 3 THEN SCORH=SCORH+1

IF Q(44) = 1 THEN SCORH=SCORH+3

SCOR=SCORS+SCORH

 IF SCOR<0 THEN SCOR=0
```

```
PRINTOUT:
        IF T$="1" THEN LOCATE 5,5:COLOR 0,7:PRINT "  PRINTING NUMBER";NUM+1;"... ";ID$;" ":COLOR 7,0
        IF T$="2" THEN LOCATE 5,5:COLOR 0,7:PRINT "  PRINTING NUMBER";NUM;"... ";ID$;" ":COLOR 7,0
        LPRINT DTL$; :FOR I=1 TO 76 :LPRINT DHL$; :NEXT I: LPRINT DTR$
        LPRINT DVL$;: FOR I=1 TO (CINT(48-LEN(OP$(4)))/2):LPRINT " " ;:NEXT I :LPRINT OP$(4); " -- SCHOOL HEALTH & SAFETY PROFILE";:L
        LPRINT DVL$;: FOR I=1 TO (CINT(76-LEN(OP$(6)))/2):LPRINT " " ;:NEXT I :LPRINT OP$(6);:LPRINT TAB(78) DVL$
        LPRINT DBL$;:FOR I=1 TO 76 :LPRINT DHL$; :NEXT I: LPRINT DBR$

        IF ID$<>"" THEN LPRINT TAB(62)"ID: ";ID$;""
        LPRINT " "
        LPRINT "   How you live your life can have a big affect on your health and "
        LPRINT "   safety.  Eat right, be safe, don't smoke and don't do drugs, and you"
        lprint "   can be a STRONGER, HEALTHIER person.  "
        LPRINT " "

SAFETY:
        LPRINT "Your SAFETY score was"; SCORS;"out of 30 points."
SAFEGRAPH:
        LPRINT "   ";:LPRINT "VERY POOR      POOR            FAIR            GOOD            EXCELLENT"
        LPRINT "    >";:FOR I=1 TO INT(SCORS*2.33):LPRINT ">";:NEXT I
        LPRINT " "

health:
        LPRINT " "
        LPRINT "Your HEALTH score was"; SCORH;"out of 70 points."
healthGRAPH:
        LPRINT "   ";:LPRINT "VERY POOR      POOR            FAIR            GOOD            EXCELLENT"
        LPRINT "    ";:FOR I=1 TO SCORH:LPRINT ">";:NEXT I
        LPRINT " "

TOTAL:
        LPRINT " "
        LPRINT "Your TOTAL score was"; SCOR;"out of 100 points."
TOTALGRAPH:
        LPRINT "   ";:LPRINT "VERY POOR      POOR            FAIR            GOOD            EXCELLENT"
        LPRINT "    >";:FOR I=1 TO INT(SCOR*.7) :LPRINT ">";:NEXT I
        LPRINT " " :LPRINT " "
        LPRINT "                        ------------------------"

GOOD:

        IF Q(1)=1 OR Q(9)=4 OR Q(12)>2 OR Q(16)=4 OR Q(18)=2 OR Q(20)<3 OR Q(21)<3 OR (Q(27)<3 AND Q(30)<3 AND Q(31)<3)
 OR (Q(37)<3 AND Q(38)<3 AND Q(39)<3) OR Q(47)=1 OR Q(48)=1 THEN GOTO POSITIVE ELSE GOTO BAD

POSITIVE:
        GOODCTR=0
        LPRINT " "
        LPRINT "Good for you.  You did well in these areas:"
        LPRINT " "
Q1:
        IF Q(1)=1 THEN GOTO SEAT ELSE GOTO Q9

SEAT:
        LPRINT "        ";FACE1$;"  WEARING SEATBELTS" :GOODCTR=GOODCTR+1


        IF Q(9)<4 THEN GOTO EXER ELSE GOTO Q12

EXER:
        LPRINT "        ";FACE1$;"  EXERCISE" :GOODCTR=GOODCTR+1
```

```
Q12:
        IF Q(12)>2 THEN GOTO NOSMOK ELSE GOTO Q16

K    K:
        LPRINT "        ";FACE1$;"  NOT SMOKING" :GOODCTR=GOODCTR+1

Q16:
        IF Q(16)=4 THEN GOTO NODRNK ELSE GOTO Q18

NODRNK:
        LPRINT "        ";FACE1$;"  NO ALCOHOL" :GOODCTR=GOODCTR+1


Q18:
        IF Q(18)=2 THEN GOTO NODRUG ELSE GOTO Q20

NODRUG:
        LPRINT "        ";FACE1$;"  NO DRUGS" :GOODCTR=GOODCTR+1


Q20:
        IF Q(20)<3 OR Q(21)<3 THEN GOTO LIKE ELSE GOTO Q27

LIKE:
        LPRINT "        ";FACE1$;"  YOU LIKE YOURSELF" :GOODCTR=GOODCTR+1


Q27:
        IF Q(27)<3 AND Q(30)<3 AND Q(31)<3 THEN GOTO DIET ELSE GOTO Q37

DIET:
        LPRINT "        ";FACE1$;"  YOUR DIET" :GOODCTR=GOODCTR+1


Q37:
        IF Q(37)<3 AND Q(38)<3 AND Q(39)<3 THEN GOTO TEETH ELSE GOTO Q47

TEETH:
        LPRINT "        ";FACE1$;"  YOUR TEETH" :GOODCTR=GOODCTR+1


Q47:
        IF Q(47)=1 OR Q(48)=1 THEN GOTO FIRE ELSE GOTO NOGOODCHK

FIRE:
        LPRINT "        ";FACE1$;"  FIRE SAFETY" :GOODCTR=GOODCTR+1

NOGOODCHK:
        IF GOODCTR=0 THEN GOTO NOGOOD ELSE GOTO BAD
NOGOOD:
        LPRINT "        ";FACE2$;"  NO AREAS WERE GOOD! "

BAD:

        IF Q(1)>1 OR Q(2)=2 OR Q(2)=3 OR Q(3)<4 OR Q(4)=2 OR Q(5)<3 OR Q(6)<3 OR Q(12)<3 OR Q(25)<3 OR Q(27)>1 OR Q(30)>1 OR
Q(37)>1 OR Q(47)>3 OR Q(48)=2 OR Q(49)=2 OR Q(50)=2 THEN GOTO NEGATIVE ELSE GOTO CONCLUDE

NEGATIVE:
        LPRINT " "
```

```
      LPRINT "You can do even better by:"
      LPRINT " "
      BDCTR=0
SEATCHK:
      IF Q(1)>1 THEN GOTO SEATBELT ELSE GOTO KNIFECHK

SEATBELT:
      LPRINT "        ";FACE2$;"  ALWAYS WEAR SEATBELTS, it may save your life!":BDCTR=BDCTR+1

KNIFECHK:
      IF Q(3)<4 THEN GOTO KNIFE ELSE GOTO SWIMCHK

KNIFE:
      LPRINT "        ";FACE2$;"  Knives and other weapons are VERY dangerous. ":BDCTR=BDCTR+1
      LPRINT "           Accidents CAN happen!"

SWIMCHK:
      IF Q(4)=2 THEN GOTO SWIM ELSE GOTO HOMECHK

SWIM:
      LPRINT "        ";FACE2$;"  Learn how to swim!":BDCTR=BDCTR+1

homeCHK:
      IF Q(5)<3 THEN GOTO home ELSE GOTO dngrchk

home:
      LPRINT "        ";FACE2$;"  In an emergency, know that you can call 911 for HELP.":BDCTR=BDCTR+1

dngrCHK:
      IF Q(6)<3 THEN GOTO danger ELSE GOTO smkchk

danger:
      LPRINT "        ";FACE2$;"  Don't let friends dare you into DANGER!":BDCTR=BDCTR+1

smkCHK:
      IF Q(12)<3 THEN GOTO badsmk ELSE GOTO EXERCHK

BADSMK:
      LPRINT "        ";FACE2$;"  The most important thing you can do for your health is to ":BDCTR=BDCTR+1
      LPRINT "           STOP SMOKING TODAY! "

EXERCHK:
      IF Q(9)=4 THEN GOTO BADEXER ELSE GOTO SADCHK
BADEXER:
      LPRINT "        ";FACE2$;"  Every BODY needs regular exercise.  Try it, you will LOOK" :BDCTR=BDCTR+1
      LPRINT "           and FEEL better!"

SADCHK:
      IF Q(25) < 3 THEN GOTO SAD ELSE GOTO BKFSTCHK
SAD:
      LPRINT "        ";FACE2$;"  If you feel that life is not worth living, don't do anything":BDCTR=BDCTR+1
      LPRINT "           hasty.  Help is available - ask your teacher or school"
      LPRINT "           counselor."
BKFSTCHK:
      IF Q(27) > 2 THEN GOTO BREAKFST ELSE GOTO FSTFDCHK
    jFST:
      LPRINT "        ";FACE2$;"  Don't skip breakfast.":BDCTR=BDCTR+1
FSTFDCHK:
      IF Q(30) <3 THEN GOTO FASTFOOD ELSE GOTO teethchk
FASTFOOD:
```

```
        LPRINT "        ";FACE2$;"  Cut down on JUNK FOOD.  Stay away from high fat and fried":BDCTR=BDCTR+1
        LPRINT "           foods."
TEETHCHK:
        IF Q(37) > 1 THEN GOTO mouth ELSE GOTO alarmchk
        LPRINT "        ";FACE2$;"  Good dental health is very important.  Brush and floss your":BDCTR=BDCTR+1
        LPRINT "           teeth EVERY day"
alarmchk:
        IF Q(47)>3 THEN GOTO ALARM ELSE GOTO FIRECHK
ALARM:
        LPRINT "        ";FACE2$;"  A smoke alarm in your home can save you or your family in" :BDCTR=BDCTR+1
        LPRINT "           case of a fire."
FIRECHK:
        IF Q(48)=2 THEN GOTO OUTT ELSE GOTO DRIVECHK
OUTT:
        LPRINT "        ";FACE2$;"  In case of fire KNOW THE WAY OUT!" :BDCTR=BDCTR+1
DRIVECHK:
        IF Q(49)=1 THEN GOTO DRIVE ELSE GOTO NINE11CHK
DRIVE:
        LPRINT "        ";FACE2$;"  Don't let people you love drink alcohol and drive.":BDCTR=BDCTR+1
NINE11CHK:
        IF Q(50)=2 THEN GOTO NINE11 ELSE GOTO CONCLUDE
NINE11:
        LPRINT "        ";FACE2$;"  In case of an emergency call 911 to get HELP.":BDCTR=BDCTR+1

CONCLUDE:
        IF BDCTR=0 THEN LPRINT "        ";FACE1$;FACE1$;" Congratulations!  You can't do much better than you are now!"
        LPRINT " "
        LPRINT "                        IN CONCLUSION  "
        LPRINT " "
        LPRINT FACE1$;FACE1$;"  There are changes YOU can make that can help you to live longer.    "
        LPRINT "    Think about your health.  Make good health and safety habits a way of"
        LPRINT "    life!"
```

VITA

Ruth C. Obersaat was born in Victorville, California, at George Air Force Base. She attended Lutheran grade schools in Lanesville, Indiana and Springfield, Illinois, and after graduating from Springfield High School as a junior in 1977, Ruth entered St. John's College in Winfield, Kansas, where she received the Associate of Arts in Education in 1979. Ruth then went on to Concordia Teachers College in Seward, Nebraska, where she received the Bachelor of Science degree in Education in 1981.

After several years of teaching and coaching at Dallas Lutheran High School, Ruth matriculated into the Graduate School at The University of Tennessee, Knoxville, and received the Master of Public Health degree in Community Health Education in 1987. She entered the Doctor of Education program in Health Education at The University of Tennessee, Knoxville, in the winter of 1987. From 1986 to 1990, while working on her doctorate, Ruth served as a doctoral teaching associate in the Department of Health, Leisure and Safety. Ruth received the Doctor of Education degree in Health Education with collateral areas in Public Health and Educational and Counseling Psychology in May 1990.

In addition to her studies and teaching, Ruth has served as a health consultant for a city and community health agency in the senior services network.

Ruth is a member of Pi Lambda Theta, the Society for Prospective Medicine, and the American Alliance for Health, Physical Education, Recreation, and Dance.