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ABSTRACT

In 1990, the Youth Risk Behavior Survey (YRBS) was completed by a random sample of 1,448 West Virginia public-school students in grades 9-12. The sample was 51 percent male and 89 percent white. About 71 percent of subjects were aged 15-17; 39 percent were in the ninth grade. The YRBS covered behaviors producing vehicle-related or other injuries, drug and alcohol use, sexual behaviors, tobacco use, dietary behaviors, and physical activity. A 6-point scale to measure level of rurality was developed, based on the number of enrolled students per school attendance area in square miles. Half of the subjects attended extremely rural or very rural schools. One-way analysis of variance resulted in significantly higher risk scores on the entire YRBS for males compared to females, for 12th graders compared to lower grades, and for subjects aged 16-18 compared to younger subjects. Both when subjects were clustered as three risk groups (high, average, and low) and when they were clustered as two groups (high and average), discriminant function analysis indicated that rurality was the most consistent discriminator of the groups, with higher risk being associated with less rural classification. Gender was the next most potent discriminator of risk groups, but results were affected by a few extreme scores. (SV)

# West Virginia Adolescents' Health Risk Behaviors: Differences by Gender, Age, Grade Level, and Level of Rurality

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# EXECUTIVE SUMMARY

The Youth Risk Behavior Survey (YRBS) was completed by 1,448 West Virginia students in grades 9 through 12 in 1990. The sample was drawn via a two-stage, proportionally stratified random sampling process. Inspection of the schools in the sample revealed them to vary considerably more in their rurality than in their enrollment size. Inspection of the resultant descriptive statistics' tables revealed large differences by most demographic variables.

The objectives of this study were: (1) to define and measure levels of rurality and add it as an independent variable, (2) to compute and present the reliability coefficients for the YRBS, and (3) to conduct various analyses of differences in YRBS scores by the independent variables and draw appropriate conclusions.

The definition of rurality developed and used in this study was the number of enrolled students per school attendance area in square miles. When standardized, the "students per school per square mile" figures produced six clear levels of rurality. These six levels of rurality were labeled: (1) extremely rural, (2) very rural, (3) rural, (4) almost rural, (5) least rural, and (6) not rural.

Regarding the YRBS reliabilities, the Alpha reliability coefficients for the total instrument and the Tobacco, Alcohol/Drug, and Sexual subscales were satisfactory, ranging from 82 to .90. The Injury subscale reliability was marginal at .68. Unexpectedly, the Dietary and Physical subscales yielded unsatisfactory Alpha reliability coefficients at .55 and .46, respectively.

From the series of one-way analysis of variance runs, significant differences were found on the gender, grade level, age, and level of rurality independent variables. From the followup procedures for the analysis of variance results, several mutiple group comparisons were significantly different. In summary of those followup differences: males; 12th graders, and 16, 17, and 18 year olds had significantly higher health risk factor scores. From the discriminant function analysis on both the two health risk groups and also the three health risk groups, rurality of the students was the most consistent discriminator of the groups with the higher risk associated with the less rural classification. Gender was the next most potent discriminator of the health risk groups (males having higher scores), but this variable was affected by a few extreme scores.

Three recommendations grew out of this study of the health risk behaviors of West Virginia adolescents. First, continued use of the YRBS instrument was recommended. Second, the new definition of rurality, i.e., students per school per square mile, should be tested out in other locales and for other studies. Third, this study, or a study very similar to it, should be conducted on the data resulting from the next administration of the YRBS to West Virginia adolescents.

# INTRODUCTION

Adolescence is an especially important development period in everyone's life. Knowledge, attitudes, and behaviors formed in adolescence set the stage for later life. This is especially true in the area of health lifestyles. Attitudes, behaviors, and knowledge related to safety practices, alcohol and other drugs, diet and exercise, tobacco use, and sexual practices formed in adolescence impact on lifestyles in adulthood.

Adolescence is a period of great physical, emotional, and cognitive growth coupled with many opportunities for learning and experimenting. Also, though, adolescence is a period in which feelings of invulnerability abound. This presents problems in young people that must be addressed by the health and education communities. For example, three-quarters of injury-related deaths among persons aged 15 through 24 are due to automobile accidents and, further, half of all automobile accidents involve alcohol (United States Public Health Service, 1990). Rates of sexually transmitted diseases are highest in the nation in the 15 through 19 age group. Education and health promotion programs to address these and other health risk problems of adolescents must begin with reliable data and careful analyses of those data.

## West Virginia Health Problems

The citizens of West Virginia, including its adolescents, are facing serious health problems, as are the citizens of the nation. The Governor of West Virginia, Gaston Caperton, has stated that "Nowhere is the crisis more apparent than in the health and well-being of our children" (Address to 1990 Task Force on School Health Conference).

Statistics about the health of West Virginia residents support the governor's alarm. In Children in Crisis: State at Risk (1988), the West Virginia Human Resources Association reports these data for the state:

- One in two babies was born into poverty.
- One in six babies was born to a teenage mother.
- One in four children was born to a mother who did not receive early prenatal care.
- Children died from causes that were preventable: accidents, homicides, suicides, low birthrate.
- Forty-seven of the 55 counties in West Virginia are designated as medically underserved areas.

In January 1990, the West Virginia State Medical Association published a document that reported in West Virginia:

- Mortality rates are 19 percent higher than the national averages.
- In 1988, 66 percent of deaths were attributable to heart disease, cancer, and strokes.
- Residents typically lead a lifestyle that contributes to high rates of preventable disease; e.g., cigarette smoking, use of smokeless tobacco, lack of exercise, obesity, failure to control blood pressure, and non-use of seatbelts.

The Behavior Risk Factor Surveillance Survey conducted in 1989 by the West Virginia Bureau of Public Health found that for West Virginia adults 18 years of age or older, 30 percent of males and 25 percent of females smoked cigarettes, 42 percent of males used smokeless tobacco, 23 percent of males [illegible]5 percent of females were overweight, 67 percent of males and 65 percent of females reported sedentary lifestyles, and 17 percent of males and 23 percent of females reported uncontrolled hypertension (Anderson, Thoenen, Thompson, & Wright, 1989).

Heart disease causes 36 percent of all deaths in the United States, but 39 percent of all deaths in West Virginia. West Virginians die from heart disease at a rate higher than residents in every one of 48 other states. West Virginians die from cancer at a rate higher than residents in each of 46 other states (Kolbe, 1990b).

West Virginia adolescents are forming unhealthy patterns of risky behaviors that will not improve on the dismal statistics of their mothers and fathers. For example, in 1988, the West Virginia Department of Education staff administered the Parent Resources In Drug Education (PRIDE) survey to over 37,000 8th and 11th graders in the state. The PRIDE survey (1988) results showed that, for the 11th graders, 31.1% had used marijuana, 62.9% had used alcohol, 4.0% had used cocaine, and 42.9% had used cigarettes. For eighth graders, the PRIDE survey revealed that 31.2% had used alcohol and 35.8% had used cigarettes.

West Virginia adolescents' patterns of sexual activity are just as alarming--and more life threatening--than their alcohol and other drug-related behaviors. During 1990-91, there were significant increases in the incidence of all Sexually Transmitted Diseases (STDs) in adolescents 19 and under. By April 6, 1993, West Virginia reported 330 cases of AIDS and an additional 404 persons who were HIV positive (L. E. Haddy, WV AIDS/HIV Surveillance Update Through 03/31/93, memorandum to W. T. Wallace, April 6, 1993). Twenty percent (65 cases) of those diagnosed with AIDS and 34 percent (138 persons) of those HIV infected are between 20 and 29 years of age and, since the incubation period can be up to 10 years, that means they became infected when they were much younger.

While the health of West Virginians is one major perspective of this paper, a second major perspective is that of the concept of rurality. There are many definitions of rurality and rural and small schools, and it could be said that the last thing the field needs is yet another definition to add to the list. But, a definition with usefulness should be tested with real data, presented to the profession, and discussed. There is a need for a practical definition of rurality that may be applied to studies of adolescents. For example, in the 1991 Annual Meeting of the American Educational Research Association (AERA), there was an interesting symposium titled "Attitudes and Knowledge Toward AIDS: A Rural Perspective." And, while the papers presented in this symposium advanced the knowledge base of AIDS knowledge and attitudes from rural students, in none of those AERA papers was rurality used as an independent variable, as this study does.

## Objectives of Study

The purposes of this study include presenting a new technique for defining rurality as it applies to schools, presenting the reliabilities of a widely used adolescent health survey, and using that one technique as one variable in studying the differences in health risk behaviors of adolescents in the state. Specifically, the objectives of this report are:

- to present a new technique for defining and measuring levels of rurality for participants in the survey and using the results as an independent variable in the analyses,
- to present the total instrument and subscale reliabilities for the widely used Youth Risk Behavior Survey from a random sample of adolescents in one state, and
- to present the results of various analyses of differences by the independent variables and draw conclusions from them.

Related Research

A search of the Educational Resources Information Center (ERIC) system of holdings between 1982 and 1992 produced many citations on the topic of adolescents' health behaviors, yet none of those employed rurality as an independent variable. A review of the recent AERA Annual Meeting programs yielded a few related studies. Also, the federal government, mainly through the General Accounting Office (GAO), has completed a few studies in this area. These AERA and GAO studies will be summarized briefly below.

Hales and McGrew (1990) sought to determine the extent to which AIDS education was taught in three remote rural school districts in Oregon, to study the focus of the AIDS curriculum across grade levels, and to compare the districts' instructional practices with the state guidelines. Two questionnaires were constructed--one elementary level and one secondary level. In May 1990, the questionnaires were mailed to all teachers "in three small school districts in a relatively remote area of southern Oregon" (1990, p. 4). Neither the size of the districts in students nor in teachers was reported. Hales and McGrew found that 55 percent of the elementary teachers had incorporated AIDS education into their curriculum, but that less than 23 percent of the secondary teachers had done so. They found that while most upper elementary teachers taught AIDS education reasonably consistent with the state curriculum mandate, little such instruction occurred at the secondary level. They concluded that the state mandate for AIDS instruction has had little impact on the curriculum of the secondary schools in the three rural Oregon school districts.

At the same AERA Annual Meeting as above, Hales, McGrew, and Nizic-Anderson (1990) reported on a study of the knowledge levels and attitudes of rural middle school students. A questionnaire, based on the Oregon Department of Education AIDS questionnaire, was administered "to all students who were present in their science classes on May 30, 1988...the sample consisted of 97 seventh-graders and 82 eighth-graders" (1990, p. 7-8). There was no mention of fifth or sixth graders in the study. Presumably, the study was conducted in a single school building; presumably, a middle school consisting of seventh and eighth grades only. Hales, McGrew, and Nizic-Anderson found that over 84 percent of the middle school students knew that AIDS is spread by direct sexual contact, but no differences were found by sex or grade level. The authors found that the pattern of rural middle school students' knowledge about HIV/AIDS reflects the attention given to the topic by television, which was the primary source of information about AIDS (47 percent), compared to school (26 percent) and parents (17 percent). From the students' responses, the authors concluded that rural middle students possess many misconceptions about the transmission of the HIV virus. Also, in dealing with ways of relating to people with AIDS, 24 percent of the rural middle school students favored quarantining and another 21 percent were undecided. Overall, Hales, McGrew, and Nizic-Anderson (1990) concluded that if the school is to provide instruction impacting on student knowledge, attitudes, and behaviors, educators must consider very carefully the patterns of misconceptions about the prevention and transmission of AIDS that middle school students possess, together with their attitudes towards relationships with AIDS patients.

Salzman and Girvan (1991) conducted a five-part evaluation of an AIDS prevention education program for the Idaho Department of Education. The independent evaluators stated their's was a rural school model evaluation, given the rural makeup of Idaho and its schools. That portion of the multiple-part evaluation focusing on the levels of AIDS knowledge and attitudes of 8th and 11th graders is most relevant to this West Virginia study. The student sample for the study consisted of all eighth and senior high school students in two small, two medium, and two large schools in each of the four geographic regions of the state. The total sample was 7,776 students. The student survey was developed by project staff and reviewed by Idaho Department of Education staff. There were some positive results from the student survey, but also some negative findings. For example, only 47 percent of the students said they had received AIDS education in school, yet 88 percent believed they should be taught about AIDS in school. Too, 42 percent of the students were not sure where to find information about AIDS. Idaho students revealed many misconceptions about AIDS transmission. For example, 19 percent believed that a person could be infected with the HIV virus from being bitten by insects and eight percent responded that a person could be infected from using public toilets. Ten percent of the Idaho students in the survey believed that only homosexual men could get AIDS. Salzman and Girvan (1991) concluded that while AIDS education is taught in many Idaho public schools at some time during grades 8-12, most topics related to prevention of AIDS are taught less often and later than teachers in these schools think they should be.

Hales and McGrew (1991) completed a study designed to assess the knowledge and attitudes about AIDS of students in rural schools in one state, examined by gender and grade level. In contrast to their 1990 AERA paper, the focus of the 1991 AERA paper was just secondary-level students in grades 7, 9, and 10. These subjects responded to a mail questionnaire based largely on the AIDS questionnaire from the Oregon Department of Education. All of the 288 completed questionnaires were from students in three remote rural school districts in the state. Overall, Hales and McGrew found the students in their 1991 study to be more knowledgeable about AIDS and its transmission than the students in their rural middle school study (1990). The authors feel that this difference may be attributed to the greater influence of the schools in the 1991 study. Like the middle school students, the 7th, 9th, and 10th graders in the 1991 study incorrectly placed greater faith in birth control pills, diaphragms, and the AIDS test than the 1990 middle school students. The authors concluded that while the school in this study is seen as "the chief source of information about AIDS for most students" (p. 38), the school seems to have less of an impact in the area of attitudes towards AIDS and persons with AIDS.

In March and June of 1990, certain members of the United States Congress asked the General Accounting Office (GAO) to examine the nature and extent of the drug problem in rural America. The Program Evaluation and Methodology Division of the GAO conducted the study and reported its results to the congressional requestors in September 1990. The study (USGAO, 1990) reviewed survey, arrest, and treatment data. The authors studied these data from rural states and rural areas both. Rural states were operationally defined as having a population density of 50 persons or less per square mile. There were 18 states fitting that definition. Rural areas were not as tightly defined. Each data source provided its own definition of rural area. The GAO report found that students in rural areas have lifetime, annual, and 30-day prevalence rates for stimulants, inhalants, sedatives, and tranquilizers that are comparable to those of students in nonrural areas. For example, "Over 90 percent of seniors in rural areas have used alcohol sometime during their lives; over 80 percent have used it in the past year, over 60 percent in the past month" (p. 20). They found that over 40 percent of the rural seniors have tried marijuana, almost 30 percent using it in the previous year, and 14 percent in the past month. The authors (USGAO, 1990) concluded that total substance abuse rates in rural states are about as high as in nonrural states. In fact, they concluded that "Our main finding is that total substance abuse rates are about the same in rural and nonrural places" (p. 1).

# METHODOLOGY

The major purpose of this study was to examine rural adolescents' health risk behaviors by several variables such as gender, age, grade level, and levels of rurality. The methodology was several secondary analyses of a major statewide survey of adolescents in West Virginia. This section presents the methodology used in this study.

## Subjects, Sampling Process, and Weighting

The subjects for this study were students in grades 9 through 12 in public schools in the state of West Virginia. The population from which the sample was drawn consisted of all regular public schools in West Virginia with grades 9 through 12. Since the purpose of the study was to generalize the results to the entire public school population of 9th through 12th grades, a probability sampling process was established such that the results could be weighted and used to make inferences to all 9th, 10th, 11th, and 12th grade students in West Virginia in 1990. West Virginia was one of 24 state education agencies and 7 local education agencies that conducted a YRBS in 1990. Also, a national school-based YRBS was conducted and reported.

A two-stage sample of schools and classes was used. At the school building stage, all regular schools containing grades 9, 10, 11, and 12 were included in the sampling frame. Schools were selected with probability proportional to enrollment size of students in grades 9 through 12. Schools were drawn from a random start.

At the class level within the randomly selected schools, random selection was done by either English classes that all students were required to take or by a certain period in the morning in which all students were in some class. Most schools used the English classes as the basis for their sampling frame. At the remaining schools, all classes meeting during a certain period, usually the first period, were included in the sampling frame. A random number table was used to select three classes from each school. Additional classes were drawn if the original three produced less than the desired number of completed surveys.

Actual drawing of the sample of schools was completed through the use of specially designed software for this purpose. The software and the handbook for using it were prepared by Westat, Inc., Rockville, Maryland, under contract to the Centers for Disease Control, the prime sponsor of the survey. The drawing of the classes within each school was completed by a school nurse working with a school building administrator. This group of school nurses was specifically trained to be the survey administrators for the statewide project. These school nurses were trained in the process of randomly drawing the classes from within each randomly drawn school.

The response rates were satisfactory. Completed questionnaires were received from 24 of the 30 schools sampled. Interestingly, two of the nonresponding schools contacted the state coordinator, apologized for their nonparticipation due to local circumstances, and requested to be included in the next administration. At the student level, a total of 1,448 usable surveys were returned from the more than 1,700 sampled for an 84 percent response rate. The overall response rate was 80 percent x 84 percent or 67 percent.

The sampling process, the completion rates, and the analyzed data were reviewed by staff at Westat, Inc., for weighting purposes. They assigned a weight to each questionnaire to reduce bias by compensating for differing patterns of nonresponse and also to reflect the fact that not all students were surveyed with the same likelihood. In a communication to the West Virginia Department of Education staff, an official with the Centers for Disease Control wrote that "The weighted results can be used to make inferences concerning all 9th, 10th, 11th, and 12th grade students in West Virginia" (L. Kahn, personal communication to L. Zedosky, April 24, 1991, with enclosures).

## The Youth Risk Behavior Survey Instrument

The instrument used in this study was the Youth Risk Behavior Survey (YRBS). The YRBS is part of the Youth Risk Behavior Surveillance System designed, developed, and implemented by the Division of Adolescent and School Health (DASH) in the Centers for Disease Control (CDC) in Atlanta, Georgia.

A complete explanation of the YRBS was provided by Kolbe (1990a) in an article published in Health Education. In the article, Kolbe stated that staff in DASH reviewed all the leading causes of death among youth ages 1 to 24. Their extensive review showed that the mortality, morbidity, and social problems in the 1- to 24-year-old group are the result of a small number of behaviors such as drinking; drinking and driving; and precocious, unprotected sexual intercourse. Next, DASH staff studied the leading causes of death among all age groups including youth 1 to 24. In the United States, they found that nearly 60 percent of all deaths are due to only two causes: diseases of the heart and malignant neoplasms. Too, they found that a small number of behaviors contribute greatly to death from these two causes. These behaviors include insufficient physical activity, tobacco use, and excessive consumption of fat. These behaviors often are established during youth and continued into adulthood.

Kolbe (1990a) concluded that the most important aspect of the health problems reviewed by DASH "...is that they largely are preventable" (p. 5). He concluded that responsible agencies must concentrate their efforts on modifying those behaviors begun in youth that result in mortality, morbidity, and social problems. Also, Kolbe stated that these responsible agencies should periodically monitor such behaviors of youth over time to determine if they are increasing, decreasing, or remaining the same. Thus, his agency developed the YRBS.

Between 1988 and 1990, DASH developed the YRBS. Kolbe (1990a) explained the process in detail in his article. The reader is referred to the article for the specifics of the extensive development process involving numerous agencies, meetings, drafts, and reviews. The process included a national-level steering committee, scientific expert reviews, practitioner reviews, and scientific global reviews. In addition to the two purposes of the YRBS stated above, Kolbe provided three other purposes: (1) to provide comparable data across six different categories of youth behavior; (2) to provide comparable national, state, and large city data; and (3) to provide a way to monitor the National Health Objectives for Year 2000.

The YRBS consists of a total of 70 items. Five of these items are demographic-type items, while the other 65 items are health risk inquiry questions in the basic categories of health risks defined by CDC staff.

CDC staff determined from their reviews of mortality, morbidity, and social problems that the six categories of behaviors contributing most to adverse health and social problems are: (1) behaviors producing unintentional and intentional injuries; (2) drug and alcohol use; (3) sexual behaviors resulting in HIV infection, sexually transmitted diseases, and unintended pregnancy; (4) tobacco use; (5) dietary behaviors; and (6) physical activity. Table 1 displays the six categories and the specific behaviors measured by the YRBS.

The YRBS was designed to be administered in a single class period of about 45 minutes. With about 10 minutes for administration time, this left 35 minutes for actual completion time; thus, the design of a 70-item instrument. Scientists in four of the six categories of health risk behaviors originally were limited to no more than eight items in the draft instrument. Scientists in two categories (injuries and alcohol and drug use), because they addressed a much wider range of behaviors, were allowed to prepare 12 items each for the draft instrument. Later, scientists in the sexual category were allowed to expand its number of items.

In its final form, the YRBS used in this study consisted of the following items per each category (the shortened subscale names are used here):

| | |
|---|---|
| Injury | 14 items |
| Tobacco | 8 items |
| Alcohol/Drug | 13 items |
| Dietary | 8 items |
| Physical | 8 items |
| Sexual | 14 items |
| TOTAL | 65 items |

Table 1

Behaviors Measured by the Youth Risk Behavior Surveys*

| No. | Category Name/Behaviors |
|---|---|
| (1) | Unintentional and Intentional Injury |
| | - seatbelt use |
| | - bicycle and motorcycle helmet use |
| | - riding with a driver or driving under the influence of alcohol or drugs |
| | - swimming without a lifeguard or adult supervision |
| | - physical fighting |
| | - weapon carrying |
| | - suicide attempts |
| (2) | Tobacco Use |
| | - cigarette smoking |
| | - smokeless tobacco use |
| (3) | Alcohol and Other Drug Use |
| | - alcohol use |
| | - episodic heavy drinking |
| | - other drug use, including marijuana, cocaine, steroids, and injected drugs |
| (4) | Sexual Behavior |
| | - sexual intercourse |
| | - sexual intercourse with multiple partners |
| | - alcohol and drug use associated with sexual intercourse |
| | - contraceptive use |
| | - condom use |
| | - sexually transmitted diseases (STDs) |
| | - pregnancy |
| (5) | Dietary Behavior |
| | - weight loss methods |
| | - food selections |
| (6) | Physical Activity |
| | - vigorous activity |
| | - light to moderate activity |
| | - stretching |
| | - strengthening |
| | - participation in team sports |
| | - participation in physical education class |

*Source: Division of Adolescent Health, Centers for Disease Control, Atlanta, GA.

The actual YRBS used in this study was a 13-page, reusable survey instrument. The YRBS instrument was printed on 8 1/2 x 11" white paper with black ink. The top page contained the instructions and a note about how the information provided by the student was confidential. Students were supplied separate answer sheets to record their responses. The completed answer sheets were returned to the survey administrator who assembled them into building-level groups.

All 70 items in the YRBS were the selected-response type. There were no constructed-response-type questions. The number of responses available to select varied per the nature of the stem statement. Some stems called for either a Yes or No response, while others included as many as seven responses to select from. One item from each category (subscale) of the YRBS and their response options are provided below.

15. During the past 12 months, have you ever seriously thought about attempting suicide?

    (A) Yes
    (B) No

21. On how many of the past 30 days did you smoke cigarettes?

    (A) I have never smoked cigarettes
    (B) None
    (C) Less than 5 days
    (D) 6 to 15 days
    (E) 16 to 25 days
    (F) More than 25 days

30. How old were you when you had your first drink of alcohol (other than a sip)?

    (A) I have never drunk alcohol
    (B) Less than 9 years old
    (C) 9 or 10 years old
    (D) 11 or 12 years old
    (E) 13 or 14 years old
    (F) 15 or 16 years old
    (G) 17 or more years old

31. Think about all the meals and snacks you ate yesterday. How many servings of fruits or fruit juices did you have yesterday? (for example, a glass of fruit juice, an apple, or an orange)

    (A) I did not eat fruits yesterday
    (B) 1 or 2 servings
    (C) 3 or 4 servings
    (D) 5 or 6 servings
    (E) 7 or more servings

51. On how many of the past 14 days did you do any kind of exercise in a place such as a "Y," sports league, dance class, recreational center, or any other community center?

    (A) None
    (B) 1 or 2 days
    (C) 3 to 5 days
    (D) 6 to 8 days
    (E) 9 or more days

67. How many times have you been pregnant or gotten someone pregnant?

    (A) I have never been pregnant or gotten someone pregnant
    (B) 1 time
    (C) 2 or more times
    (D) Not sure

A unique aspect of this study was the scoring of the YRBS. Believing the YRBS items to be additive by subscales and then the subscales being additive to a total health risk behaviors score, each item's responses were inspected, discussed, then assigned a point value. Of course, the five demographic-type questions were not included in this health risk behavior score. Two items had the response options "None" and "I have not been in a fight" producing zero-point values. The scoring of three items, in particular, led to much discussion among the study's coauthors. Item #67, above, is one of those three items. How do you assign points to the "(D) Not sure" response option in terms of a health risk score? After much discussion and debate, the team decided that students responding with "(D) Not sure" were indicating a higher health risk factor than those who responded with "(C) 2 or more times."

The total health risk factor score ranged from low of 63 points to a high of 333 points. The minimum and maximum points per each subscale follow:

| | |
|---|---|
| Injury | 11 to 63 points |
| Tobacco | 8 to 37 points |
| Alcohol/Drug | 13 to 86 points |
| Dietary | 8 to 38 points |
| Physical | 8 to 44 points |
| Sexual | 14 to 47 points |
| TOTAL | 63 to 333 points |

The content validity of the YRBS was established in the extensive development, review, and refinement process described briefly above and in detail by Kolbe (1990a). The reliabilities of the YRBS were not reported in the literature and, thus, became one of the objectives of this study and will be reported in the Findings and Discussion major section that follows.

## Data Collection and Analyses

As stated above, a cadre of public school nurses was chosen to be the local survey administrators. The choice of school nurses was purposeful for the following reasons: (1) they were not the students' classroom teachers; (2) they were independent of the school building administrators for the random draw of classes step; (3) they could be trained at one time to complete their tasks; (4) they could be given the time to conduct the administration; and (5) they could respond to the students' personal concerns with technically correct information that the YRBS questions might raise, including requests for more information.

The cadre of West Virginia public school nurses was trained in a one-day workshop led by staff of the West Virginia Department of Education. First, discussions of purpose, background, and importance of the YRBS survey were held. Next, the YRBS instrument itself was reviewed and discussed. Then, the necessity for randomly drawing classes within the randomly drawn schools was presented. The school nurses were provided specific instruction sheets on how to conduct the random draw of classes within each building, together with a table of random numbers to use. Sufficient YRBS instruments, answer sheets, and return envelopes to the Department of Education were provided to the nurses at the end of the training.

All data collection for the YRBS was completed in April-May of 1990. The trained school nurses worked with the building administrators to draw sufficient classes of 9th, 10th, 11th, and 12th graders to yield the probability sample size. Most schools used the required English classes as the sampling frame; however, a few schools used a set period in the morning (usually the first period) as the sampling frame. All sampled students were assembled in one room and the school nurse administered the YRBS to the whole sample in the school at one time. The completed YRBS answer sheets were collected, labeled by building, and sent to the West Virginia Department of Education.

The staff in the West Virginia Department of Education assembled all of the completed YRBS answer sheets and forwarded them to the staff in DASH at CDC for processing and analyzing.

Per prior arrangements, CDC staff analyzed the YRBS instruments' answer sheets from the West Virginia sample of students. Also, they had the data weighting figure for each questionnaire completed. Next, CDC staff produced a group of reports displaying descriptive statistics results. One group of results was a summary set of data tables, while a second group of results was more detailed tables of descriptive statistics. These three products (sample and weighting information, summary descriptive statistics, and detailed descriptive statistical tables) were sent back to the staff in the West Virginia Department of Education in April 1991.

At this point, staff at the Appalachia Educational Laboratory (AEL) became involved more in the YRBS. AEL staff knew of the YRBS administration in West Virginia through its contract as the third-party evaluator to the CDC HIV/AIDS prevention education cooperative agreement grant with the West Virginia Department of Education. AEL staff were invited to inspect the YRBS descriptive statistics tables produced by CDC, as part of its external evaluation contract, and suggest further analysis steps, if appropriate. Large and important differences in the responses by gender, age, and grade level appeared in the frequency tables and AEL staff suggested that these differences should be tested for statistical significance. Too, the cumulative effect of the YRBS subscales to a total health risk factor score seemed worthy of investigation. AEL staff felt that the computation of the internal consistency reliability coefficient for each subscale and the total instrument was desirable. Finally, inspection of the list of schools drawn at random to be in the sample showed them to vary considerably more in their rurality than along their enrollment size. Thus, adding the concept of rurality into the analysis seemed worthwhile to AEL staff.

Accordingly, the West Virginia Department of Education staff requested a copy of the raw data disk for the YRBS together with its codebook. CDC staff promptly fulfilled this request. It is from that CDC disk of raw data that the analyses in this report were completed.

All of the data analyses for this study were completed on the YRBS data supplied by CDC staff. Several different analyses were conducted. First, the health risk scores, by subscales and the total instrument, were computed per subject and these new data were added to each student's file. Second, the rurality variable was computed and added to each student case (see next subsection for more details on this). Third, descriptive statistics for the demographic variables and the health risk subscales and total instrument were computed. Fourth, Alpha reliabilities were computed for each subscale, total instrument, and by each demographic variable. Fifth, cross-tabulations of the demographic variables were computed. Sixth, a series of one-way analyses of variance were completed with the total health risk score as the dependent variable and all the demographic variables (including the new rurality variable) being the independent variables. Seventh, exploratory cluster analysis was completed on the total health risk score to derive various potential groupings of students based on their self-reported propensity toward engaging in unhealthy risk behaviors. Eighth, and last, a series of discriminant function analyses were run to test the effects that rurality, age, grade level, or gender had on discriminating between the two, three, or four groups of health risk subjects determined previously.

The Rurality Variable

Inspection of the schools in the sample revealed that there were many differently sized schools included. Yet, some of the schools had similar enrollment figures but much different locales. For example, several of the large size schools were located in some of the state's larger cities. These cities fit into the United States government's definition of Standard Metropolitan Statistical Areas (SMSA). However, there were some similarly sized schools from very rural counties in West Virginia. These large high schools in rural counties often were the result of recent mergers of smaller, small town, or village-oriented high schools. Thus, the West Virginia sample of schools participating in the YRBS survey administration seemed to present another wrinkle to the simple "enrollment size" sample selection variable.

The definition of rurality for the schools in this study was the number of enrolled students per square mile per school attendance area. Similar to the census definition of population density, this "students per school per square mile" may overcome the simpler "enrollment size of school" problem in describing the rurality of the different schools.

Attendance area in square miles was available for all 151 high schools in West Virginia from a previous study (Hughes, Meehan, and Harmon, 1990). The school enrollment figures in the previous study's database were updated with 1989-90 school year figures. Three of the 30 schools in the sample were junior high schools that had grade 9 classes, but no grades 10, 11, or 12. The attendance area in square miles for these three junior high schools was not in the previous study's database. Interestingly, two of the three junior high schools were in the same school district and a telephone call revealed that they both fed into one senior high school and, also, that the pair comprised the total attendance area of that high school. So, the attendance area in square miles for the high school was used for each of these junior high schools and new "students per school per square mile" figures were computed. For the remaining junior high school, the students per square mile for the high school that it feeds into was used as its figure.

The "students per school per square mile" figures ranged from a low of 0.2330 to a high of 86.5070. The mean was a low of just 5.5066 students per school per square mile and the standard deviation was 8.9381. The median was low at 2.7250. Clearly, the distribution of "students per school per square mile" data was positively skewed.

Next, the "students per school per square mile" figures for all 151 high schools in the state were converted to Z-score standardized statistics. When standardized by school students per square mile, they ranged from a minimum of −0.5900 below the mean to 2.3500 units above the mean. The Z-score median was −0.3100, again indicating very positively skewed data. Except for three outliers, the 148 remaining schools fit into a range of Z-scores from less than .5 below the mean to 2.5 Z-score units above the mean. Fully 111 of the schools were one-half or more Z-score units below the mean, while most of the remaining schools were within 2.0 Z-score units above the mean. The three outliers were more than 2.0 Z-score units above the mean. Last, labels were assigned to six groups of schools in West Virginia based on their level of rurality as determined by their standardized "students per school per square mile."

For the purposes of this study, the six different levels of rurality of West Virginia high schools, with their code numbers and labels, were:

1 = Extremely Rural = Less than -.5 Z-score units below the mean

2 = Very Rural = -.5 Z-score units below the mean to the mean

3 = Rural = Mean to .5 Z-score units above the mean

4 = Almost Rural = .5 Z-score units to 1.0 Z-score units above mean

5 = Least Rural = 1.0 Z-score units to 1.5 Z-score units above mean

6 = Not Rural = More than 1.5 Z-score units above the mean

The number of West Virginia schools in each of the levels of rurality was: (1) Extremely Rural, N = 27; (2) Very Rural, N = 84; (3) Rural, N = 6; (4) Almost Rural, N = 4; (5) Least Rural, N = 4; and (6) Not Rural, N = 6. Figure 1 displays distribution of the rurality definition applied to the West Virginia high schools and, also, the six rurality labels. These six rurality groups later were reduced to four by aggregating the Extremely Rural and the Very Rural into one combination and the Least Rural and Not Rural into another combination. This reduction in rurality groups was done to form groups of sufficient sample size for statistical hypothesis testing.

The new level of rurality for the students' schools was added into the database, with each student receiving the school's level of rurality code. This rurality variable was used as an additional independent variable in the analyses. In these analyses and the results from them, it should be remembered that the rurality variable was a post-sample selection variable and played no role in the selection of schools to be in the sample.

The findings and short discussions of those findings from the analyses of the YRBS data are presented in the next major section.

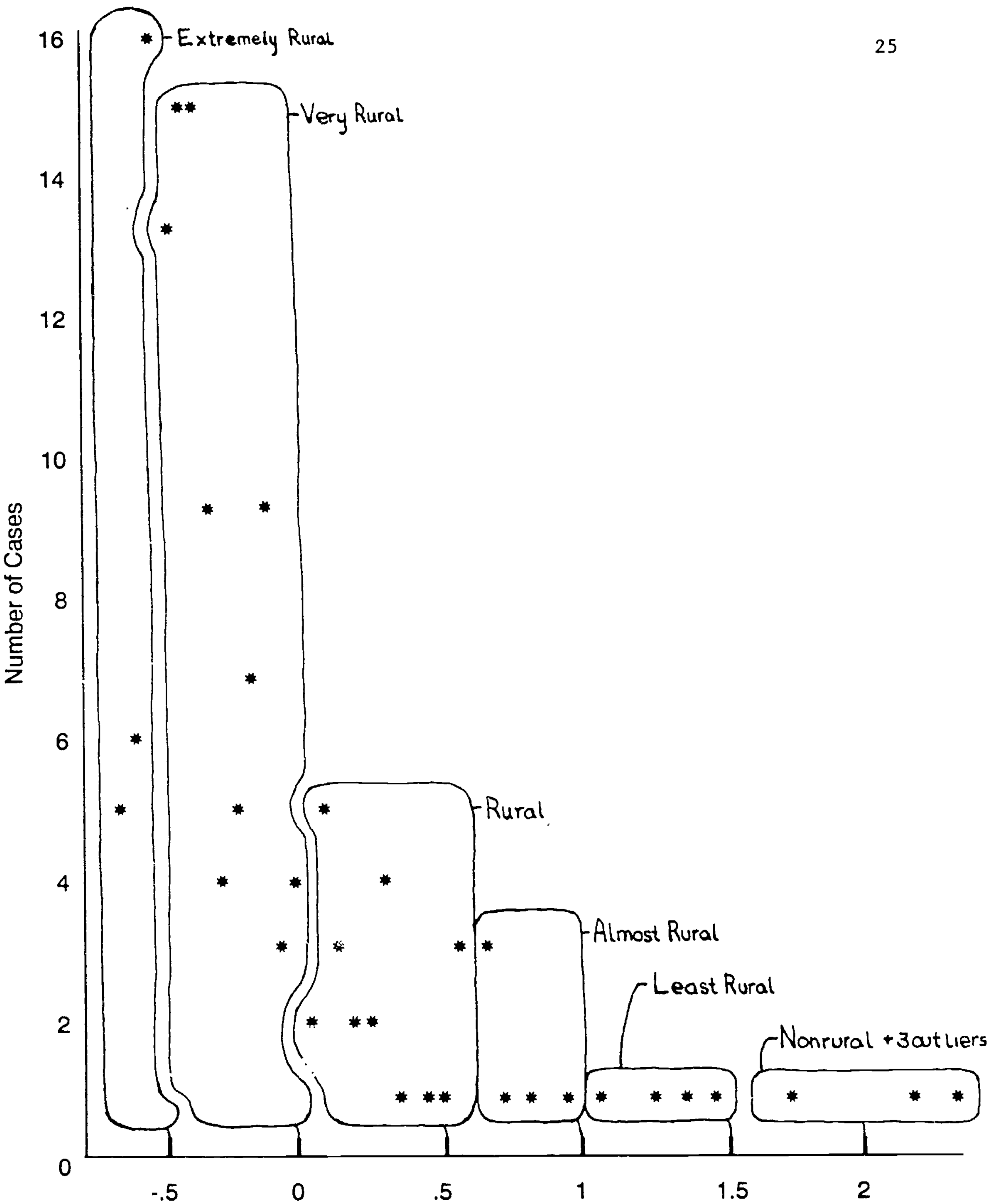


**Figure 1. Standardized Students per School per Square Mile for West Virginia High Schools in 1990 and the Six Rurality Labels**

# FINDINGS AND DISCUSSION

This section presents the findings and the discussions of those findings. The findings and discussions are presented together because the discussions of the findings are rather brief.

## Sample Statistics

A total of 1,448 usable YRBS surveys and answer sheets were returned from the sample of West Virginia students in grades 9, 10, 11, and 12. These 1,448 usable YRBS answer sheets were analyzed. Not all of the answer sheets had complete data--understandable given the ages in the sample and also the sensitive nature of some questions. There were 941 answer sheets with complete data. Through the two-stage, proportionally stratified random selection process, CDC staff concluded that the weighted results could be used to make inferences regarding all 9th, 10th, 11th, and 12th grade students in West Virginia schools.

Table 2 presents the descriptive statistics for the students' demographic variables. The sample was split evenly between females and males. The majority of the students were 15, 16, or 17 years old with nearly 30% being 15 years old. Only 2.1% were 13 years old or younger, while 12.9% were 18 years old or older. In terms of grade level, nearly twice as many of the sample students were in the 9th grade (39.0%) as in any other grade level. Regarding self-reported ethnicity, 89.0% of the sample students were white, 7.0% were Black, and the remainder were the other ethnicities, the Other category, or missing data. These ethnicity data of students reflect the population characteristics of West Virginia, which has few minority residents.

Table 2

Descriptive Statistics for Students' Demographic Variables

| Variable Value Label | | Number | Percent | Cumulative Percent |
|---|---|---|---|---|
| Gender: | | | | |
| Female | | 712 | 49.2 | 49.3 |
| Male | | 733 | 50.6 | 100.0 |
| Missing Data | | 3 | 0.2 | |
| | Total | 1,448 | 100.0 | |
| Age (collapsed): | | | | |
| 13 Years or Younger | | 31 | 2.1 | 2.1 |
| 14 Years Old | | 208 | 14.4 | 16.5 |
| 15 Years Old | | 422 | 29.1 | 45.6 |
| 16 Years Old | | 308 | 21.3 | 66.9 |
| 17 Years Old | | 292 | 20.2 | 87.1 |
| 18 Years or Older | | 187 | 12.9 | 100.0 |
| | Total | 1,448 | 100.0 | |
| Grade Level: | | | | |
| 9th Grade | | 564 | 39.0 | 39.4 |
| 10th Grade | | 280 | 19.3 | 59.0 |
| 11th Grade | | 295 | 20.4 | 79.7 |
| 12th Grade | | 288 | 19.9 | 99.8 |
| Ungraded | | 3 | 0.2 | 100.0 |
| Missing Data | | 18 | 1.2 | |
| | Total | 1,448 | 100.0 | |
| Ethnicity: | | | | |
| White | | 1,289 | 89.0 | 89.3 |
| Black | | 101 | 7.0 | 96.3 |
| Hispanic | | 4 | 0.3 | 96.6 |
| Asian/Pacific Islander | | 6 | 0.4 | 97.0 |
| Native American | | 23 | 1.6 | 98.6 |
| Other | | 20 | 1.4 | 100.0 |
| Missing Data | | 5 | 0.3 | |
| | Total | 1,448 | 100.0 | |
| Rurality (collapsed): | | | | |
| Extremely and Very Rural | | 729 | 50.3 | 50.3 |
| Rural | | 382 | 26.4 | 76.7 |
| Almost Rural | | 59 | 4.1 | 80.8 |
| Not Rural | | 278 | 19.2 | 100.0 |
| | Total | 1,448 | 100.0 | |

Table 2 also displays the rurality levels of the students in the sample. Recall that the rurality group code was assigned to each student based on the standardized school students per square mile of the building he/she attended. This rurality coding was a post-sample selection process and was not used to stratify the sample in the random draw procedure. Data in Table 2 show that 50.3% of the students were coded in the collapsed rurality group labeled Extremely and Very Rural. This figure approximates the fact that more than half of the West Virginia high schools were at the mean or below on the standardized students per square mile listing. The other 50 percent of the students were in the three remaining collapsed rurality groups of Rural, Almost Rural, and Not Rural.

## YRBS Instrument Descriptive Statistics

After assigning points to the various response options for each of the 65 nondemographic items in the YRBS, the possible total score ranged from a low of 63 points to a high of 333 points. This was the total health risk factor score. The subscale scores ranged from a low of 8 to a high of 86, depending on both the number of items in each subscale and the number of response options per item (e.g., Yes/No vs. options A through F).

Table 3 displays the descriptive statistics for the total YRBS health risk factor score and all six subscale health risk factor scores for all students in the study. Data in Table 3 show that 941 students answered all 65 YRBS items to yield a total health risk factor score. The scores for those 941 students ranged from a low of 84 to a high of 309. The mean was 145.11 and the standard deviation was 28.92.

Table 3

Descriptive Statistics for Total YRBS Instrument and Subscales for All Students

| Instrument or Scale Name | N | Mean | Standard Deviation | Minimum Score | Maximum Score |
|---|---|---|---|---|---|
| Total YRBS Instrument | 941 | 145.11 | 28.92 | 84.00[a] | 309.00 |
| Injury Subscale | 1,292 | 26.64 | 7.93 | 14.00 | 62.00 |
| Tobacco Subscale | 1,366 | 16.86 | 7.46 | 8.00 | 37.00 |
| Alcohol/Drug Subscale | 1,237 | 26.56 | 11.19 | 13.00 | 86.00 |
| Dietary Subscale | 1,391 | 18.62 | 3.49 | 10.00 | 34.00 |
| Physical Subscale | 1,377 | 32.16 | 5.58 | 11.00 | 44.00 |
| Sexual Subscale | 1,224 | 26.58 | 8.93 | 14.00 | 53.00 |

[a]The total YRBS possible scores ranged from a low of 63 points to a high of 333 points.

Table 3 reveals that the number of students completing all the items for the six subscales in the YRBS increased substantially from the total instrument figure. The numbers of students with completed subscale scores ranged from a low of 1,224 for the Sexual subscale to a high of 1,391 for the Dietary subscale.

The Alcohol/Drug subscale had the largest possible range of scores (from 13 to 86) and, interestingly, the resultant scores from the students matched the minimum and maximum point values. Table 3 shows that the mean for the Alcohol/Drug subscale for the sample of 1,237 students was 26.56 and the standard deviation was 11.19.

The Injury subscale had the second largest possible range of scores (from 11 to 63) and the resultant scores ranged from 14 to 62, nearly matching the highest possible score and just three points above the lowest possible score. The mean for the Injury subscale in Table 3 was 26.64 and the standard deviation was 7.93. The mean for the Injury subscale was larger, albeit slightly, than the mean for the Alcohol/Drug subscale, even though the latter had 23 more possible points.

The Sexual subscale had the third highest possible range of scores (from 14 to 57) and the scores ranged from 14 to 53, matching the lowest possible score and just four points below the highest score. The mean for the Sexual subscale was 26.58 and the standard deviation was 8.93. The mean for the Sexual subscale was nearly identical to the means for the Alcohol/Drug and Injury subscales despite having 23 and 29 fewer possible points, respectively.

The Physical subscale had the fourth highest possible range of scores (from 8 to 44) and the scores ranged from 11 to 44, matching the highest possible score and just three points above the lowest possible score. The mean in Table 3 for the Physical subscale was 32.16 and the standard deviation was just 5.58. This Physical subscale mean was the highest of all the subscale means, despite having 42 fewer possible points than the Alcohol/Drug subscale, 19 fewer possible points than the Injury subscale, and 13 fewer possible points than the Sexual subscale. Recall, the higher the subscale score, the greater the health risk factor.

The Dietary subscale had the fifth highest possible range of scores (from 8 to 39) and the scores from the sample of students ranged from 10 to 34, missing the lowest possible score by two points and the highest possible score by five points. Table 3 shows the Dietary subscale mean to be 18.62 and the standard deviation to be 3.49. This was the next to lowest mean of all the subscales and the smallest standard deviation figure.

The Tobacco subscale had the sixth and lowest possible range of scores (from 8 to 37). The Tobacco subscale had the same number of items as the Physical and Dietary subscales at eight; the differences were in the number of response options available for the students to choose. Specifically, the Tobacco subscale had three items with Yes/No response options, while the Physical and Dietary subscales had no such Yes/No response options for any of their items. The sample of students matched both the lowest possible score of 8 and the highest possible score of 37 on the Tobacco subscale. The mean score for the Tobacco subscale, as displayed in Table 3, was 16.86, with the standard deviation of 7.46. The Tobacco mean was the lowest mean for all the subscales.

Instrument Reliabilities for the YRBS

One of the objectives of this study was to compute and report the Alpha reliability coefficients for the YRBS instrument and its subscales. Table 4 displays the Alpha reliability coefficients for the total YRBS instrument and its six different subscales. The number of students answering all 65 items in the total instrument was 941, while the number of students completing all the items in the six subscales ranged from 1,224 to 1,391. The Alpha reliability coefficient for the total YRBS instrument was .8951. The Alpha reliability coefficients for the six YRBS subscales were: Injury = .6786, Tobacco = .8355, Alcohol/Drug = .8890, Dietary = .5540, Physical = .4647, and Sexual = .8197.

The Alpha coefficient for the total YRBS instrument was rather satisfactory at .90 (rounded figure). The Alpha coefficients for the Tobacco, Alcohol/Drug, and Sexual subscales were all satisfactory being .84, .89, and .82 (rounded figures), respectively. The Injury subscale Alpha coefficient could be labeled marginal at .68 (rounded figure). Clearly the Dietary subscale Alpha at .55 (rounded) and the Physical subscale Alpha at .46 (rounded) were unsatisfactory, indicating unstable subscales. These results for the two latter subscales were unexpected in that the project team expected the Sexual subscale, with its very sensitive questions, to yield the lowest Alpha reliability coefficient. Inspection of the standard deviation values for the Physical and Dietary subscales in Table 3 shows them to be the two smallest such values of all the subscales. Clearly, the Physical and Dietary subscales, as completed by the sample of students in this study, did not produce much variance, thus contributing to the lower Alpha reliability coefficients.

Table 4

Alpha Reliability Coefficients for the Total
YRBS Instrument and Subscales for All Students

| Instrument or Scale Name | Number of Students | Number of Items | Alpha Coefficient |
|---|---|---|---|
| Total YRBS Instrument | 941 | 65 | .8951 |
| Injury Subscale | 1,292 | 14 | .6786 |
| Tobacco Subscale | 1,366 | 8 | .8355 |
| Alcohol/Drug Subscale | 1,237 | 13 | .8890 |
| Dietary Subscale | 1,391 | 8 | .5540 |
| Physical Subscale | 1,377 | 8 | .4647 |
| Sexual Subscale | 1,224 | 14 | .8197 |

Table 5 displays the Alpha reliability coefficients for the total YRBS instrument by the students' demographic variables, including the levels of rurality variable presented in this study. Data in Table 5 show that the total YRBS instrument Alpha reliability coefficients did not differ much across the gender or grade levels of the students. The Alpha figures for all the subgroups in those two demographic variables ranged from .8843 to .9038. The ethnicity variable did not produce any Alpha reliability coefficient for the Hispanic and Asian/Pacific Islander subgroups, because only one student responded to all 65 YRBS items in each category. The other subgroups in the ethnicity variable yielded Alpha reliability coefficients ranging from .8283 to .8991. The white subgroup had the largest number of students with 859 and the highest Alpha at .90 (rounded figure).

The Alpha reliability coefficients for the total YRBS instrument by rurality groups showed them all to be rather consistent, ranging from .8835 to .9131. Three of the four rurality groups with students completing all 65 items yielded Alpha reliabilities above .90. Table 5, in the number of the students column, shows that no students in the Extremely Rural and the Least Rural categories completed all 65 YRBS items. Too, only 39 students in the Almost Rural category completed all 65 items. These zero and low figures in these three rurality groups illustrate the reasons why the rurality groups had to be collapsed for later analyses.

Table 5

Alpha Reliability Coefficients for the Total YRBS Instrument by Students' Demographic Variables

| Student Subgroup Name | Number of Students | Number of Items | Alpha Coefficient |
|---|---|---|---|
| Gender: | | | |
| Female | 502 | 65 | .8851 |
| Male | 438 | 65 | .9038 |
| Grade Level: | | | |
| 9th Grade | 334 | 65 | .9002 |
| 10th Grade | 186 | 65 | .9019 |
| 11th Grade | 208 | 65 | .8843 |
| 12th Grade | 204 | 65 | .8883 |
| Other | 1 | 65 | -- |
| Ethnicity: | | | |
| White | 859 | 65 | .8991 |
| Black | 48 | 65 | .8370 |
| Hispanic | 1 | 65 | -- |
| Asian/Pacific | 1 | 65 | -- |
| Native American | 16 | 65 | .8283 |
| Others | 14 | 65 | .8411 |
| Rurality: | | | |
| Extremely Rural | 0 | 65 | -- |
| Very Rural | 461 | 65 | .8825 |
| Rural | 237 | 65 | .9005 |
| Almost Rural | 39 | 65 | .9131 |
| Least Rural | 0 | 65 | -- |
| Not Rural | 204 | 65 | .9061 |

Note: There were no students sampled in the smallest and second largest rurality groups; therefore, the two groups were collapsed into other groups for later analyses.

Analysis of Variance Results for Demographic Groups

Inspection of the cross-tabulation results of the individual YRBS items, produced by CDC staff, revealed large differences in responses across various demographic variables such as gender, grade level, and age group. Thus, one of the objectives of this study was to examine the differences in YRBS scores across various demographic groups and to present the results. To accomplish this objective, a series of one-way analysis of variance computations, with appropriate followups, were run on all the demographic variables, including the levels of rurality with the collapsed categories.

Table 6 displays the results of the series of one-way analysis on the total YRBS instrument score by all the demographic variables. Those demographic variables in the one-way analysis of variance were: (1) gender, (2) grade level, (3) ethnicity, (4) age, and (5) rurality. Data in Table 6 show that significant F values were produced in the one-way analysis of variance for the gender, grade level, age, and rurality demographic variables. The gender, grade level, and age F values were significant at the .01 level. The rurality variable on the total YRBS instrument score was significant at the .05 level. Thus, significant differences on the total YRBS instrument score were revealed on four of the five demographic variables, only ethnicity failed to produce a significant total YRBS score F value.

Table 6 also displays the results of the followup procedures to the significant analysis of variance F values. These followup results with significantly different groups are shown in the last column in Table 6. For the reader's convenience, the groups with the higher health risk factor scores are listed first, followed by the groups with the lower

Table 6

One-Way Analysis of Variance Results for Demographic Groups on the Total YRBS Instrument Score

| Student Group Name | F Value | P Value | Significantly Different Groups |
|---|---|---|---|
| Gender | 21.13 | .000** | Males[a] vs. females |
| Grade Level (collapsed) | 11.05 | .000** | 12+10 vs 9; 12 vs. 11+10 |
| Ethnicity | 0.65 | .631 | None |
| Age (collapsed) | 8.23 | .000** | 16,17,+18 vs. 14; 18 vs. 13+15 |
| Rurality (collapsed) | 3.58 | .014* | None |

[a]Group(s) with higher health risk factor listed first before the groups with the lower health risk factor score (the "vs." groups).

*Significant at .05 level.

**Significant at .01 level.

health risk factor scores. For the gender variable, males in this sample had significantly higher health risk factor scores than females. For the grade level groups, two multiple comparisons were significantly different. The 12th and 10th grade level groups differed significantly from the 9th grade level group on the total YRBS instrument score with the two former groups having the significantly higher health risk factor scores. Also, the 12th grade level group of students had significantly higher health risk factor scores than the 11th and 10th grade level groups. Regarding the age groups, two multiple group comparisons were significantly different. The 16-, 17-, and 18-year-old students in this study had significantly higher health risk factor scores than the 14-year-old students. Also, the 18-year-old students in this study had significantly higher health risk scores than the 13- and 15-year-old students in this sample. Finally, with respect to the rurality variable, while the main F value was significant but low (3.58), the followup comparisons failed to produce any two groups that differed significantly, possibly due to the more conservative nature of the multiple comparison tests.

## Cluster Group and Discriminant Function Analysis Results

Exploratory cluster analysis on the total YRBS instrument scores was conducted to identify empirically derived groups of students on their health risk factor scores. This was followed by cross-tabulations to describe the makeup of the identified cluster groups.

Table 7 presents the results of the cluster analysis in terms of the descriptive statistics for the groups' total YRBS instruments. Cluster analysis yielded two viable solutions: a two-group solution and a three-group solution. The two groups in that solution might be labeled the

Table 7

Descriptive Statistics for the Two and Three Health Risk Cluster Groups' Total Instrument Scores

| Number of Groups | Cluster Group Names | Number | Mean Health Risk Score | Standard Deviation |
|---|---|---|---|---|
| Two-Group Solution | | | | |
| | High Risk Group | 29 | 218.41 | 20.95 |
| | Average Risk Group | 912 | 142.78 | 25.95 |
| Three-Group Solution | | | | |
| | Above Average Risk Group | 235[a] | 183.59 | 17.01 |
| | Average Risk Group | 72 | 148.38 | 18.59 |
| | Below Average Risk | 633 | 130.20 | 16.77 |

[a]One outlier (highest score) was dropped from the three-group solution.

high risk group and the average risk group. Table 7 shows that just 29 students fit into the high risk group and they had a mean health risk score of 218.41 with a standard deviation of 20.95. The average risk group in the two-group solution numbered 912 and they had a mean health risk score of 142.78 with a standard deviation of 25.95.

The groups in the three-group cluster analysis solution on the total YRBS instrument score might be labeled the above average risk group, the average risk group, and the below average risk group. Data in Table 7 show that 235 students fit into the above average risk group and they had a mean health risk score of 183.59 with a standard deviation of 17.01. The average risk group in the three-group solution numbered 72 and they had a mean health risk score of 148.38 with a standard deviation of 18.59. Finally, the below average risk group had a mean health risk score of 130.20 with a standard deviation of 16.77.

Using the two and three groups from the cluster analysis, discriminant function analysis was conducted to test the effects that gender, age, grade level, ethnicity, and rurality had on discriminating between the two groups and, also, the three groups. Discriminant function analyses were run, first, with all the independent variables as a group, then individually to describe whether any or all combinations could discriminate the identified health risk groups. Also, cross-tabulations on gender and ethnicity were run to determine the association between their groups and the health risk groups.

The discriminant function analysis on the two health risk groups produced interesting results. For gender, males scored more in the high risk factor group, while females scored more in the average risk factor group, although not quite at the .05 significance level for the females. The rurality variable produced significant results with the more urban (or less rural) group associated with the high risk factor scores. On ethnicity, there appears to be no discriminating effects of ethnicity on health risk score, owing much to the fact that there were fewer Black students with complete instrument scores and also owing to the fact that all the students in the high risk factor group were white. Neither age nor grade level could discriminate between the two health risk cluster groups.

When the two health risk factor groups (high and average) were studied via discriminant function analysis with all the independent variables as a group, only rurality and gender could discriminate significantly between the groups. Basically, as a student's school is classified more toward nonrural (away from rural) and as students are classified as male, the health risk scores rise to high. Table 8 presents the numbers of the students in the two significant demographic variable subgroups in the high health risk group and in the average health risk group.

Discriminant function analysis on the three health risk groups produced similar, but slightly less clear, results than the two-group analysis. The three cluster groups were labeled above average risk, average risk, and below average risk. Although these three groups can be formed by cluster analysis, most of the discrimination among the groups centers on two of the three groups. Those two groups drawing most of the discrimination are the above average and the average risk groups. Thus, the three-group discriminant function analysis largely mirrors the two-group results. Rurality and gender significantly discriminate the three

Table 8

Frequencies for the Significant Demographic Variable Subgroups in the Two Health Risk Factor Groups

| Variable | Subgroup | High Risk Group | Average Risk Group |
|---|---|---|---|
| Gender | | | |
| | Female | 11 | 491 |
| | Male | 18 | 420 |
| Rurality | | | |
| | Extremely and Very Rural | 8 | 453 |
| | Rural | 9 | 228 |
| | Almost Rural | 3 | 36 |
| | Not Rural | 9 | 195 |

health risk groups. Age appears to discriminate the three cluster groups, but this seems to be masked by the fact that a few individuals in the smallest risk group are either very young or very old for the sample and, thus, represent extreme observations. Table 9 presents the numbers of the students in the two significant demographic variable subgroups in the above average health risk group, the average health risk group, and the below average health risk group. As with the two-group discriminant function analysis results, the two significant discriminating variables are gender and rurality. And, as with the two-group results, the less rural the student's school and as students are classified as male, the health risk factor scores rise higher.

In summary, based on all the cluster and discriminant function analysis and a none too rigid interpretation of relationships among the independent variables, the YRBS instrument can identify either two or three clear health risk factor groups. The two groups can be labeled high risk and average risk, while the three groups can be labeled above average risk, average risk, and below average risk. When the students in this sample were clustered into these groups, rurality was the most consistent discriminator of the groups with the higher risk being attained as the less rural (or more urban) classification is reached. Gender seems to be the next most potent discriminator of the health risk cluster groups, but it seems to be affected by extreme scores of small numbers of individuals. Males have the higher health risk scores. Age and grade level vary in their ability to discriminate health risk groups, probably because of their intercorrelation with each other. Ethnicity did not help discriminate between any health risk group identified in this study.

Table 9

Frequencies for the Significant Demographic Variable Subgroups in the Three Health Risk Factor Groups

| Variable | Subgroup | Above Avg. Risk Group | Average Risk Group | Below Avg. Risk Group |
|---|---|---|---|---|
| Gender | | | | |
| | Female | 86 | 43 | 373 |
| | Male | 149 | 29 | 259 |
| Rurality | | | | |
| | Extremely and Very Rural | 100 | 28 | 333 |
| | Rural | 64 | 25 | 147 |
| | Almost Rural | 9 | 4 | 26 |
| | Not Rural | 62 | 15 | 127 |

# CONCLUSIONS AND RECOMMENDATIONS

The previous section presented the findings and brief discussions of those findings for this study. This section presents the conclusions and recommendations of this study of West Virginia adolescents' health risk factors.

## Conclusions

One objective of this study was to develop and present a new technique for measuring the students' levels of rurality and using the results in further analyses as an independent variable. It is concluded that the "students per school per square mile" technique for defining and measuring levels of rurality has utility. This definition of levels of rurality makes logical sense, is not too difficult to obtain, and relates well with the United States census definition of population density. Further, from the outcomes of later statistical analyses where the "students per school per square mile" was used as an independent variable, it is concluded that this new measure of the levels of rurality is worthy of further utilization.

Another objective of this study was to present the Alpha reliability coefficients for the YRBS instrument for the West Virginia sample of high school students. It is concluded that the Alpha reliability coefficient for the total YRBS instrument was rather satisfactory at .90. It is concluded that the Alpha reliability coefficients for the YRBS Tobacco, Alcohol/Drug, and Sexual subscales were all satisfactory, being .84, .89, and .82, respectively. It is concluded that the YRBS Injury subscale Alpha reliability coefficient was marginal at .68. Finally, the two remaining YRBS subscales of Dietary and Physical yielded unsatisfactory Alpha reliability coefficients of .55 and .46, respectively.

A third objective of this study was to analyze the students' health risk factor scores by the various independent variables, including the new "students per school per square mile" variable. Based on the series of one-way analysis of variance runs on all the independent variables, it is concluded that significant differences on the total YRBS health risk factor score were revealed on four of the five demographic variables, i.e., gender, grade level, age, and level of rurality. Only the ethnicity variable failed to produce a significant total YRBS score F value.

Based on the analysis of variance followup procedures, it is concluded that West Virginia students in certain specific groups had significantly higher total health risk factor scores than students in other specific groups on the same demographic variable. Males in this West Virginia sample of students had significantly higher health risk factor scores than females in the sample. For the grade level groups, the 12th and 10th graders had significantly higher health risk factor scores than the 9th graders and, likewise, the 12th graders had significantly higher health risk factor scores than the 10th and 11th graders. On the age variable, the 16-, 17-, and 18-year-old students had significantly higher health risk factor scores than the 14 year olds and, similarly, the 18 year olds had significantly higher scores than the 13 and 15 year olds. To summarize, it is concluded that males; 12th graders; and 16, 17, or 18 year olds had significantly higher health risk factor scores in this sample.

From the exploratory cluster analysis, it is concluded that two viable group solutions emerged on the West Virginia students' health risk factor scores. One viable solution was the formation of two groups of students based on their health risk factor scores that can be labeled the high risk group and the average risk group. The other viable solution was the formation of three groups of West Virginia students that can be labeled the above average risk, the average risk, and the below average risk groups. It is concluded that either solution (two groups or three groups) provides credible starting points for describing West Virginia students in terms of the health risk factor scores.

Based on the discriminant function analyses on both the two health risk groups and also on the three health risk groups, it is concluded that rurality was the most consistent discriminator of the groups with the higher risk being associated with the less rural (or more urban) classification. It is concluded that gender was the next most potent discriminator of the groups with the males having higher health risk factor scores; however, this variable is affected by extreme scores of a few individuals. It is concluded that age and grade level varied in ability to discriminate health risk factor groups and, thus, were not stable discriminators. Last, it is concluded that ethnicity does not help discriminate between the health risk groups in this study.

Finally, it is concluded from all the various analyses in this study that the significantly higher health risk factor scores for the males; the 12th graders; the 16, 17, and 18 year olds; and the less rural groups had serious programmatic implications for the health education curriculum and instruction provided to West Virginia youth. This is the major conclusion. The data are clear. West Virginia students in these groups report higher levels of health risk behaviors than others and something should be done about it.

Recommendations

From the investigation of rural adolescents' health risk behaviors, certain recommendations can be made. These recommendations are presented in no particular priority order.

First, the continued use of the YRBS instrument is recommended. The total instrument yielded a satisfactory Alpha reliability coefficient. The six YRBS subscales yielded a range of Alpha reliability coefficients, prompting a recommendation for more research on the Dietary and Physical subscales from other student samples. Certainly, the content validity of these two subscales is not an issue, given the extensive development work. But the Alpha reliability coefficients produced by this sample of students calls for more, or different, studies of the reliabilities for these two YRBS subscales.

Second, it is recommended that the new definition of rurality presented in this study, namely, "students per school per square mile," be tested out in other locales and for other studies. It is concluded, based on the various analyses in which it was used as an independent variable, that it was quite useful. It should be tested and tried by other researchers to determine if they arrive at the same conclusion. The use of the "students per school per square mile" definition of rurality should be given a chance to prove its utility or nonutility by the research community.

Third, this study, or a study very similar to it, should be conducted on the data resulting from the next administration of the YRBS to a sample of West Virginia students. If the same, or nearly the same, results are found, then the consistency of the results over two administrations of the YRBS have serious implications for the health education of males; 12th graders; 16, 17, and 18 year olds; and the more urban classifications of students. To be pointed about it, if these results are replicated with the next sample of West Virginia students to take the YRBS, then perhaps public school educators should consider seriously adding more specific health instruction into the required curriculum of high school senior males, such as an additional half Carnegie unit in health education. And, too, public health officials should design, implement, and evaluate more or new programs for young people in these groups.

REFERENCES

Anderson, R. H., Thoenen, E., Thompson, G. L., & Wright, J. G. (1989). West Virginia behavioral risk factor survey: 1989. Charleston, WV: Bureau of Public Health, Office of Epidemiology and Health Promotion.

Hales, L. W., & McGrew, R. R. (1990, April). AIDS education in rural Oregon school districts: Compliance with state curriculum guidelines. Paper presented at the Annual Meeting of the American Educational Research Association, Boston, MA.

Hales, L. W., & McGrew, R. R. (1991, April). AIDS--knowledge and attitudes of students in rural schools examined by gender and grade level. Paper presented at the Annual Meeting of the American Educational Research Association, Chicago, IL.

Hales, L. W., McGrew, R. R., & Nizic-Anderson, K. (1990, April). AIDS--knowledge and attitudes of rural middle school students examined by sex and grade level. Paper presented at the Annual Meeting of the American Educational Research Association, Boston, MA.

Hughes, M. F., Meehan, M. L., & Harmon, H. (1990, October). Commonalities and differences among West Virginia's highest and lowest ranking high schools. Paper presented at the Rural Education Research Forum, Colorado Springs, CO.

Kolbe, L. J. (1990a). An epidemologic surveillance system to monitor the prevalence of youth behaviors that most affect youth. Health Education, 21(6), 44-48.

Kolbe, L. J. (1990b, September). Can schools substantially improve the health of West Virginians? Prepared speech delivered to the West Virginia Governor's Task Force on School Health, Charleston, WV.

Salzman, S. A., & Girvan, J. T. (1991, April). Evaluation of AIDS prevention education programs: A rural perspective. Paper presented at the Annual Meeting of the American Educational Research Association, Chicago, IL.

West Virginia Department of Education. (1988). The PRIDE questionnaire for grades 6-12: West Virginia combined results. Charleston, WV: Author.

West Virginia Human Resources Association. (1988). Children in crisis: State at risk. Charleston, WV: Author.

West Virginia State Medical Association. (1990). Health care in West Virginia: Not just a problem--it's a crisis! Charleston, WV: Author.

United States General Accounting Office. (1990). Rural drug abuse: Prevalence, relation to crime, and programs. Washington, DC: Author.

United States Public Health Service. (1990). Healthy youth 2000. Washington, DC: United States Government Printing Office.