

Changes in HIV-Related Information Sources, Instruction, Knowledge, and Behaviors among US High School Students, 1989 and 1990

ABSTRACT

Objectives. Few data have been available among adolescents to determine behavioral changes that may prevent human immunodeficiency virus (HIV) infection. This analysis examines changes in the prevalence of self-reported HIV-related information sources, instruction, knowledge, and behaviors among high school students in the United States.

Methods. Two independent, multistage national probability samples of students in grades 9 through 12 were surveyed in 1989 ($n = 8098$) and 1990 ($n = 11\,631$) with self-administered, anonymous questionnaires that included similar items.

Results. Compared with students surveyed in 1989, a significantly greater proportion of students surveyed in 1990 had received HIV instruction in school. Significant decreases were found in the proportion of White and female students who reported having had sexual intercourse, in the proportion of White students reporting two or more lifetime sex partners, and in the proportion of 15- and 16-year-olds, White students, and female students who reported having had four or more lifetime sex partners. For both years, students who had a greater level of HIV knowledge were less likely to have had multiple lifetime sex partners or to have injected illicit drugs.

Conclusions. The findings suggest that school-based HIV education and knowledge may be contributing factors in reducing certain risk behaviors that can lead to HIV transmission among secondary school youth. (*Am J Public Health*. 1994;84:388-393)

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Introduction

Since the latter half of the 1980s, schools throughout the United States have been offering education programs to teach adolescents about human immunodeficiency virus (HIV) infection. However, the effect of such programs on HIV-related knowledge and behaviors among adolescents is largely unknown. Several recent studies have investigated the extent to which adolescents in the United States engage in behaviors that place them at risk for HIV infection.¹⁻⁵ Although a few studies have tried to assess changes in these behaviors over time, their findings have been limited.⁶⁻⁸

To begin to evaluate the effect of national public health information and education efforts on HIV-related behaviors of US adolescents, we compared data from two national probability samples of students in grades 9 through 12. In 1989, the Centers for Disease Control (CDC) conducted the Secondary School Student Health Risk Survey⁴ to measure the prevalence of HIV-related knowledge, beliefs, and behaviors among US high school students. In 1990, using a similar methodology, CDC's Youth Risk Behavior Survey expanded this effort by measuring priority health-risk behaviors for HIV infection and other major causes of morbidity and mortality.⁹ Eight HIV-related questions were either identical on the two surveys or were similar enough to allow comparisons.

In this analysis we examine the prevalence of HIV-related sources of information, instruction, and knowledge and the prevalence of selected HIV-related sexual and drug use behaviors and assess changes in these rates from 1989 to 1990. We also examine relation-

ships among the variables in 1990 to determine predictors of HIV-related sexual and drug use behavior and compare these findings with those from analyses of the 1989 data.^{3,5} We hypothesized that greater levels of HIV knowledge would be negatively related to the risk behaviors and that the relationships would not change between the two time periods.

Methods

Study Design

By use of self-administered questionnaires, data were obtained from two independent samples of high school students who were surveyed in spring 1989 and spring 1990, respectively. Both were designed as probability samples of all 9th through 12th grade public and private school students in the United States, Puerto Rico, and the Virgin Islands. Schools were randomly selected within primary sampling units (counties or groups of counties), one or two classes per grade were randomly selected within schools, and all students within selected classes were eligible to participate. The sampling frames were stratified by geographic region and metropolitan status and additionally by race/ethnicity in the

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1990 Youth Risk Behavior Survey. Both samples were selected with probability proportional to enrollment size. Schools with substantial numbers of Black and Hispanic students were oversampled to ensure adequate numbers of students in these two groups. Weighting factors were developed to compensate for unequal selection probabilities and to adjust for nonresponse in both surveys.

Additional information about the 1989 Secondary School Student Health Risk Survey sample can be found elsewhere.³⁻⁵ Like the 1989 survey, the 1990 Youth Risk Behavior Survey questionnaire was designed for a seventh-grade reading level and administered in the classroom by professionally trained data collectors. Parents provided consent for students to participate, and student anonymity was protected.

Data Analysis

We used *t* tests to determine significant differences between 1989 and 1990 for selected student responses. Following previous studies of the 1989 Secondary School Student Health Risk Survey,^{3,5} we examined the 1990 Youth Risk Behavior Survey data to determine relationships between two dependent variables (sexual behavior [having had two or more sex partners during a lifetime] and injecting drug use [having ever injected illicit drugs]) and two independent variables (having received HIV instruction [yes/no] and having correct knowledge about HIV [based on responses to two items]). (In establishing models for the 1990 survey data, we made every effort to replicate the two previous analyses of the 1989 survey data. However, in the 1989 analyses, 17 items—instead of 2—were available to measure HIV knowledge. Also the models for the 1989 survey included the interactions between HIV instruction and sex and between instruction and race/ethnicity. We excluded these interaction terms from our models for the 1990 survey because of the relatively high correlations between the terms and their main effects.) We used stepwise multiple logistic regression and controlled for age, sex, and race/ethnicity in each model.

All analyses were conducted on weighted data. We calculated confidence intervals (CIs) and statistical tests by using SESUDAAN procedures,¹⁰ which account for the complex sample design. Results were considered significant if the *P* value for the calculated statistic was less than or equal to .05.

TABLE 1—Percentage of Students Who Received HIV Instruction in School, by Demographic Characteristic

	1989 Secondary School Student Health Risk Survey			1990 Youth Risk Behavior Survey		
	%	95% CI	No. Observations	%	95% CI	No. Observations
Age, y						
<15	57.7	49.6, 65.8	697	74.8	68.1, 81.6*	1534
15-16	57.0	50.9, 63.1	3957	75.2	70.2, 80.2*	5507
>16	49.1	42.3, 56.0	3432	72.4	66.9, 77.9*	4522
Race/ethnicity						
White	54.0	47.5, 60.5	5102	73.8	67.8, 79.7*	6302
Black	54.9	47.2, 62.7	1153	79.2	75.5, 82.9*	2262
Hispanic	51.4	43.1, 59.6	1366	76.1	72.1, 80.2*	2253
Other ^a	51.4	41.5, 61.2	460	61.9	53.4, 70.3	722
Sex						
Female	54.0	48.0, 60.1	4335	75.6	70.9, 80.2*	5928
Male	53.4	47.6, 59.2	3745	72.5	67.2, 77.9*	5632
Total	53.7	48.0, 59.5	8088	74.0	69.1, 79.0*	11 567

Source. The percentages and confidence intervals for the 1989 survey are reproduced with permission from Holtzman et al.⁵

^aIncludes Native Americans, Alaskan Natives, Asian or Pacific Islanders, and persons of other unspecified groups.

**P* ≤ .05.

TABLE 2—Percentage of Students Who Reported Having Had Sexual Intercourse, by Demographic Characteristic

	1989 Secondary School Student Health Risk Survey		1990 Youth Risk Behavior Survey	
	%	95% CI	%	95% CI
Age, y				
<15	33.5	27.4, 39.5	35.0	30.2, 39.9
15-16	52.9	48.9, 56.9	47.7	43.5, 51.9
>16	69.7	66.2, 73.2	68.0	65.0, 70.9
Race/ethnicity				
White	57.9	54.9, 60.9	51.6	48.7, 54.5*
Black	77.1	72.5, 81.6	72.3	68.5, 76.1
Hispanic	51.8	46.9, 56.7	53.4	48.6, 58.1
Other ^a	43.3	35.4, 51.1	43.7	33.9, 53.5
Sex				
Female	53.8	50.5, 57.0	48.0	45.3, 50.7*
Male	63.1	59.5, 66.8	60.8	56.5, 65.1
Total	58.5	55.5, 61.5	54.2	51.2, 57.3

Source. The race and sex percentages and confidence intervals for the 1989 survey are reproduced with permission from Kann et al.⁴⁽³³⁹⁹⁾

^aIncludes Native Americans, Alaskan Natives, Asian or Pacific Islanders, and persons of other unspecified groups.

**P* ≤ .05.

Results

Of 122 schools selected for the 1989 Secondary School Student Health Risk Survey, 99 (81%) participated. Usable

questionnaires were received from 8098 (83%) of the eligible students. Of 168 schools selected for the 1990 Youth Risk Behavior Survey, 124 (74%) participated, and 11 631 (87%) students pro-

TABLE 3—Percentage of Students Who Reported Having Had Sexual Intercourse with Two or More Partners during Their Lifetime, by Demographic Characteristic

	1989 Secondary School Student Health Risk Survey		1990 Youth Risk Behavior Survey	
	%	95% CI	%	95% CI
Age, y				
< 15	21.7	16.1, 27.3	23.0	19.2, 26.7
15–16	34.6	30.3, 38.8	30.8	27.5, 34.2
> 16	50.1	45.9, 54.3	46.9	43.5, 50.4
Race/ethnicity				
White	38.5	35.2, 41.8	32.4	29.7, 35.1*
Black	63.9	58.3, 69.4	59.8	55.8, 63.8
Hispanic	36.0	31.6, 40.4	34.6	29.7, 39.5
Other ^a	28.5	20.8, 36.2	29.2	21.0, 37.5
Sex				
Female	33.4	30.1, 36.7	29.4	26.7, 32.0
Male	46.7	42.7, 50.8	43.6	39.6, 47.5
Total	40.1	36.8, 43.5	36.3	33.4, 39.2

Sources. The race and sex percentages and confidence intervals for the 1989 survey are reproduced from Anderson et al.³ with the permission of the Alan Guttmacher Institute.

^aIncludes Native Americans, Alaskan Natives, Asian or Pacific Islanders, and persons of other unspecified groups.

* $P \leq .05$.

TABLE 4—Percentage of Students Who Reported Having Had Sexual Intercourse with Four or More Partners during Their Lifetime, by Demographic Characteristic

	1989 Secondary School Student Health Risk Survey		1990 Youth Risk Behavior Survey	
	%	95% CI	%	95% CI
Age, y				
< 15	12.7	8.6, 16.8	12.0	9.1, 14.8
15–16	20.0	17.1, 23.0	14.7	12.6, 16.8*
> 16	29.9	26.5, 33.2	26.4	23.4, 29.5
Race/ethnicity				
White	22.0	19.9, 24.2	15.8	13.8, 17.8*
Black	43.6	38.4, 48.8	37.8	33.0, 42.6
Hispanic	20.4	15.7, 25.0	16.5	13.4, 19.6
Other ^a	16.9	10.7, 23.2	16.8	11.3, 22.3
Sex				
Female	16.0	13.5, 18.6	11.8	10.3, 13.3*
Male	31.1	27.9, 34.3	26.7	23.0, 30.4
Total	23.6	21.2, 26.0	19.1	17.2, 21.0*

^aIncludes Native Americans, Alaskan Natives, Asian or Pacific Islanders, and persons of other unspecified groups.

* $P \leq .05$.

vided usable data. Comparisons of selected and participating schools by region, metropolitan status, and race/ethnicity (in the 1989 survey)⁵ and by region and metropolitan status (in the 1990 survey) showed small differences within each category, suggesting minimal nonresponse bias among the samples.

Demographic characteristics of the samples for both years showed that participants were distributed almost evenly by grade and by sex. With two exceptions, the samples also had similar distributions by age group and by race/ethnicity. The 1989 and 1990 samples differed in the weighted proportion of

Black students (9.1% vs 15.2%) and the weighted proportion of students younger than 15 years of age (8.4% vs 13.1%). To determine whether these differences would influence results of the *t*-test analysis, we conducted additional multivariate analyses that took into account the demographic characteristics of the samples (data not shown). Controlling for age, sex, and race/ethnicity, we regressed each HIV-related measure on time. All significant changes observed in the *t*-test analysis were confirmed by the multivariate analysis, indicating that the small differences in the samples did not influence the changes we found in reported instruction, knowledge, or behavior from 1989 to 1990. (In fact, differences from 1989 to 1990 that were not statistically significant in the *t*-test analysis were significant in the multivariate analysis. Thus, the findings reported here from the *t*-test analysis are statistically more conservative.) Furthermore, the weighted percentages of White, Black, and Hispanic students in both surveys were not unlike the racial and ethnic distribution of 9th through 12th grade students in the United States, suggesting that the samples were representative of the general population of students.⁵

Instruction, Knowledge, and Behavior

In both years, students were asked whether they had been taught about the acquired immunodeficiency syndrome (AIDS) and HIV infection in school. The percentage of students receiving HIV instruction significantly increased from 53.7% in 1989 to 74.0% in 1990; these increases were evident for almost every demographic subgroup (Table 1). Moreover, a significantly greater proportion of students in 1990 (68.4%; 95% CI = 65.0, 71.7) than in 1989 (49.0%; 95% CI = 46.5, 51.5) reported that they knew where to get good information about AIDS/HIV infection. However, students were no more likely to talk about AIDS/HIV infection with their parents or other adult family members in 1990 (52.8%; 95% CI = 50.9, 54.8) than they were in 1989 (54.4%; 95% CI = 51.9, 56.8). And although students in 1990 (61.1%; 95% CI = 56.5, 65.6) were significantly more likely than those in 1989 (45.1%; 95% CI = 42.3, 48.0) to know that insects do not transmit the virus, significantly fewer students in 1990 (54.9%; 95% CI = 52.1, 57.7) than in 1989 (64.0%; 95% CI = 61.3, 66.7) reported that they knew the virus could not be transmitted from donating blood.

Essentially no change was observed from 1989 (8.1%; 95% CI = 6.6, 9.6) to 1990 (8.3%; 95% CI = 6.9, 9.7) in the proportion of students who reported that they were younger than age 13 when they first had sexual intercourse. However, in 1990, proportionately fewer students in most subgroups reported that they had had sexual intercourse (Table 2). Notably, these decreases were significant among White students and female students.

Similarly, the proportion of all students who reported having had two or more sex partners during their lifetime was lower in 1990 (36.3%) than in 1989 (40.1%) (Table 3). Although this decline was evident by age group, racial/ethnic group, and sex, with one exception the differences were not statistically significant. Among White students, a significantly smaller proportion reported two or more lifetime sex partners in 1990 than in 1989. For reported sexual intercourse with four or more partners, however, the decrease in prevalence between 1989 and 1990 was significant for all students; within subgroups, the decline was significant for 15- and 16-year-olds, White students, and female students (Table 4).

In 1990, 1.5% (95% CI = 1.0, 1.9) of students reported having ever injected illicit drugs. We were unable, however, to directly compare this estimate with that for 1989. Although the wording of the relevant questions was similar in 1989 and 1990, different criteria were used to define injecting drug use in the 1990 survey.¹¹ Likewise, we were unable to compare condom use from 1989 to 1990; however, for this behavior, the wording of the relevant questions differed. In 1989, students were asked about the frequency of condom use whenever they had sexual intercourse. In 1990, students were asked whether they had used a condom at last sexual intercourse.

Results of the multivariate analysis of the 1990 Youth Risk Behavior Survey data revealed that having lower levels of HIV knowledge, being male, being Black, and being in an older age group were all significantly associated with having had two or more lifetime sex partners (Table 5). A previous study of the 1989 Secondary School Student Health Risk Survey found that these same variables were significantly associated with having had two or more lifetime sex partners.³ Importantly, after we controlled for demographic characteristics, students with lower levels of HIV knowledge

TABLE 5—Logistic Regression Analysis of Factors Predicting Multiple Sex Partners, 1990 Youth Risk Behavior Survey

Factor ^a	<i>b</i>	Standard Error (<i>b</i>)	Odds Ratio	95% CI
HIV knowledge	-0.111*	0.045	0.90	0.82, 0.98
Male	0.632*	0.074	1.88	1.63, 2.18
Age	0.372*	0.029	1.45	1.37, 1.54
Black	1.338*	0.097	3.81	3.15, 4.61
Hispanic	0.182	0.131	1.20	0.93, 1.55

^aReference categories for male and for Black and Hispanic are female and other racial/ethnic group, respectively.

**P* < .05.

TABLE 6—Logistic Regression Analysis of Factors Predicting Ever Injecting Drugs, 1990 Youth Risk Behavior Survey

Factor ^a	<i>b</i>	Standard Error (<i>b</i>)	Odds Ratio	95% CI
HIV instruction	-0.356	0.293	0.70	0.39, 1.24
HIV knowledge	-0.274*	0.129	0.76	0.59, 0.98
Male	1.221*	0.268	3.39	2.01, 5.73
White	-0.530	0.269	0.59	0.35, 1.00
Black	-1.549*	0.439	0.21	0.09, 0.50

^aReference categories for HIV instruction, male, and White and Black are no HIV instruction, female, and other racial/ethnic group.

**P* < .05.

were more likely to report two or more lifetime sex partners.

Our analysis of the 1990 survey data also found that having lower levels of HIV knowledge, being male, and not being Black compared with other race/ethnic groups were all associated with reported lifetime drug injection (Table 6). Again, these results were consistent with those reported for 1989.⁵ Notably, controlling for demographic characteristics, we found that students in 1990 who reported lower levels of HIV knowledge also were more likely to report ever injecting drugs. Lastly, although HIV instruction did not directly affect these behavioral outcomes, when we controlled for age, sex, and race/ethnicity, HIV instruction was positively associated with HIV knowledge in analyses of the 1990 data (similar to our findings for the 1989 data⁵).

Discussion

Programs to educate students about HIV have been implemented in many of the nation's schools.¹² But whether such programs are associated with improve-

ments in HIV knowledge and changes in HIV-related risk behaviors is unclear. Few studies have examined changes over time, and the results are inconsistent. For example, in a study of adolescent decision-making regarding contraceptive use, sexually active adolescents visiting health clinics in San Francisco were surveyed in 1984 and 1985 and again in 1985 and 1986.⁶ Researchers found no substantial increases in condom use among the participants, and large percentages of respondents continued to report multiple sex partners.

Other studies, however, have found differences over time. To compare risk behavior, one study used data from two matched samples—one from the winter of 1986 and the other from the fall of 1987—of unmarried young adults attending a university in California.⁷ Researchers found that students in the later survey not only showed greater worry and concern about all sexually transmitted diseases, including AIDS, but also demonstrated behavioral changes. For example, the proportion of young adults who reported using condoms increased from 46% in 1986 to 62% in 1987.

Respondents surveyed in 1987 also were significantly more likely than those surveyed in 1986 to report delaying sexual involvement, avoiding anal sex, and asking their partners about prior sexual behavior.

Differences also emerged from a Massachusetts study that used data from two independent phone surveys of 16- to 19-year-old adolescents who were selected by statewide random-digit dialing; this study was conducted in August through September of 1986 and 1988.⁸ The proportion of teenagers who had a teacher who discussed AIDS in school increased from 52% in 1986 to 82% in 1988. Knowledge about how AIDS is transmitted also was more widespread in 1988. Between 1986 and 1988 some behavioral changes were found as well: reported intravenous drug use declined from 1% to 0.1%; the proportion of sexually active teenagers who reported having made changes in sexual behavior to avoid AIDS increased from 16% to 34%; and the proportion who reported using condoms in response to AIDS increased from 2% to 19%. However, the proportion of teenagers who reported having had sexual intercourse during the year preceding the survey increased from 55% to 61%.

In a retrospective assessment, 39% of inner-city adolescents surveyed in 1988 reported that concern about AIDS led them to make behavior changes during the 6 months preceding the survey.¹³ Of those reporting behavior changes, 67% (25% of the total study group) reported that they used condoms, and 16% (6% of the total study group) reported that they were currently abstaining from sexual intercourse.

Although some important behavioral changes were noted in these studies (differences in methodology and samples may partially account for some of the inconsistencies in the results across studies), none represent a very broad cross-section of the adolescent population; therefore, all were unable to assess the impact of the nation's HIV education efforts on behavior. The 1989 Secondary School Student Health Risk Survey and the 1990 national school-based Youth Risk Behavior Survey are the first surveys to measure HIV-related instruction, knowledge, and behaviors among national probability samples of high school students in the United States. Together these surveys provide a unique opportunity to assess possible changes at the national level.

The significantly greater proportion of high school students who in 1990 reported receiving school-based HIV instruction may indicate that more schools are establishing such programs or are expanding current programs to reach students at multiple grade levels. The quality and content of these programs probably vary. Such variation may partly explain our finding that students in the 1990 survey were more knowledgeable about one aspect of HIV transmission but less knowledgeable about another.

Coupled with the increase in school-based HIV instruction, the decreases we found in certain HIV-related behaviors also are encouraging, even though the decreases were not significant for all subgroups of students. These observations are particularly important given the previous trend of increasing sexual activity among selected subgroups of US adolescents over almost two decades.^{14,15}

School-based HIV instruction (which appears to be reaching more students over time) and its impact on HIV knowledge may have contributed to some of the positive behavioral changes we observed. Although the survey data do not allow us to make inferences about cause and effect, the similar associations for both surveys suggest that HIV knowledge—which, in turn, was found to be positively associated with HIV education both in the current analysis and in previous analyses⁵—may be one important determinant of HIV-related risk behavior among US high school students. Furthermore, despite the limitations of our knowledge measure in the 1990 survey, the findings from our multivariate analyses held across surveys.

It is important to note that although these findings are suggestive, the relationship between HIV education or knowledge and risk behavior is still unclear. A recent study found an association between AIDS education and (1) increases in the consistency of condom use and (2) decreases in the frequency of intercourse and in the number of sexual partners among teenage men in the United States.¹⁶ AIDS knowledge also was found to be positively correlated with behavior change in an earlier study of inner-city high school students.¹³ Other studies of adolescents or young adults, however, have failed to show an association between AIDS-related knowledge and behavioral change or intentions.^{8,17-19} Additional research (notably, intervention studies currently underway) may help identify the mecha-

nisms by which education or knowledge can influence behavior in relation to HIV.

It is also important to recognize some limitations of our data. Because behaviors may differ between in-school and out-of-school adolescents, our results can be generalized only to the adolescent population in school. This limitation becomes more pronounced among older youth, because dropout rates increase with student age.

The limitations of self-reported data also apply to our findings; despite extensive measures to ensure student privacy and anonymity, underreporting or overreporting may have occurred. Underreporting by females or overreporting by males may partially explain our finding that males report greater levels of sexual activity than females. Such potential bias, however, is likely to operate in a similar fashion across surveys, and therefore is unlikely to influence the changes we observed from 1989 to 1990.

Finally, we must be cautious about interpreting change with only two points in time. Clearly, more data will be needed to identify trends. We can be encouraged, however, by the consistent pattern of decline that emerged for many of these reported risk behaviors—declines that were significant over the 1-year period for some groups of students.

The results of national school-based surveys are useful for assessing our efforts to educate youth about HIV infection. Although limited to two points in time, the behavioral changes we observed between 1989 and 1990 provide information about directions we need to encourage and about those where we need to redouble our efforts. Our findings suggest that school-based HIV instruction may be an important part of the national effort to help us improve the health and well-being of our youth. □

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References

- Centers for Disease Control. HIV-related beliefs, knowledge, and behaviors among high school students. *MMWR Morb Mortal Wkly Rep.* 1988;37:717-721.

2. Centers for Disease Control. HIV-related knowledge and behaviors among high school students—selected U.S. sites, 1989. *MMWR Morb Mortal Wkly Rep.* 1990;39:385–397.
3. Anderson JE, Kann L, Holtzman D, Arday S, Truman B, Kolbe L. HIV/AIDS knowledge and sexual behavior among high school students. *Fam Plann Perspect.* 1990;22:252–255.
4. Kann L, Anderson JE, Holtzman D, Ross J, Truman BI, Collins J, et al. HIV-related knowledge, beliefs, and behaviors among high school students in the United States: results from a national survey. *J Sch Health.* 1991;61:397–401.
5. Holtzman D, Anderson JE, Kann L, Arday SL, Truman BI, Kolbe LJ. HIV instruction, HIV knowledge, and drug injection among high school students in the United States. *Am J Public Health.* 1991;81:1596–1601.
6. Kegeles SM, Adler NE, Irwin CE. Sexually active adolescents and condoms: changes over one year in knowledge, attitudes and use. *Am J Public Health.* 1988;78:460–461.
7. Cochran SD, Keidan J, Kalechstein A. Sexually transmitted diseases and acquired immunodeficiency syndrome (AIDS): changes in risk reduction behaviors among young adults. *Sex Transm Dis.* 1990;17:80–86.
8. Hingson R, Strunin L, Berlin B. Acquired immunodeficiency syndrome transmission: changes in knowledge and behaviors among teenagers, Massachusetts State-wide Surveys, 1986 to 1988. *Pediatrics.* 1990;85:24–29.
9. Kolbe LJ. An epidemiologic surveillance system to monitor the prevalence of youth behaviors that most affect health. *Health Educ.* 1990;21:44–48.
10. Shah BV. *SESUDAAN: Standard Errors Program for Computing of Standardized Rates from Sample Survey Data.* Research Triangle Park, NC: Research Triangle Institute; 1987.
11. Centers for Disease Control. Selected behaviors that increase risk for HIV infection among high school students—United States, 1990. *MMWR Morb Mortal Wkly Rep.* 1992;41:231–240.
12. Holtzman D, Greene BZ, Ingraham GC, Daily LA, Demchuk DG, Kolbe LJ. HIV and health education in the United States: a survey of local school district policies and practices. *J Sch Health.* 1992;62:421–427.
13. Goodman E, Cohall AT. Acquired immunodeficiency syndrome and adolescents: knowledge, attitudes, beliefs, and behaviors in a New York City adolescent minority population. *Pediatrics.* 1989;84:36–42.
14. Centers for Disease Control. Premarital sexual experience among adolescent women—United States, 1970–1988. *MMWR Morb Mortal Wkly Rep.* 1991;39:929–932.
15. Sonenstein FL, Pleck JH, Ku LC. Sexual activity, condom use and AIDS awareness among adolescent males. *Fam Plann Perspect.* 1989;21:152–158.
16. Ku LC, Sonenstein FL, Pleck JH. The association of AIDS education and sex education with sexual behavior and condom use among teenage men. *Fam Plann Perspect.* 1992;24:100–106.
17. Brown L, Fritz G. Children's knowledge and attitudes about AIDS. *J Am Acad Child Adolesc Psychiatry.* 1988;27:504–508.
18. DiClemente RJ, Forrest KA, Mickler S, et al. College students' knowledge and attitudes about AIDS and changes in HIV-preventive behaviors. *AIDS Educ Prev.* 1990;2:201–212.
19. Keller SE, Bartlett JA, Schleifer SJ, Johnson RL, Pinner E, Delaney B. HIV-relevant sexual behavior among a healthy inner-city heterosexual adolescent population in an endemic area of HIV. *J Adolesc Health.* 1991;12:44–48.