Aggression, Substance Use, and Suicidal Behaviors in High School Students

ABSTRACT

Objectives. We sought to analyze the frequency and correlates of suicidal behaviors in a community sample of adolescents.

Methods. Information concerning suicidal thoughts and acts, aggressive behaviors, substance use and physical recklessness were collected with the 70-item self-report Youth Risk Behavior Survey from a statewide sample of 3764 South Carolina public high school students.

Results. Seventy-five percent of students reported no suicidal behaviors, 11% reported serious suicidal thoughts, 6.4% reported specific suicidal plans, 5.9% reported attempts not requiring medical care, and 1.6% reported attempts requiring medical care. All types of suicidal behaviors occurred more frequently in females than males. Odds ratios for aggressive behaviors and cigarette use were elevated across all categories of suicide behaviors, increasing in magnitude with severity of reported suicidal behavior. Substance use was associated with some but not all categories of suicidal behaviors. The relationships were most pronounced with the use of potentially more dangerous drugs.

Conclusions. The results suggest that suicidal behaviors are not infrequent occurrences among adolescents and that they often coexist with other high-risk behaviors. Interventions designed to reduce suicidal behaviors should simultaneously address coexisting high-risk behaviors. (*Am J Public Health.* 1993;83:179–184)

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Introduction

Although the rate of suicidal behavior among adolescents has increased dramatically over the last three decades, little is known about the prevalence and correlates of these behaviors in nonclinical samples of young people.[1] Instead, current information relies heavily on data obtained from one of the following sources: (1) clinical psychiatric populations, (2) psychological autopsies, (3) mortality statistics, (4) attempted suicides reaching medical attention, and (5) large-scale surveys, which have often failed to differentiate among specific categories of suicidal behaviors (i.e., thoughts, plans, attempts not requiring medical care, and attempts requiring medical care).[1,2]

Frequency estimates of all categories of suicidal behaviors in community samples of adolescents have varied from a low of 2% to a high of 63%.[3–11] Findings from these studies are consistent with the premise that completed suicides occur more frequently among male adolescents, but lack consistency regarding the relative frequency of suicidal thoughts and attempts among adolescent males as opposed to adolescent females. Although a number of different correlates or predictors of suicidal thoughts, plans, and attempts have been addressed in the literature, two factors—aggressive/impulsive behavior and drug and alcohol use—have received considerable attention.[12–19]

Investigations focusing on the relationship between aggression and suicide have indicated that there may be a stronger association between the two behaviors than has previously been appreciated.[12] Shaffer[20] suggested that there may be two different clusters of suicidal individuals, the first characterized by aggressive and violent outbursts and the second characterized by depression or withdrawal. High incidences of suicidal behavior have been described in samples of juveniles selected because of their history of violent or aggressive behaviors.[21–23] Other researchers have reported that up to two thirds of suicide attempts among adolescents are impulsive in that they occur with little premeditation and are preceded only by a short period of planning.[24] Clark et al.[13] suggested that a small but identifiable group of adolescents place themselves in physically dangerous situations more often than do other adolescents, but Clark et al. noted that the association between reckless behavior and the continuum of suicidal behavior is far from clear.

The widespread use of alcohol and other illicit drugs among adolescents has been identified as an influential factor contributing to observed increases in the rate of adolescent suicide.[15–18] Kandel[25] and Levy and Deykin[26] reported that the relationship between substance use and actual attempts is much stronger than the relationship between substance use and ideation. Hirschfeld and Davidson[27] suggested that intoxicating substances may increase impulsivity and decrease inhibi-

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tions, thus predisposing substance users to suicide attempts. Crumley[15] suggested that more research is needed to determine the nature and degree of the association. At question is whether the relationship is causal, connected but correlated with other risk factors, or secondary.

Accordingly, our purpose was to estimate the prevalence of suicidal thoughts, plans, attempts requiring no medical care, and attempts requiring medical care in a statewide community-based sample of high school students. We compared rates of these various types of suicidal behaviors in males and females and explored the relationships between suicidal behaviors and aggressive behaviors; cigarette, alcohol, and illicit drug use; and physical recklessness (i.e., other risk-taking behaviors).

Methods

Sample

The South Carolina Youth Risk Behavior Survey was a statewide survey of 9th through 12th grade public school students conducted in April and May of 1990. All South Carolina public schools that included 9th grade or above were eligible for selection, with the exception of special education schools. The initial sampling frame included 219 schools stratified into three levels on the basis of enrollment: large (1285 to 2577), medium (887 to 1278), and small (74 to 874). Within each level, schools were selected on a systematic basis with probabilities proportional to enrollment size. A total of 100 schools in 58 school districts were selected for participation. Thirty-seven of the 58 districts contacted, representing 57 actual schools, agreed to participate. The distribution of schools across the three strata included 17 large schools, 22 medium-sized schools, and 18 small schools.

To maximize student eligibility and to include students who left school in mid-afternoon, data collection was conducted during the second period. Self-weighting random-number work sheets generated by PCSAMPLE[27] were used to choose classes for participation from the roster of eligible classes.

The study protocol required that all schools notify parents at least 5 days in advance of the data collection. Parents were asked to return a form only if they declined to have their children participate. Fifty-four students (2% of senior high students) waived participation in the study.

Instrumentation

Data were collected via the 70-item self-report Youth Risk Behavior Survey developed and piloted by the Centers for Disease Control. The questionnaire focused on high-risk and health-promoting behaviors relevant to high school students, including suicidal thoughts and acts during the previous 12 months; aggressive behaviors (carrying weapons and fighting); cigarette, alcohol, and illicit drug use; lack of exercise; and physical recklessness (i.e., other risk-taking behaviors).

The information on suicidal behaviors was collected via four questions: (1) During the past 12 months have you ever seriously thought about attempting suicide? (2) During the past 12 months did you make a specific plan about how you would attempt suicide? (3) During the past 12 months how many times did you actually make a suicide attempt? (4) If you attempted suicide during the past 12 months, did that attempt result in an injury or poisoning that had to be treated by a doctor or a nurse?

This information permitted the placement of subjects in one of five mutually exclusive groups: 0—no serious suicidal thoughts or acts, 1—serious thoughts about suicide, 2—specific plan for attempting suicide, 3—suicide attempt not requiring medical attention, and 4—suicide attempt requiring medical attention. A hierarchical assignment strategy was used whereby subjects were placed in the most serious (highest) category of behavior reported.

Composite scores were developed for the potential risk variables. All composite scores had a possible range of 0 to 4. The composite aggression score included questions related to fighting and carrying weapons. The composite physical recklessness score included drinking and driving/riding, seat belt and motorcycle helmet use, and swimming without a lifeguard. The composite alcohol use score covered habitual and binge drinking. The composite illegal drug use score encompassed habitual and recent use of illegal drugs. The composite cigarette use score addressed frequency of smoking and number of cigarettes smoked per day. The composite lack-of-exercise score addressed the frequency of engaging in regular hard and light exercise. Post hoc factor analyses of these data support the construction of the composite scores.

Statistical Analysis

PROC CATMOD in the SAS statistical software[28] was used to perform a series of polychotomous logistic regression analyses to explore the relation of the demographic and potential risk variables to the four categories of suicidal behavior (thoughts, plans, attempts requiring no medical care, and attempts requiring medical care). Students reporting no suicidal behaviors constituted the referent group in all analyses. Simple models that adjusted for race and gender and considered the effect of each potential risk variable separately were constructed first. Variables found to be significant in these simple models were entered into more comprehensive models that simultaneously considered the effects of all the independent variables entered on the four categories of suicidal behavior. After a backward elimination procedure was applied, the final model included race, gender, and all variables retaining overall significance at the .05 level.

TABLE 1—Demographic Characteristics of the 3764 High School Students Participating in the South Carolina Youth Risk Behavior Survey, 1990

	No.	%
Race and gender		
White males	1093	29
White females	1250	33
Black males	609	16
Black females	812	22
Grade		
9th	979	26
10th	1076	29
11th	852	23
12th	857	23
Age, y		
≤14	469	12
15	942	25
16	968	26
17	848	23
≥18	534	14

Results

The school participation response rate was 57%. A total of 43 schools declined to participate for a variety of reasons, mostly logistical. Compared with school districts that did not participate, participating school districts included more Black students (49% vs 30%) and more students who were eligible for a free lunch (46% vs 30%). The student response rate within participating schools was 84% and took into account absentee students, those who waived participation, and those

TABLE 2—Percentages of Self-Reported Suicidal Behaviors in 3764 South Carolina High School Students, by Race and Gender, 1990

Suicidal Behavior	White Males (n = 1093)	White Females (n = 1250)	Black Males (n = 609)	Black Females (n = 812)
None	80.97 (78.64, 83.30)	66.24 (63.62, 68.86)	85.39 (82.58, 88.20)	73.15 (70.10, 76.20)
Serious thoughts	7.41 (5.86, 8.96)	14.56 (12.60, 16.52)	8.37 (6.17, 10.57)	12.07 (9.83, 14.31)
Specific plans	5.86 (4.47, 7.25)	8.80 (7.23, 10.37)	3.12 (1.74, 4.50)	6.03 (4.39, 7.67)
Attempts	4.57 (3.33, 5.81)	8.48 (6.94, 10.02)	2.30 (1.11, 3.49)	6.40 (4.72, 8.08)
Attempts requiring medical treatment	1.19 (0.55, 1.83)	1.92 (1.16, 2.68)	0.82 (0.10, 1.54)	2.34 (1.30, 3.38)

Note. Numbers in parentheses are 95% confidence intervals.

whose response forms were not scannable. The data reported here are based on the responses of 3764 9th (26%), 10th (29%), 11th (23%), and 12th (23%) grade students with no missing or inconsistent responses on the variables of interest. Similar percentages of Blacks (15%) and Whites (14%) and of males (16%) and females (13%) were excluded because of inconsistent or missing responses.

Slightly more female (55%) than male (45%) students participated. Sixty-two percent of the students described themselves as White and 38% as Black (Table 1). An additional 185 students who were Native American (37), Hispanic (45), Asian (50), or of other ethnic origin (53) completed the questionnaire. Because of the relatively small number of individuals in each of these groups, these students were excluded from all analyses.

Seventy-five percent of the students reported no suicidal behaviors during the preceding 12 months. Approximately 11% reported having serious suicidal thoughts, 6.4% reported making a specific plan about how they would attempt suicide, 5.9% reported making an attempt not requiring medical care, and 1.6% reported suicide attempts that required medical treatment. Each of these types of suicidal behaviors was reported one and a half to two times more frequently by females than by males (Table 2). Although suicide attempts were reported more frequently by Whites than by Blacks, Black females reported the highest frequency (2.3%) of attempts requiring medical treatment.

Fifty (18%) of the 283 students who had made suicide attempts reported impulsive attempts (i.e., attempts with no reported plans for suicide in the preceding 12 months). The frequency of impulsive suicide attempts was similar among Black males (n = 3, 16%) and females (n = 12, 17%). A somewhat larger difference was observed between White males (n = 9, 14%) and females (n = 26, 20%). Nine (18%) of the 50 students who had made impulsive attempts required medical care, vs 52 (22%) of the 233 who had made nonimpulsive attempts.

TABLE 3—Mean Scores[a] for Potential Correlates of Suicidal Behaviors among 3764 South Carolina High School Students, 1990

	White Males (n = 1093)	White Females (n = 1250)	Black Males (n = 609)	Black Females (n = 812)
Aggressive behaviors	0.64 (0.96)	0.11 (0.38)	0.51 (0.84)	0.17 (0.49)
Alcohol use	1.14 (1.23)	0.78 (0.97)	0.61 (1.01)	0.38 (0.78)
Illicit drug use	0.31 (0.65)	0.17 (0.42)	0.13 (0.35)	0.08 (0.27)
Cigarette use	0.68 (1.09)	0.59 (0.94)	0.18 (0.47)	0.12 (0.30)
Physical recklessness	1.38 (0.94)	1.00 (0.73)	0.76 (0.64)	0.44 (0.45)
Lack of exercise	1.78 (1.30)	2.36 (1.16)	2.16 (1.21)	2.77 (1.09)

Note. Numbers in parentheses are standard deviations.
[a]Possible range for all scores is 0 to 4; higher scores indicate greater risk or amount of substance use.

Overall, 51% of the students reported alcohol use in the previous 30 days, 31% reported at least one episode of binge drinking, 10% reported marijuana use, 2% reported cocaine use, 11% reported ever using other illegal drugs, and 7% reported ever using intravenous drugs. Thirty percent reported current cigarette smoking. Twenty-two percent reported carrying a weapon in the previous 30 days and 7% reported involvement in a fight resulting in an injury requiring medical treatment during the same time span.

Mean aggression, alcohol, drug, cigarette, and reckless behavior scores were higher for males than for females and higher for Whites than for Blacks. Lack-of-exercise scores were higher for females and Blacks (Table 3).

In multivariate models, female gender was the most consistent predictor of all types of suicidal behaviors; the odds ratios (ORs) increased from 2.43 for serious suicidal thoughts to 8.29 for attempts requiring medical care. The odds ratios for aggressive behaviors and cigarette use were elevated across all categories of suicidal behaviors (though not significantly so for thoughts) and increased in magnitude with the severity of the suicidal behavior reported. Lack of exercise and reckless behaviors were not significantly associated with suicidal behaviors. The patterns of association were less clear for the remaining variables. Blacks were less likely to report plans (OR = 0.71) but more likely to report attempts requiring medical attention (OR = 2.34). Significant differences by race were not observed for thoughts or attempts not requiring medical attention. Alcohol use was significantly associated with plans (OR = 1.22) and attempts not requiring medical attention (1.31), but not with thoughts or attempts requiring medical care. Illicit drug use was significantly associated with thoughts (OR = 1.34), attempts without medical care (OR = 1.73) and attempts with medical care (OR = 2.88), but not with plans (Table 4).

Results from the individual alcohol and illicit drug use items somewhat clarify the inconsistencies observed when the composite scores are considered (Table 5). Significantly elevated odds ratios were observed for all variables and across all categories of suicidal behavior except for marijuana use with suicidal thoughts and cocaine use with suicidal thoughts and plans. The magnitude

TABLE 4—Odds Ratios of Suicide Behaviors with Sociodemographic and Other Risk Behaviors in 3764 South Carolina High School Students, 1990

	Type of Suicidal Behavior			
	Thoughts (n = 412)	Plans (n = 242)	Attempts (n = 222)	Attempts Requiring Medical Care (n = 61)
Race (White)	0.91 (0.72, 1.14)	0.71 (0.52, 0.96)	0.88 (0.63, 1.22)	2.34 (1.22, 4.49)
Gender (male)	2.43 (1.91, 3.09)	2.78 (2.03, 3.80)	4.98 (3.45, 7.19)	8.29 (3.99, 17.23)
Aggressive behaviors	1.18 (1.00, 1.41)	1.44 (1.19, 1.74)	1.66 (1.37, 2.01)	1.92 (1.39, 2.65)
Alcohol use	1.05 (0.92, 1.19)	1.22 (1.05, 1.42)	1.31 (1.12, 1.52)	1.17 (0.88, 1.56)
Illicit drug use	1.34 (1.03, 1.74)	1.17 (0.86, 1.58)	1.73 (1.32, 2.26)	2.88 (1.94, 4.29)
Cigarette use	1.06 (0.92, 1.24)	1.20 (1.02, 1.41)	1.23 (1.05, 1.45)	1.66 (1.25, 2.20)

Note. Numbers in parentheses are 95% confidence intervals. Odds ratios were calculated from a polychotomous logistic regression. The comparison group includes 2827 students who reported no suicidal behaviors. Categories of suicidal behaviors are mutually exclusive; subjects are assigned to the most severe category of behavior reported. Odds ratios for variables other than race and gender reflect a one-unit change in the independent variable.

TABLE 5—Odds Ratios of Suicide Behaviors with Specific Alcohol and Illicit Drug Use Variables in 3764 South Carolina High School Students, 1990

	Type of Suicidal Behavior			
	Thoughts (n = 412)	Plans (n = 242)	Attempts (n = 222)	Attempts Requiring Medical Care (n = 61)
Drinking frequency	1.16 (1.05, 1.27)	1.43 (1.28, 1.60)	1.74 (1.56, 1.95)	2.10 (1.73, 2.57)
Binge drinking	1.14 (1.02, 1.27)	1.37 (1.22, 1.53)	1.64 (1.46, 1.83)	2.09 (1.74, 2.51)
Marijuana use	1.13 (0.96, 1.32)	1.26 (1.06, 1.49)	1.60 (1.39, 1.85)	2.35 (1.93, 2.87)
Cocaine use	0.68 (0.30, 1.50)	0.35 (0.06, 2.08)	2.11 (1.58, 2.81)	3.63 (2.67, 4.94)
Other drugs	1.26 (1.10, 1.45)	1.29 (1.10, 1.51)	1.86 (1.63, 2.11)	2.54 (2.08, 3.09)
Intravenous drugs	1.88 (1.28, 2.78)	2.56 (1.65, 3.98)	3.10 (2.00, 4.80)	6.91 (3.72, 12.84)

Note. Numbers in parentheses are 95% confidence intervals. Odds ratios were calculated from a simple polychotomous logistic regression. Each model includes race and gender. The comparison group includes 2827 students who reported no suicidal behaviors. Categories of suicidal behaviors are mutually exclusive; subjects are assigned to the most severe category of behavior reported. Odds ratios reflect a one-unit change in the independent variable.

of the odds ratios increased with the severity of the suicidal behavior reported. The largest effects were seen for attempts requiring medical care and intravenous drug use (OR = 6.91), cocaine use (OR = 3.63), other drug use (e.g., lysergic acid diethylamide [LSD], phencyclidine [PCP], 4 methylenedioxymethamphetamine [MDMA], ecstasy mushrooms, speed, heroin) (OR = 2.54), marijuana use (OR = 2.35), and frequency of alcohol intake (OR = 2.10).

Discussion

South Carolina is a predominantly rural state with a large minority population, mostly Black. The population demographics are reflected in this study sample, especially given the nonparticipation of some school districts with lower non-White student enrollments. Although the number of White student participants was more than adequate for estimates by race and gender, the overall analysis may be limited in its applicability to populations that are more urban or more affluent or that have rather different ethnic constituencies. Furthermore, although the overall participation in the study was adequate, differential response could lead to selection bias and distorted results.

Results indicating that three quarters of a school-based sample of high school students report no suicidal behaviors in the past 12 months parallel earlier findings with a younger middle school population in the same state.[29] However, rates of self-reported attempts in this high school population were considerably higher than the rates of interview-reported attempts in the community-based middle school sample (7.5% vs 1.7%). The age differential in reported attempts may reflect a true increase or a difference in the method of data collection (self-report questionnaire vs psychiatric interview), the manner in which the questions were phrased, or both. The Youth Risk Behavior Survey does not differentiate the seriousness of attempts beyond the ascertainment of those requiring medical treatment, whereas the previous interview-based study reported only serious attempts (i.e., those characterized by a definite intent of death).

It is interesting that the rate of attempts requiring medical care in the present study (1.6%) was nearly identical to the rate of all serious attempts reported in the middle school sample (1.7%). It may be that a high proportion of serious attempts require medical care. Conversely, in an older population with a higher rate of attempts, the proportion requiring medical care could easily approach the level of all serious attempts in a younger population with a lower prevalence.

All types of suicidal behaviors occurred more frequently in females than in males. Male–female differences increased with the increasing severity of the suicidal behavior reported. The difference in rates by gender is consistent with findings in adults[30] and a recent community-based study of children and adolescents,[8] but

contradicts (with regard to attempts only) previous findings with middle school students in South Carolina.[29]

The majority of the reported attempts (82%) were made by individuals who also reported making a specific plan about how they would attempt suicide. Brown et al.[24] suggested that those who make premeditated attempts have stronger suicidal intent. Thus, premeditation may define those at highest risk for eventual completion. If so, it is significant that another 6.4% of the sample reported having made a specific plan for a suicide attempt in the preceding 12 months. It should be noted, however, that the percentage of subjects receiving medical care after an attempt (a potential measure of the lethality of the attempt) was very similar (about 20%) in both the impulsive and nonimpulsive suicide attempt groups. Unfortunately, the degree of injury associated with attempts not receiving medical care and the severity of intent associated with all categories of attempts is not known. It should also be noted that given the wording of the suicide questions, it is not possible to ascertain whether the reported plans preceded or followed the reported attempts.

Aggressive behavior was associated with all four types of suicidal behavior even when alcohol and illicit drug use were controlled for. The associations were robust, not limited by race or gender. Cairns et al.[12] suggested that both suicidal behavior and aggression are manifestations of poor impulse control. The relatively low number of impulsive suicide attempts in our sample suggests that this may not be the case, but rather that aggressive juveniles may be more likely to act out impulses when depressed, frustrated, or scared. Because the present study lacks data on depression the latter hypothesis cannot be tested, nor can the importance of depression vs impulsivity and/or antisocial behavior be addressed. In the present study lack of exercise was not a significant correlate of any type of suicidal behavior. Other studies have suggested that regular exercise can reduce hostility and aggression,[31] elevate mood,[32] increase self-esteem,[33] and reduce emotional strain.[34]

It is interesting that other types of risk-taking behaviors (i.e., physical recklessness) were not associated with any category of suicidal behaviors, even in univariate models. Although these other risk-taking behaviors may represent unconscious suicidal behaviors, the lack of an observed association fails to support the so-called continuum of self-destructive behaviors and underscores the caution that clinicians and researchers should not automatically equate reckless behavior and unconscious suicidal tendencies.[13]

The relationships between alcohol and illicit drug use and suicidal behaviors were consistent in simple models. Elevated odds ratios were observed across all categories of suicidal behaviors and the magnitude of the odds ratios increased with the severity of the suicidal behavior reported. The relationships were most pronounced with the reported use of the potentially more dangerous or "harder" drugs, but remained even when the substance of interest was nicotine. The observed relationships were less consistent once the effects of aggressive behaviors were taken into account. It may be that aggressive behaviors are an intervening variable. Alternately, some have suggested that adverse health behaviors tend to co-occur (e.g., drug use is higher among delinquents). Given the cross-sectional nature of the data collection, conclusions regarding temporal relations among the variables under investigation are not possible. The findings of Fowler and colleagues[18] indicate that suicidal behaviors may be a late manifestation of substance abuse. Thus, in a group of young individuals insufficient time may have elapsed for the full effect of substance use to have occurred. Brent et al.[17] suggested that the association between one measure of substance use (blood alcohol) and suicide completion is stronger than the association observed when attempts are the outcome of interest. Thus, our results may be somewhat attenuated because we have not considered completed suicides.

The disturbing prevalence of suicidal behavior and its coexistence with other high-risk behaviors in high school students have implications for school and medical personnel and public health practitioners. First, ascertainment of any one of these high-risk behaviors suggests the need for careful assessment for other adverse behaviors. Second, successful suicide prevention efforts might most appropriately target a broader array of adverse outcomes. Such an approach could increase both the cost efficiency and outcome efficacy of the programs and services delivered.[35] □

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Planning Themes for the Journal: A Call for Papers

This annotation introduces a small experiment, an innovation for the Journal. For a number of the issues in each volume, our intention is to plan and announce ahead their themes (the featured topic of each issue). For this purpose, we invite potential authors among our readership to submit papers relevant to the chosen topic by a date far enough ahead to permit review and preparation (see below for topics and dates; for guidelines and submission address, see "What *AJPH* Authors Should Know" in each issue). In recent volumes, Journal editors have managed with growing frequency to assemble themes out of the material on hand. Readers' response has been positive.

Theme issues that have been announced in advance will certainly be more coherent if they attract the number of authors we hope for. They will also enable us to indicate the Journal's interest in neglected areas that authors may not see as high on our agenda. (In general, we suspect that authors tend to submit topics that they recognize are already the domain of a journal. The result is a self-perpetuating cycle difficult to break.)

We begin the trial by announcing three themes. The first two deadlines will have a 4-month interval. The third deadline is still to be decided. Until we get a sense of the flow of manuscripts and of the review process entailed, we shall not attempt to set exact publication dates for the theme issues, but we do expect them to be expedited to some degree. With too exiguous a flow, the featured theme may not be realizable. With too full a flow, some papers submitted and publishable may not fit into the single issue and may be deferred. The first three themes and the deadlines for submission are as follows:

Children: Societal and Individual Violence, Injury, and Abuse
Submissions due April 1, 1993

Age and Aging: Epidemiology, Health Care, and General Public Health
Submissions due August 1, 1993

Primary Care and Public Health
Submission date to be announced