

Patterns of Health-Compromising Behaviors among Minnesota Adolescents: Sociodemographic Variations

ABSTRACT

Objectives. This study compared prevalence rates of health-compromising behaviors among boys and girls from different ethnic backgrounds in early, middle, and late adolescence and compared co-occurrences of such behaviors across gender and ethnic groups.

Methods. The study population included 123 132 adolescents in grades 6, 9, and 12. Adolescents completed a classroom-administered statewide survey focusing on high-risk behaviors, including unhealthy weight loss, substance abuse, suicide risk, delinquency, and sexual activity.

Results. Prevalence rates of most health-compromising behaviors differed by gender, increased with age, and tended to be highest among American Indian youth and lowest among Asian Americans. Strong associations were found between substance abuse and delinquency across all ethnic groups. Substance abuse and delinquency were associated with suicide risk across most ethnic groups. Covariations with sexual activity and unhealthy weight loss behaviors showed more ethnic variation.

Conclusions. Prevention interventions should take into account the tendency for health-compromising behaviors to co-occur and should be sensitive to demographic and socioeconomic differences in behavior patterns. (*Am J Public Health*. 1996; 86:1599-1606)

Dianne Neumark-Sztainer, PhD, MPH, RD, Mary Story, PhD, RD, Simone French, PhD, Nadav Cassuto, MA, David R. Jacobs, Jr., PhD, and Michael D. Resnick, PhD

Introduction

Over the past 2 decades, there has been a growing body of literature focusing on intercorrelations between health-compromising behaviors among adolescents.¹⁻¹⁰ Behaviors commonly found to co-occur include excessive drinking, marijuana use, delinquent behavior, and precocious sexual intercourse.^{1,2,6} A number of theories have been formulated to explain covariations in high-risk behaviors in adolescence.¹¹ Most notable is problem behavior theory, which posits that a "syndrome" of problem behaviors co-occur that may be accounted for by a set of common underlying factors.² According to problem behavior theory, while the separate behaviors have unique aspects, they also may have a set of common underlying causes that are related to a tendency toward "unconventionality."¹¹ Other behaviors, such as suicide attempts and disordered eating, have been described as part of an empirical constellation of "quietly disturbed" behaviors and attitudes that also includes high emotional distress and low self-esteem.¹² In a number of studies, suicide attempts and disordered eating have been found to co-occur with an array of other health-compromising behaviors.¹³⁻¹⁹

Comparisons of patterns of health behaviors across subgroups of the adolescent population increase our understanding of the factors influencing risk behavior. Extremely low or high prevalence rates among different gender, age, or ethnic groups and different patterns of co-occurring behaviors may lead to a greater understanding of the influence of developmental and social factors on high-risk behaviors and provide information for the design of intervention programs.

Recent studies have shown strikingly different prevalence rates of health-compromising behaviors among youth from different ethnic backgrounds that may be mediated by differences in socioeconomic status.²⁰⁻²⁴ For example, sexual activity tends to be more prevalent among African American than White adolescents,²⁰ while cigarette smoking and unhealthy weight control have been reported to be higher among female Whites than among female African Americans.²¹ Unfortunately, few population-based studies have compared co-occurrences between high-risk behaviors across diverse ethnic groups²⁵ because studies tend to concentrate on one ethnic group^{4,22} or ethnic groups are combined as a result of small sample size.²⁶

The present study examined patterns of so-called problem behaviors across gender, age, and diverse ethnic groups. Specifically, the study objectives were (1) to compare the frequencies of health-compromising behaviors between male and female adolescents from different racial/ethnic backgrounds in early, middle, and late adolescence and (2) to compare co-occurrences of health-compromising behaviors across gender and ethnic groups.

Dianne Neumark-Sztainer, Mary Story, Simone French, and David R. Jacobs, Jr., are with the Division of Epidemiology, and Nadav Cassuto and Michael D. Resnick are with the Division of General Pediatrics and Adolescent Health, University of Minnesota, Minneapolis. Michael D. Resnick is also with the Division of Health Management and Policy, University of Minnesota.

Requests for reprints should be sent to Dianne Neumark-Sztainer, PhD, MPH, RD, Division of Epidemiology, School of Public Health, 1300 S Second St, Suite 300, University of Minnesota, Minneapolis, MN 55454.

This paper was accepted March 6, 1996.

TABLE 1—Number of Adolescents Responding (n = 123 132), by Gender, Grade, and Race/Ethnicity: The 1992 Minnesota Student Survey

Grade	American Indians		African Americans		Hispanics		Asian Americans		Whites		Other	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
6th	426	416	283	297	267	240	383	509	18 270	18 316	3 004	2 500
9th	257	251	404	333	270	237	471	563	19 182	19 769	1 244	875
12th	120	112	204	174	166	162	470	480	15 069	15 196	392	268

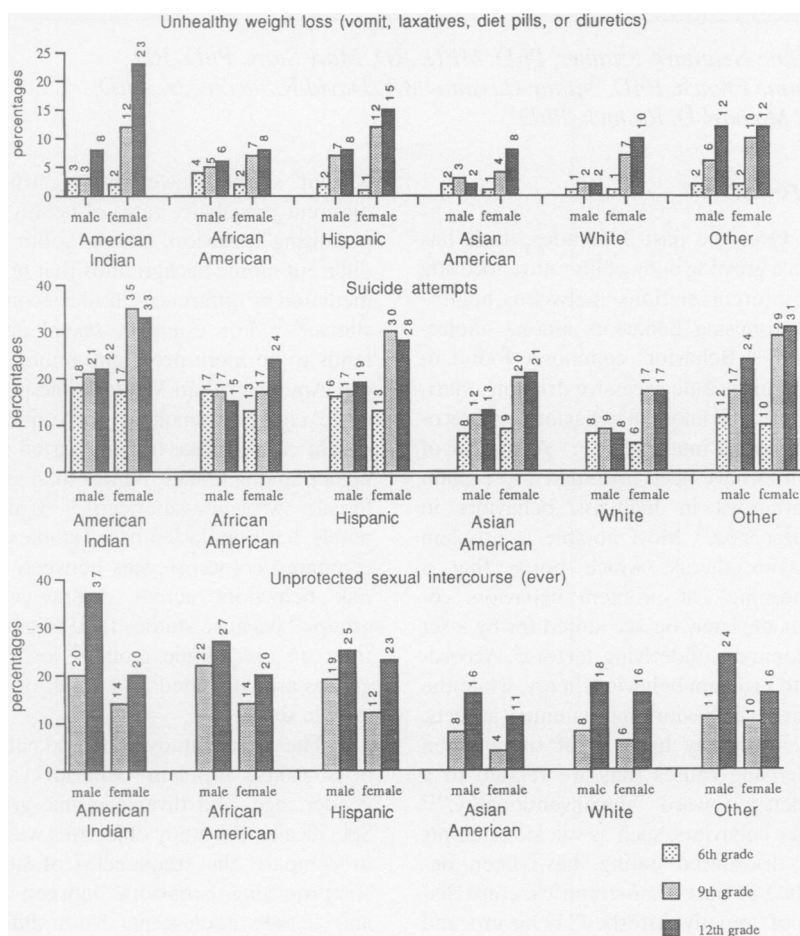


FIGURE 1—Percentages of adolescents reporting unhealthy weight loss, suicide attempts, and unprotected intercourse, by race/ethnicity, gender, and age: the 1992 Minnesota Student Survey.

This study is unique in both the size of the study population and the wide variety of health behaviors assessed.

Methods

Study Population and Design

The study population included 123 132 adolescents (50.1% boys, 49.9% girls) in Minnesota who completed the

Minnesota Student Survey in 1992. Students in grades 6, 9, and 12, in all but one of the 411 school districts within Minnesota, participated in the study. In most districts, the entire student population in these grades participated; however, within a few of the larger school districts, representative sampling was undertaken. The study population included approximately 73% of the actual student enroll-

ment for these grades. Details on sampling, instrumentation, psychometrics, consent procedures, and data cleaning have been described elsewhere.^{27,28}

The adolescents participating in the study ranged in age from 11 to 21 years (mean = 14.3, SD = 2.4); 37.2% were in 6th grade, 36.0% were in 9th grade, and 26.9% were in 12th grade. The ethnic breakdown was as follows: 1.3% American Indian, 1.4% African American, 1.1% Hispanic, 2.4% Asian American, 87.0% White, and 6.4% mixed/other/unknown. State school enrollment data show that 88% of students are White and 12% are from minority groups. Therefore, the study population closely approximated the overall population of students in Minnesota. The mixed/other/unknown ethnicity category comprised about 6.8% of the total. It was composed nearly equally of "mixed/other" and "unknown" subsets involving mostly younger students (Table 1). Although there was no further information available to characterize the mixed/other/unknown group, the group's results are reported for completeness. Adolescents who did not indicate their grade level (n = 302) or their ethnic background (n = 1506) were excluded from the analyses conducted by age and ethnicity.

Measures

The Minnesota Student Survey focused on high-risk behaviors and associated factors. Questions used in this study were standard items adapted mainly from the Adolescent Health Survey,^{12,29} the National Institute on Drug Abuse Monitoring the Future Survey,³⁰ and the National Youth Risk Behavior Survey.³¹ Measures were coded as scales for examining correlations between behaviors and as dichotomous variables, in order to examine the frequencies of youth engaging in these behaviors in an easily interpretable manner (e.g., percentage of sixth-grade Hispanic girls reporting suicide attempts). Unless explicitly stated,

the descriptions of measures relate to the scaled versions of the behaviors.

Unhealthy weight loss behaviors. Respondents indicated involvement in any of the following weight control behaviors: laxative use, use of water pills (diuretics), use of diet pills, and vomiting. Internal consistency was low ($\alpha = .60$) because different behaviors were being assessed, there were relatively few items, and only two response categories were provided for each behavior (yes or no). Scores ranged from 0 to 4, representing the number of unhealthy weight loss methods used. The dichotomized form of this variable was any vs none of these methods.

Substance abuse behaviors. Respondents indicated frequency and quantity of consumption for cigarettes, alcohol, and marijuana. Six responses, ranging from never to daily, were listed for items assessing frequency, and seven responses were listed for items assessing the typical amount of the substance used. Scores ranged from 1 to 6.33, with higher scores indicating greater substance use ($\alpha = .81$). The dichotomized form of these behaviors was at least monthly use vs less frequent or no use (separate variables for cigarettes, alcohol, and marijuana).

Delinquent behaviors. Adolescents reported the frequency with which they had damaged property, hit or beat up another person, or taken something from a store without paying for it over the previous 12 months. Five categories of response were given for each of the three items: never, once or twice, 3 to 5 times, 6 to 10 times, and more than 10 times. Scores ranged from 1 to 5 ($\alpha = .84$).

Sexual activity. Adolescents in the 9th and 12th grades answered three questions regarding frequency of sexual intercourse (never, 1 to 2 times, or 3 or more times), number of opposite-gender partners over the previous 12 months, and frequency of birth control use. Scores ranged from 1 to 6.5, with higher scores indicating higher risk sexual activity (more partners and less use of birth control). The internal consistency of this scale was high ($\alpha = .98$). The dichotomized form of this variable was any vs no unprotected sexual activity.

Suicide risk. Adolescents answered two questions regarding suicidal ideation and suicide attempts. Adolescents indicated whether they had thought about or attempted suicide more than a year ago, during the previous year, both, or never. Responses were summed and averaged, and scores ranged from 1 to 4, higher scores indicating increased suicidal risk. The items were only modestly correlated

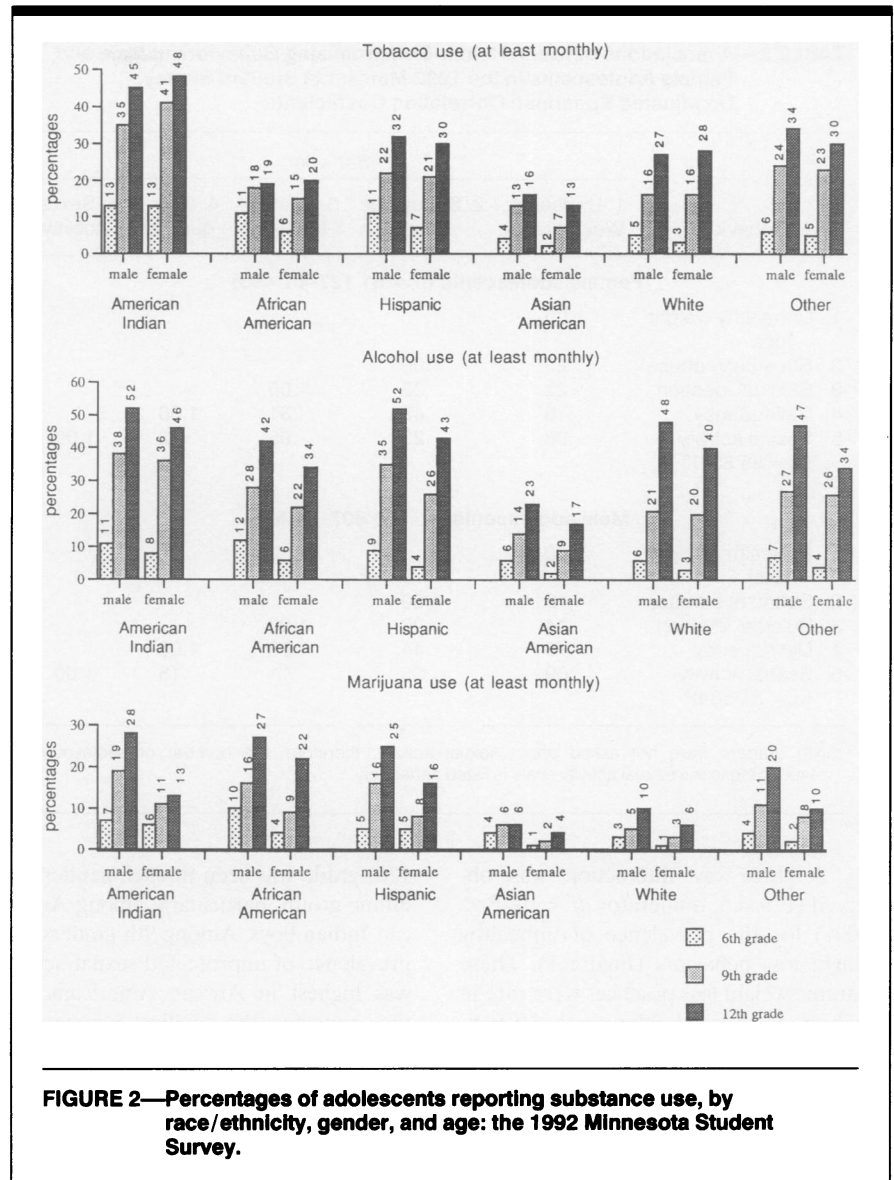


FIGURE 2—Percentages of adolescents reporting substance use, by race/ethnicity, gender, and age: the 1992 Minnesota Student Survey.

with each other ($r = .54$); however, they were combined in these analyses, which may have had an effect on the magnitude of correlations found with other variables. The dichotomized form of this variable related only to behavior (any vs no suicide attempts).

Data Analysis

In the first set of analyses, three-way analysis of variance (ANOVA) procedures were run for each of six health-compromising behaviors, expressed as dichotomous variables; ethnicity, gender, and grade were the independent factors. Main effects and two-way and three-way interactions were examined. Dominant patterns of clear substantive interest are described. In the second set of analyses, Spearman rank correlation coefficients were used in examining associations be-

tween the scaled behaviors. As a result of the large size of the study population, small correlations were significant; thus, P values are not shown in the tables.

Results

Prevalence of Health-Compromising Behaviors

Percentages of adolescents reporting unhealthy weight loss behaviors, suicide attempts, unprotected sexual intercourse, and use of tobacco, alcohol, and marijuana varied by grade level, gender, and ethnicity. The histograms in Figure 1 show the effect size of these factors on prevalence rates. Patterns of interest and interaction effects are briefly described in the paragraphs to follow.

TABLE 2—Associations between Health-Compromising Behaviors in Male and Female Adolescents in the 1992 Minnesota Student Survey: Unadjusted Spearman Correlation Coefficients

Behavior	Behavior				
	1. Unhealthy Weight Loss	2. Substance Abuse	3. Suicidal Ideation	4. Delinquency	5. Sexual Activity
Female adolescents (n = 61 127–61 493)					
1. Unhealthy weight loss	1.00				
2. Substance abuse	.23	1.00			
3. Suicidal ideation	.22	.33	1.00		
4. Delinquency	.16	.42	.31	1.00	
5. Sexual activity (n = 35 831) ^a	.08	.23	.05	.12	1.00
Male adolescents (n = 60 807–61 639)					
1. Unhealthy weight loss	1.00				
2. Substance abuse	.12	1.00			
3. Suicidal ideation	.14	.26	1.00		
4. Delinquency	.10	.44	.26	1.00	
5. Sexual activity (n = 34 584) ^a	.09	.25	.11	.18	1.00

^aSixth graders were not asked about sexual activity; therefore, the number of adolescents responding to the sexual activity scale is listed separately.

A three-way interaction was observed ($F = 4.5$, numerator $df = 10$, $P < .0001$) for the prevalence of unhealthy weight loss behaviors (Figure 1). These extreme weight loss practices were rare in sixth grade. Among older youth, Hispanics and American Indians were most likely to engage in unhealthy weight loss practices. The prevalence tended to be higher among girls than among boys. The prevalence of unhealthy weight loss behaviors increased with age in girls of all ethnicities; in boys, however, the prevalence increased with age only among American Indian, Hispanic, and mixed/other/unknown ethnicities.

ANOVAs of attempted suicide showed a significant Race \times Grade \times Gender interaction ($F = 2.2$, numerator $df = 10$, $P = .02$). American Indian and Hispanic youth were most likely to report suicide attempts. Among adolescents in 9th grade and 12th grade, gender differences were apparent, with more girls than boys reporting suicide attempts. The older girls reported more suicide attempts than the younger ones; this age effect was generally not seen in boys.

ANOVAs of unprotected sexual activity showed significant Ethnicity \times Grade ($F = 2.6$, numerator $df = 5$, $P = .02$) and Ethnicity \times Gender ($F = 3.3$, numerator $df = 5$, $P = .005$) interactions. An increase in prevalence from 9th grade to

12th grade was seen in each gender and ethnic group, particularly among American Indian boys. Among 9th graders, the prevalence of unprotected sexual activity was highest in African Americans, but they reported the smallest increase between 9th and 12th grades. Hispanic youth reported relatively high levels of unprotected sexual activity, while Whites and Asian Americans reported lower prevalence rates, particularly in 9th grade. Boys were somewhat more likely than girls to report unprotected sexual activity.

Prevalence of cigarette smoking varied by ethnicity (the rate was highest among American Indians, followed by Hispanics, those of mixed/unknown ethnicity, Whites, African Americans, and Asian Americans) and increased with age, but gender differences were small ($F = 5.0$, numerator $df = 1$, $P = .025$ for the gender main effect) (Figure 2). ANOVAs of cigarette smoking suggested that only the Ethnicity \times Gender interaction was of interest ($F = 2.6$, numerator $df = 5$, $P = .024$, adjusted for grade); boys had a slightly greater cigarette smoking rate than girls, except for American Indians, among whom girls had the slightly higher rate.

Asian Americans were least likely to report alcohol use. There was a striking increase in alcohol use with age. The Ethnicity \times Grade interaction ($F = 27.9$, numerator $df = 10$, $P < .0001$) and the

Gender \times Grade interaction ($F = 65.4$, numerator $df = 2$, $P < .0001$) were significant. Male and female students reported similar alcohol use in grades 6 and 9, but 12th-grade boys were more likely than 12th-grade girls to be alcohol consumers. The Ethnicity \times Grade interaction reflected that, after adjustment for gender, African Americans were second most likely among the six ethnicities to be drinkers as 6th graders but second least likely as 12th graders.

In ANOVAs of reported marijuana use, there was a three-way interaction ($F = 3.9$, numerator $df = 10$, $P < .0001$). African American, American Indian, and Hispanic youth, particularly older boys, reported high use rates, while reports of marijuana use were much less frequent among Whites and Asian Americans of both genders. Boys reported increasingly greater marijuana use than girls as grade level increased, except among African Americans.

Associations between Health-Compromising Behaviors

Positive associations were found between all of the health-compromising behaviors, and these correlations were all statistically significant (Table 2). Among both boys and girls, the strongest associations were found between substance abuse and delinquency, followed by associations between substance abuse and suicide risk, between substance abuse and sexual activity, and between suicide risk and delinquency. Associations between high-risk sexual activity and all behaviors except substance abuse were quite low. Although large differences in correlation patterns were not found between the gender groups, stronger associations among girls were found between unhealthy weight loss behaviors and most other behaviors. Fisher's z tests were used in comparing correlations between behaviors among the boys and girls; differences were statistically significant except for the correlation between sexual activity and unhealthy weight loss.

Partial correlations that controlled for grade were also used in examining correlations between the health-compromising behaviors among boys and girls within the different ethnic groups (Tables 3 and 4). Virtually all of these associations were positive, and all correlations above .10 were statistically significant. Among all ethnic groups, the strongest associations were between substance abuse and delinquency. In most groups, strong associations were also found between sub-

stance abuse and suicide risk and between delinquency and suicide risk. Although, in most of the ethnic groups, substance abuse was moderately associated with high-risk sexual activity, weak associations were found between these two behaviors among African-American girls and, in particular, among American-Indian girls. Associations between sexual activity and suicide risk were lower among American-Indian and Asian-American boys than among other boys. Associations between unhealthy weight loss behaviors and other behaviors were considerably higher among African-American and Hispanic boys than among the other boys.

Discussion

Prevalence rates of health-compromising behaviors were found to be alarmingly high among youth living in Minnesota, and these rates were consistent with those found in other large studies within Minnesota and across the United States.³⁰⁻³³ A clear trend toward higher prevalence rates was found among older adolescents; for most behaviors, the greatest differences were between 6th and 9th grades. Suicidal involvement and unhealthy weight loss, which have been labeled as "quietly disturbed" behaviors,¹² were more common among the girls, while alcohol use and marijuana use were somewhat more prevalent among the boys. High rates of reported suicide attempts among adolescent girls have been consistently reported,³¹⁻³³ and rates have increased considerably,³⁴ suggesting a high level of distress. The high prevalence rates of substance abuse are particularly troublesome, considering that these rates involve youth who are still in school, while out-of-school populations appear to be at even greater risk for substance abuse.³⁵ Our findings further indicate that prevalence rates of health-compromising behaviors among youth vary by ethnicity. The disturbingly high prevalence rates of health-compromising behaviors among American-Indian youth are consistent with previous findings^{24,36,37} and emphasize the need to further study sociocultural factors explaining behavior patterns. The relatively low prevalence of tobacco use among African-American youth is of interest and is consistent with findings from the Youth Risk Behavior Survey.³¹ Tobacco is typically viewed as a stepping stone behavior to marijuana use³⁵; however, among African Americans, this may not be the chain of events. The differences in prevalence rates of health-compromis-

TABLE 3—Associations between Health-Compromising Behaviors among Male Adolescents, by Race/Ethnicity, after Age Has Been Controlled for: Spearman Rank Correlation Coefficients

Behavior	Behavior				
	1. Unhealthy Weight Loss	2. Substance Abuse	3. Suicidal Ideation	4. Delinquency	5. Sexual Activity
American Indians (n = 779-813)					
1. Unhealthy weight loss	1.00				
2. Substance abuse	.09	1.00			
3. Suicidal ideation	.16	.31	1.00		
4. Delinquency	.08	.50	.26	1.00	
5. Sexual activity (n = 332) ^a	.06	.33	.01	.23	1.00
Hispanics (n = 688-703)					
1. Unhealthy weight loss	1.00				
2. Substance abuse	.24	1.00			
3. Suicidal ideation	.28	.36	1.00		
4. Delinquency	.21	.53	.34	.100	
5. Sexual activity (n = 375) ^a	.18	.32	.19	.32	1.00
Whites (n = 51 806-52 521)					
1. Unhealthy weight loss	1.00				
2. Substance abuse	.10	1.00			
3. Suicidal ideation	.11	.26	1.00		
4. Delinquency	.09	.44	.25	1.00	
5. Sexual activity (n = 30 898) ^a	.08	.24	.10	.17	1.00
African Americans (n = 889-927)					
1. Unhealthy weight loss	1.00				
2. Substance abuse	.23	1.00			
3. Suicidal ideation	.28	.36	1.00		
4. Delinquency	.19	.44	.26	1.00	
5. Sexual activity (n = 522) ^a	.11	.33	.13	.21	1.00
Asian Americans (n = 1292-1324)					
1. Unhealthy weight loss	1.00				
2. Substance abuse	.10	1.00			
3. Suicidal ideation	.17	.18	1.00		
4. Delinquency	.07	.41	.19	1.00	
5. Sexual activity (n = 818) ^a	.08	.24	.05	.24	1.00
Mixed/other/unknown (n = 4535-4640)					
1. Unhealthy weight loss	1.00				
2. Substance abuse	.17	1.00			
3. Suicidal ideation	.19	.31	1.00		
4. Delinquency	.15	.44	.30	1.00	
5. Sexual activity (n = 1377) ^a	.17	.28	.16	.20	1.00

^aSixth graders were not asked about sexual activity; therefore, the number of adolescents responding to the sexual activity scale is listed separately.

ing behaviors between gender, age, and ethnic groups, and the interactive effects found, suggest that social, developmental, and cultural factors unique to each of these groups influence youth and demonstrate the complexity of factors influencing adolescent behavior.

In addition to examining prevalence rates of health-compromising behaviors by ethnicity, we were interested in determining whether similar patterns of problem behaviors exist across ethnic groups. Overall, the patterns of correlations were similar among the different ethnic groups.

TABLE 4—Associations between Health-Compromising Behaviors among Female Adolescents, by Race/Ethnicity, after Age Has Been Controlled for: Spearman Rank Correlation Coefficients

Behavior	Behavior				
	1. Unhealthy Weight Loss	2. Substance Abuse	3. Suicidal Ideation	4. Delinquency	5. Sexual Activity
American Indians (n = 768–779)					
1. Unhealthy weight loss	1.00				
2. Substance abuse	.13	1.00			
3. Suicidal ideation	.16	.35	1.00		
4. Delinquency	.13	.34	.34	1.00	
5. Sexual activity (n = 329) ^a	.04	.04	-.05	.06	1.00
Hispanics (n = 624–639)					
1. Unhealthy weight loss	1.00				
2. Substance abuse	.16	1.00			
3. Suicidal ideation	.16	.35	1.00		
4. Delinquency	.14	.32	.32	1.00	
5. Sexual activity (n = 350) ^a	.07	.27	.06	.13	1.00
Whites (n = 53 037–53 280)					
1. Unhealthy weight loss	1.00				
2. Substance abuse	.23	1.00			
3. Suicidal ideation	.23	.33	1.00		
4. Delinquency	.16	.42	.30	1.00	
5. Sexual activity (n = 32 464) ^a	.08	.23	.06	.12	1.00
African Americans (n = 773–804)					
1. Unhealthy weight loss	1.00				
2. Substance abuse	.16	1.00			
3. Suicidal ideation	.21	.28	1.00		
4. Delinquency	.10	.35	.20	1.00	
5. Sexual activity (n = 437) ^a	.01	.13	.03	.12	1.00
Asian Americans (n = 1540–1552)					
1. Unhealthy weight loss	1.00				
2. Substance abuse	.21	1.00			
3. Suicidal ideation	.16	.29	1.00		
4. Delinquency	.14	.38	.29	1.00	
5. Sexual activity (n = 956) ^a	.09	.25	.06	.07	1.00
Mixed/unknown					
1. Unhealthy weight loss	1.00				
2. Substance abuse	.25	1.00			
3. Suicidal ideation	.23	.38	1.00		
4. Delinquency	.19	.43	.34	1.00	
5. Sexual activity	.11	.22	.08	.14	1.00

^aSixth graders were not asked about sexual activity; therefore, the number of adolescents responding to the sexual activity scale is listed separately.

unhealthy weight loss, covariations differed by ethnicity, suggesting that functional meanings and/or etiologic factors associated with these behaviors may differ by ethnicity. Among American Indian and African-American adolescent girls, high-risk sexual activity may not be part of the problem behavior syndrome and may not share common underlying causes with other high-risk behaviors.

In drawing conclusions from this study, a number of limitations need to be taken into account. Information was not available for socioeconomic status, level of parental education, and geographic location (e.g., urban vs rural) of the participants. Thus, we are unable to disaggregate the influences of socioeconomic and ethnic factors. It is quite probable that the lower socioeconomic status of certain ethnic groups, rather than their ethnic culture, is a major contributor to the high prevalence of high-risk behaviors. Another limitation is the self-reported nature of the data. While most large surveys rely on self-reported data, and the literature indicates the validity of such data,^{24,38,39} particular problems may arise in comparing individuals of different ethnicities. The possibility for systematic differences in interpretation of question items exists and may influence results. Ideally, a large-scale study on health-compromising behaviors, such as the present one, should be followed (or preceded) by a smaller in-depth study of these behaviors among different age, gender, and ethnic groups. Finally, in light of the ethnic composition of Minnesota and other factors such as geographic location and the state's relatively low youth mortality rate (in terms of US youth mortality rates, Minnesota ranks 48th³⁴), inferences to population groups outside of Minnesota need to be made cautiously. Nevertheless, to the best of our knowledge, this is one of the largest studies on adolescent health-compromising behaviors reported in the literature. Furthermore, although a number of studies have examined correlations of health behaviors among different ethnic groups, we are unaware of any studies that have compared five ethnic groups with regard to such a wide range of health-compromising behaviors using the same question items and methodologies.

The behaviors assessed in the present study have been shown to play a major contributory role in morbidity and mortality rates among adolescents,^{40,41} and their high prevalence indicates that programs aimed at prevention and reduction are

The strongest associations were consistently found between delinquency and substance abuse, while in most ethnic groups substance abuse and delinquency were associated with suicide risk. Osgood reached the conclusion that the existing literature does not suggest genuine differ-

ences between ethnic groups in the strengths of covariations among these problematic behaviors.⁸ Our findings, involving a wider range of ethnic groups than is generally found in the literature, affirm this conclusion. However, for other behaviors, such as sexual activity and

necessary. The results suggest that prevention programs should be implemented prior to middle adolescence in order to reach adolescents before they begin engaging in high-risk behaviors. Gender differences in patterns of health behaviors need to be addressed and taken into account in the development and implementation of prevention programs. The results clearly indicate that certain ethnic groups, particularly American Indians, are at increased risk for involvement in high-risk behaviors, and whether or not this is a result of lower socioeconomic status rather than ethnicity per se, these groups should be targeted for immediate prevention efforts. The presence of one high-risk behavior should alert health care providers or educators to the importance of comprehensive screening and counseling, because other seemingly unrelated behaviors may also be present. Finally, because differences may exist between adolescents from different ethnic backgrounds regarding their perceptions of certain behaviors (e.g., sexual activity), interventions need to be culturally sensitive in addressing these behaviors. In addition to further research on covariations of health behaviors, research should explore perceptions and predictors of health-compromising behaviors among adolescents from different gender, age, ethnic, and socioeconomic status groups; such studies would provide important information for the design of primary and secondary prevention programs. □

Acknowledgment

We would like to acknowledge members of the Minnesota Department of Education's Prevention and Risk Reduction Unit for all of their work in survey development and implementation and in preparation of the data for analysis.

References

- Donovan J, Jessor R. Structure of problem behavior in adolescence and young adulthood. *J Consult Clin Psychol.* 1985;53:890-904.
- Donovan J, Jessor R, Costa F. Syndrome of problem behavior in adolescence: a replication. *J Consult Clin Psychol.* 1988;56:762-765.
- Elliot DS. Health-enhancing and health-compromising lifestyles. In: Millstein SG, Petersen AC, Nightingale EO, eds. *Promoting the Health of Adolescents: New Directions for the Twenty-First Century.* New York, NY: Oxford University Press Inc; 1993:119-145.
- Ensminger ME. Sexual activity and problem behaviors among black, urban adolescents. *Child Dev.* 1990;61:2032-2046.
- Graves KL, Leigh BC. The relationship of substance abuse to sexual activity among young adults in the United States. *Fam Plann Perspect.* 1995;27:18-22, 33.
- Yamaguchi K, Kandel D. Drug use and other determinants of premarital pregnancy and its outcome: a dynamic analysis of competing life events. *J Marriage Fam.* 1987;49:257-270.
- Leigh BC, Stall R. Substance abuse and risky sexual behavior for exposure to HIV. *Am Psychol.* 1993;48:1035-1045.
- Osgood DW. *Covariation among Adolescent Health Problems.* Washington, DC: US Government Printing Office; 1991.
- Osgood DW, Johnston L, O'Malley P, Bachman J. The generality of deviance in late adolescence and early adulthood. *Am Sociol Rev.* 1988;53:81-93.
- Zabin SL. The association between smoking and sexual behavior among teens in US contraceptive clinics. *Am J Public Health.* 1984;74:261-263.
- Ensminger ME. Adolescent sexual behavior as it relates to other transition behaviors in youth. In: Hofferth SL, Hayes CD, eds. *Risking the Future: Adolescent Sexuality, Pregnancy, and Childbearing.* Washington, DC: National Academy Press; 1987;2:36-55.
- Resnick MD, Harris LJ, Blum RW. The impact of caring and connectedness on adolescent health and well-being. *J Paediatr Child Health.* 1993;29:S3-S9.
- Weiss SR, Ebert MH. Psychological and behavioral characteristics of normal-weight bulimics and normal-weight controls. *Psychosom Med.* 1983;45:293-303.
- French SA, Perry CL, Leon GR, Fulkerson JA. Weight concerns, dieting behavior, and smoking initiation among adolescents: a prospective study. *Am J Public Health.* 1994;84:1818-1820.
- Killen JD, Barr Taylor C, Telch MJ, Robinson TN, Maron DJ, Saylor KE. Depressive symptoms and substance abuse among adolescent binge eaters and purgers: a defined population study. *Am J Public Health.* 1987;77:1539-1541.
- French SA, Story M, Downes B, Resnick MD, Blum RW. Frequent dieting in adolescents: psychosocial and health behavior correlates. *Am J Public Health.* 1995;85:695-701.
- Deykin EY, Buka SL. Suicidal ideation and attempts among chemically dependent adolescents. *Am J Public Health.* 1994;84:634-639.
- Garrison CZ, McKeown RE, Valois RF, Vincent ML. Aggression, substance use, and suicidal behaviors in high school students. *Am J Public Health.* 1993;83:179-184.
- Swanson JW, Linskey AO, Quintero-Salinas M, Pumariaga AJ, Holzer CE. A binational school survey of depressive symptoms, drug use, and suicidal ideation. *J Am Acad Child Adolesc Psychiatry.* 1992;31:669-678.
- Adolescent Health. Volume II. Background and the Effectiveness of Selected Prevention and Treatment Services.* Washington, DC: Congress of the United States, Office of Technology Assessment; 1991.
- Gritz ER, Crane LA. Use of diet pills and amphetamines to lose weight among smoking and nonsmoking high school seniors. *Health Psychol.* 1991;10:330-335.
- Stanton B, Romer D, Ricardo I, Black M, Feigelman S, Galbraith J. Early initiation of sex and its lack of association with risk behaviors among adolescent African Americans. *Pediatrics.* 1993;92:13-19.
- Vega WA, Zimmerman RS, Warheit GJ, Apospori E, Gil AG. Risk factors for early adolescent drug use in four ethnic and racial groups. *Am J Public Health.* 1993;83:185-189.
- Bachman JG, Wallace JM, O'Malley PM, Johnston LD, Kurth CL, Neighbors HW. Racial/ethnic differences in smoking, drinking, and illicit drug use among American high school seniors, 1976-89. *Am J Public Health.* 1991;81:372-377.
- Watts W, Wright LS. The relationship of alcohol, tobacco, marijuana, and other illegal drug use to delinquency among Mexican-American, Black, and White adolescent males. *Adolescence.* 1990;25:171-181.
- Cooper ML, Peirce RS, Farmer Huselid R. Substance use and sexual risk taking among black and white adolescents. *Health Psychol.* 1994;13:251-262.
- Harrison PA, Luxenberg MG. Comparisons of alcohol and other drug problems among Minnesota adolescents in 1989 and 1992. *Arch Pediatr Adolesc Med.* 1995;149:137-144.
- Minnesota Student Survey: Reflections of Social Change.* St. Paul, Minn: Prevention and Risk Reduction Unit, Minnesota Department of Education; 1992.
- Saunders S, Resnick MD, Hoberman H, Blum RW. Formal help-seeking behavior of adolescents identifying themselves as having mental health problems. *J Am Acad Child Adolesc Psychiatry.* 1994;33:718-728.
- Johnston LD, Bachman JG, O'Malley PM. *Monitoring the Future: Questionnaire Responses from the Nation's High School Seniors, 1985.* Ann Arbor, Mich: Survey Research Center, Institute for Social Research; 1986.
- Kann L, Warren CW, Harris WA, et al. Youth risk behavior surveillance—United States, 1993. *MMWR Morb Mortal Wkly Rep.* 1995;44:1995.
- Blum RW, Resnick MD, Geer L, et al. The Minnesota Adolescent Survey: implications for physicians. *Minn Med.* 1988;71:143-145, 149.
- The National Adolescent Student Health Survey: A Report on the Health of America's Youth.* Oakland, Calif: Third Party Publishing Co; 1989.
- Mortality Trends, Causes of Death, and Related Risk Behaviors among U.S. Adolescents.* Atlanta, Ga: Centers for Disease Control and Prevention; 1993. CDC publication 099-4112.
- Botvin GJ, Botvin EM. Adolescent tobacco, alcohol, and drug abuse: prevention strategies, empirical findings, and assessment issues. *Developmental Behav Pediatr.* 1992;13:290-301.
- Blum RW, Harmon B, Harris L, Bergeisen L, Resnick MD. American Indian-Alaska Native youth health. *JAMA.* 1992;267:1637-1644.
- Story M, Hauck FR, Broussard BA, White LL, Resnick MD, Blum RW. Weight perceptions and weight control practices in American Indian and Alaska Native adoles-

- cents. *Arch Pediatr Adolesc Med.* 1994;148:567-571.
38. O'Malley PM, Bachman JG, Johnston LD. Reliability and consistency in self-reports of drug use. *Int J Addict.* 1983;18:805-824.
39. Winters KC, Stinchfield RD, Henly GA, Schwartz RH. Validity of adolescent self-report of alcohol and other drug involvement. *Int J Addict.* 1990-1991;25:1379-1395.
40. Blum RW. Global trends in adolescent health. *JAMA.* 1991;265:2711-2719.
41. Millstein SG. Adolescent health: challenges for behavioral scientists. *Am Psychol.* 1989;44:837-842.

APHA Publications Board Invites Proposals for Book Projects

APHA's Publications Board invites APHA members to submit proposals for publication as books. The Board is looking for manuscripts that speak to public health topics, especially to those not previously or not adequately addressed. We need your most innovative work, your dedication, and your enthusiasm to create the best possible public health book program that APHA can offer.

If you are interested in making a submission or if you have a topic in mind, feel free to discuss it with the Chair of the Publications Board, Dr Bertina Wentworth, or with the APHA Director of Publications Services, Sabine J. Beisler. To reach either or to receive guidelines on making a formal submission, call the Association Office at (202) 789-5693; fax (202) 789-5661.

Please send preliminary inquiries or formal proposals to Sabine J. Beisler, Director of Publications Services, American Public Health Association, 1015 15th St, NW, Washington, DC 20005.

Please note that all inquiries about publication in the *American Journal of Public Health* must be sent to the Editor of the Journal, Dr Mervyn Susser, at the APHA Washington, DC, address given above.