

Sexual and Drug Behavior Patterns and HIV and STD Racial Disparities: The Need for New Directions

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Marked racial disparities in the prevalence of sexually transmitted diseases (STDs) and HIV/AIDS in the United States have been well documented.^{1,2} Findings from a national probability study conducted in 2001–2002 indicate that the prevalences of chlamydial infection and trichomoniasis were each about 6 times greater among Black than White young adults, and the prevalence of gonorrhea was 22 times greater.^{3,4} Centers for Disease Control and Prevention surveillance reports indicate that Blacks accounted for 50% of HIV/AIDS cases diagnosed in 2004 and had the poorest survival rate after being diagnosed with AIDS of all US racial and ethnic groups.²

Although there are probably many reasons for these racial disparities,⁵ a major question is whether individual behaviors account for most of the differences in infection rates. Research indicates that Blacks initiate sexual intercourse at younger ages than do Whites.^{6–8} Early age at first sexual intercourse is associated with both a history of STD infection⁸ and current STD infection, although the association diminishes with age among young adults.⁹ Black adolescents are also more likely than are White adolescents to report multiple sexual partners.^{6,10} Studies have shown no race-specific differences in condom use among young men¹⁰ and higher rates of use among Black adolescents than among White adolescents.⁶ When included as covariates, sexual risk behaviors have not fully accounted for race differences in STD prevalence in nationally representative surveys.^{8,11–13} Likewise, it has been shown that odds ratios for HIV infection among Black compared with White young men who have sex with men are not reduced in models adjusting for covariates such as number of partners and condom use.¹⁴

Drug use behaviors also have been implicated in STD and HIV infections as a result of individuals sharing needles and engaging in sexual behaviors with multiple or risky

Objectives. We used nationally representative data to examine whether individuals' sexual and drug behavior patterns account for racial disparities in sexually transmitted disease (STD) and HIV prevalence.

Methods. Data were derived from wave III of the National Longitudinal Study of Adolescent Health. Participants were aged 18 to 26 years old; analyses were limited to non-Hispanic Blacks and Whites. Theory and cluster analyses yielded 16 unique behavior patterns. Bivariate analyses compared STD and HIV prevalences for each behavior pattern, by race. Logistic regression analyses examined within-pattern race effects before and after control for covariates.

Results. Unadjusted odds of STD and HIV infection were significantly higher among Blacks than among Whites for 11 of the risk behavior patterns assessed. Across behavior patterns, covariates had little effect on reducing race odds ratios.

Conclusions. White young adults in the United States are at elevated STD and HIV risk when they engage in high-risk behaviors. Black young adults, however, are at high risk even when their behaviors are normative. Factors other than individual risk behaviors and covariates appear to account for racial disparities, indicating the need for population-level interventions. (*Am J Public Health.* 2007; 97:125–132. doi:10.2105/AJPH.2005.075747)

sexual partners to obtain drugs.¹⁵ Substance use proximal to a sexual encounter has been found as well to be associated with increased sexual risk taking.¹⁶ Sexual and substance use risk behaviors are known to co-occur,^{17,18} yet relatively little research has examined patterns of these risk behaviors among young people. The few studies that have been conducted have been helpful in understanding patterns,^{19–23} but only 1 study examined behavior patterns in relation to STDs.¹⁹ That study showed that Black girls were less likely than Black boys or White boys and girls to engage in high-risk behavior patterns but more likely to report a previously diagnosed STD.

Previous research involving the use of nationally representative data from the National Health and Nutrition Examination Survey revealed that disparities between Blacks and Whites in 3 viral blood-borne or sexually transmissible diseases (hepatitis B, hepatitis C, and herpes simplex type 2) were greater among individuals in low-risk groups than among those in high-risk groups, suggesting that public health attention should be directed

toward individuals typically considered to be at low risk.²⁴ This study, however, did not include data on other important STDs.

Other studies involving nationally representative survey data have had to rely on self-reported STD information.^{11–13,19,25} A handful of important surveys have incorporated biological STD testing, but each has had notable limitations. The National Survey of Adolescent Males showed associations between chlamydial infection and unprotected sexual intercourse, but these associations were not examined by race and were limited to adolescent boys.¹⁰ The multisite Young Men's Survey conducted HIV testing of participants but was limited to a venue-based sample of young men having sex with men.¹⁴

Wave III of the National Longitudinal Study of Adolescent Health (Add Health) provides nationally representative data on biological measures of STD and HIV infection as well as interview measures of risk behaviors collected from male and female respondents who were young adults in 2002.^{3,4,26} Using this representative sample of young adults in the United States, we examined whether race associations

persist in STD and HIV infection after stratification according to substance use and sexual behavior patterns and control for other important covariates such as gender, socioeconomic status (SES), marital status, and age at first intercourse. Given that racial disparities in STDs and HIV are a critical and growing public health problem, we sought to use the best data set available to examine whether behaviors or other underlying differences might account for such unequal disease burdens.

METHODS

Add Health Data

We used data from wave III of Add Health, which was conducted in 2001–2002 when respondents were aged 18 to 26 years old. Add Health was a prospective cohort study that followed a nationally representative sample of US adolescents into young adulthood. Add Health's original sample was drawn from 7th- to 12th-grade students who appeared on school enrollment rosters in 1994–1995. A sample of 80 high schools and 52 feeder middle schools from the United States was selected with probability proportional to size. Systematic sampling methods and implicit stratification were incorporated into the Add Health study design, thus ensuring that the selected schools were representative of US schools with respect to region of the country, urbanicity, school size, school type, and ethnicity. Additional information about Add Health's research design is available elsewhere.²⁶

At wave III, Add Health researchers sought to interview all of the original participants who were living in the United States. The (weighted) response rate for the wave III probability sample was 75.6% ($n = 14,322$); analyses of nonresponse bias showed that the wave III sample adequately represented the wave I sample.²⁷ As a means of maintaining confidentiality, questionnaires were administered via laptop computers. Computer-assisted self-interviewing technology was used to gather data on sensitive topics such as sexual and substance use histories. After completion of the interview, consent for STD and HIV testing was obtained, and urine and oral mucosal transudate (OMT) specimens were collected. Participants were provided with information about HIV and other STDs, and a

toll-free telephone number was provided for participants to call for their test results (i.e., for chlamydia, gonorrhea, and HIV results).

Measures

STD and HIV infection. Urine specimens were tested for chlamydial, gonococcal, and trichomonal infections. Ligase chain reaction assays (Abbott Laboratories, Abbott Park, Ill) were used in identifying *Chlamydia trachomatis* and *Neisseria gonorrhoeae* in urine specimens. *Trichomonas vaginalis* was detected using a polymerase chain reaction enzyme-linked immunosorbent assay developed at the Microbiology Core Laboratory of the University of North Carolina Sexually Transmitted Diseases Cooperative Research Center.^{28–30} About 8% of the wave III study participants refused to provide a urine specimen for testing. An additional 6% of *N. gonorrhoeae* results were excluded as a result of product recall by the test manufacturer. Other reasons test results were not available were inability of participants to provide a specimen at the time of the interview (2%) and shipping or laboratory problems (3%).

The OraSure HIV-1 oral specimen collection device (Epitope, Beaverton, Ore) was used in collecting OMT specimens for HIV testing. Presence of antibodies to HIV-1 was assessed with the Oral Fluid Vironostika HIV-1 Microelisa System (Organon Teknika Corp, Durham, NC). The OraSure HIV-1 Western Blot Kit (Organon Teknika Corp, Durham, NC) was used to confirm repeatedly reactive results. About 5% of the wave III participants chose not to provide an OMT sample for HIV testing. Other participants provided a sample that could not be tested owing to specimen collection, shipping, or other problems (about 3%), and still others provided a sample that resulted in an indeterminate test outcome (less than 1%). Detailed information about Add Health's procedures for collecting, transporting, and testing urine and OMT samples is available elsewhere.^{3,4,28}

A composite STD and HIV measure was created to identify participants who had tested positive for at least 1 of the 4 STD and HIV infections considered (coded 1) or had tested negative for all 4 infections (coded 0). Participants who had missing data for any of the 4 infections were coded as “missing” on the composite variable.

Race. Identification of race and Hispanic ethnicity was based on respondents' self-reports. Participants were asked to indicate their race from among the options White, Black or African American, American Indian or Native American, and Asian or Pacific Islander. They were told that they could select more than 1 option. Respondents who self-identified more than 1 racial group were asked “Which 1 category best describes your racial background?” Our analyses included only participants who identified themselves as either non-Hispanic Black or non-Hispanic White.

Risk behavior patterns. A key goal of the investigation was to determine whether racial disparities in STD and HIV prevalence persist after stratification of the sample on the basis of sexual and substance use risk behaviors. We used a stratification strategy for both methodological and theoretical reasons. Methodologically, treating each risk behavior as a covariate is not optimal given the potentially nonlinear effects of sexual and substance use behaviors on STD and HIV risk. Theoretically, subgroups of individuals may engage in qualitatively distinct patterns of substance use and sexual risk behaviors. Aggregating over these subgroups could produce misleading results (i.e., “Simpson's paradox”³¹).

Given their known relation to STD and HIV risk, 4 risk strata were predefined as follows: abstaining, injection drug use (since June 1995), male–male sexual activity (since June 1995), and engaging in sex for money (since the previous interview in 1996). All individuals reporting injection drug use were assigned first, followed by those reporting male–male sexual relations and those engaging in sex for money.

Individuals not meeting criteria for these initial strata were then cluster analyzed (using the K-means method, which minimizes the sum of within-cluster variances and thus, maximizes differences between clusters, with wave III sampling weights) to identify other distinctive risk patterns. Variables entered into the cluster analysis included number of cigarettes smoked in the past month, number of days on which alcohol was consumed in the past 12 months (7 categories), number of days on which 5 or more drinks were consumed consecutively in the past 12 months

(7 categories), number of times marijuana was used in the past month, average number of days cocaine or other illegal drugs were used in the past month, condom use at most recent vaginal intercourse (4 categories: never had sexual intercourse, no sexual intercourse in past year, used condom at most recent sexual intercourse, did not use condom at most recent sexual intercourse), sexual situation in past 12 months that respondent later regretted because she or he had been drinking or using drugs (2 categories: yes or no), and number of sexual partners since June 1995.

This analysis resulted in the identification of 12 additional risk patterns. In total, the 16 risk patterns assessed explained 73% of individual differences in sexual and substance use risk behaviors, indicating a high level of within-pattern homogeneity. Thus, within each risk pattern, Black and White adolescents were highly similar (i.e., matched) in their sexual and substance use risk behavior levels. Blacks and Whites were initially cluster analyzed separately; then, because identical patterns emerged for the 2 groups, they were analyzed in combination.¹⁹ We used SAS version 8.2 (SAS Institute Inc, Cary, NC) to conduct the cluster analysis.

Control variables. Covariates included gender, marital status (married or not married), high-school dropout (yes or no), functional poverty (whether or not respondents or their households did not pay the full amount of either the rent or mortgage or utility [gas, electricity, or oil] bill because they did not have enough money), and early initiation of sexual intercourse (first sexual intercourse at age 14 years or younger vs first sexual intercourse at an older age). Given the ages of participants, school dropout and functional poverty were selected as the optimal available indicators of SES.

Statistical Analyses

First, we analyzed prevalences by race (Black or White) for each of the 4 infections individually. We conducted bivariate analyses to examine STD and HIV infection by each of the control variables, using an F test that accounted for survey design effects to assess significance. Next, we examined individual race-specific infection prevalences stratified according to risk behavior pattern. Because race-specific patterns were similar for HIV

and all of the STDs, we collapsed them into a single composite variable to avoid any chance of discerning an individual respondent's identity and responses through the known characteristics of that person. We used separate logistic regression models to determine prevalence odds ratios and 95% confidence intervals (CIs) for each of 15 risk behavior patterns (abstaining was not included) and assess the effects of race both before and after control for covariates.

We used poststratification sampling weights developed by the Add Health research team to calculate estimates representative of the national population. Procedures for survey data in Stata SE 8.0 (Stata Corp, College Station, Tex) were used to account for the complex sampling design of the Add Health study. SAS was used for analyses (e.g., frequency analyses) not requiring adjustment of standard errors. All percentages reported here are weighted; all sample sizes reported are unweighted.

RESULTS

Participants

A total of 8706 participants had complete STD and HIV data (White: $n=6257$; Black: $n=2449$). The mean age of the sample was 21.7 years ($SD=1.8$). Approximately 17% of the participants were married (18% of Whites, 11% of Blacks), 15% had dropped out of high school (13% of Whites, 19% of Blacks), and 15% met the criteria for functional poverty (13% of Whites, 21% of Blacks). Among respondents reporting ever having engaged in vaginal intercourse, 19% reported their age at first sexual intercourse as 14 years or younger (17% of Whites, 27% of Blacks). Among the 81% who reported having engaged in sexual intercourse in the past year, 60% reported not having used a condom during their most recent sexual intercourse (63% of Whites, 47% of Blacks).

STD and HIV Prevalence

The prevalence of combined STD and HIV infection within the analysis sample was 6%. Most of those with an infection had a chlamydial infection (65%). Approximately 10% of the participants tested positive for 2 or more infections. Chlamydia and gonorrhea

TABLE 1—Prevalences of STD and HIV Infections, by Race: National Longitudinal Study of Adolescent Health, Wave III, 2001–2002

	Whites (95% CI)	Blacks (95% CI)
Chlamydial infection	1.9 (1.5, 2.5)	12.5 (10.2, 15.3)
Trichomoniasis	1.2 (0.9, 1.5)	6.9 (5.4, 8.8)
Gonorrhea	0.1 (0.0, 0.3)	2.1 (1.5, 3.1)
HIV	... ^a	0.5 (0.2, 1.0)
STD and HIV combined	3.1 (2.6, 3.8)	18.8 (16.1, 21.8)

Note. STD = sexually transmitted disease; CI = confidence interval. Prevalences are reported as weighted percentages.

^aToo few cases were available to provide a reliable estimate.

were the most common co-occurring positive infections (0.35% prevalence), followed by chlamydia and trichomoniasis (0.30%). Among those with a chlamydial infection, 9% also had gonorrhea, and 8% had trichomoniasis. Among all participants with gonorrhea, 72% also had a chlamydial infection.

The prevalence of each type of infection was higher among Blacks than among Whites (Table 1). The prevalence of an STD including HIV was highest among Black women (22.8%; 95% CI=19.3%, 26.8%), followed by Black men (14.6%; 95% CI=11.6, 18.2), White women (3.7%; 95% CI=2.9, 4.6), and White men (2.6%; 95% CI=2.0, 3.4). Unmarried participants ($F=10.5$, $P<.01$), high school dropouts ($F=24.2$, $P<.001$), participants meeting the criteria for functional poverty ($F=11.5$, $P<.001$), and those who had first engaged in sexual intercourse at age 14 years or younger ($F=19.4$, $P<.001$) were more likely to have an STD. Condom use at most recent sexual intercourse was not associated with current infection ($F=3.2$, $P=.08$).

Risk Behavior Patterns

In Table 2, risk behavior patterns are ordered from most to least normative. Characteristics of the members within each group are presented. In the sample overall, the most normative behavior pattern was the “few partners, low alcohol, tobacco, and other drug use” pattern, and more than a third of Blacks (37.6%) were in this group. By contrast, Whites were more broadly distributed among

TABLE 2—Sexual Behavior and Substance Use Patterns, Pattern Descriptions, and Racial Distribution Across Patterns: National Longitudinal Study of Adolescent Health, Wave III, 2001–2002

Risk Behavior Pattern	Definition and Specific Characteristics	White, % ^a (No.)	Black, % ^a (No.)
Few partners, low ATOD use	Sexually active (almost all had had sexual intercourse in past year) but few partners and low ATOD use • Median no. of sexual partners: 1^b • 57% did not use condom during most recent vaginal intercourse^c • Very low ATOD use; none regretted AOD use in a sexual situation in the past year	12.7 (806)	37.6 (867)
Light alcohol consumption and sexual activity	Occasional alcohol consumption but low binge drinking; all have had sexual intercourse • Median no. of sexual partners: 2 • 59% did not use condom during most recent vaginal intercourse • Very low tobacco and illegal drug use	14.4 (975)	14.7 (407)
Low risk behavior	Very low or no current ATOD use; 67% had never had sexual intercourse; remainder had not had sexual intercourse in past year • Median number sexual partners: 0	11.4 (708)	12.0 (318)
Tobacco use and sexual activity	Daily cigarette smokers • Median no. of sexual partners: 2 • 60% did not use condom during most recent vaginal intercourse • Infrequent AOD use	12.3 (748)	7.0 (144)
Binge drinking	Almost all reported binge drinking once a month or more (43% binged weekly or more often) • Median no. of sexual partners: 2 • 56% did not use condom during most recent vaginal intercourse • One quarter used marijuana; almost all used no other drugs	9.8 (600)	4.0 (89)
Substance use and sexual activity	Moderate levels of smoking and drinking; one third used marijuana; most (89%) had had sexual intercourse in past year • Median no. of sexual partners: 2 • 62% did not use condom during most recent vaginal intercourse • All had smoked in past month; few used other illegal drugs	9.0 (538)	1.9 (45)
Regret related to AOD use with sexual activity, high AOD use	All regretted AOD use in sexual situation in past year; almost all engaged in binge drinking monthly or more often • Median no. of sexual partners: 4 • 59% did not use condom during most recent vaginal intercourse • 39% had used marijuana in past month	8.0 (474)	1.9 (47)
Regret related to AOD use with sexual activity, moderate AOD use	All regretted AOD use in sexual situation in past year; occasional drinkers with little binge drinking • Median no. of sexual partners: 3 • 55% did not use condom during most recent vaginal intercourse • 25% had used marijuana in past month	5.9 (389)	4.0 (115)
Marijuana use	Frequent marijuana use; 27% had used other illegal drug in past month • Median no. of sexual partners: 3 • 60% did not use condom during most recent vaginal intercourse • Most smoked cigarettes; almost all drank alcohol; most were occasional drinkers	5.3 (316)	3.3 (90)
Multiple partners	All had had 8 or more sexual partners in past 6 years • Median no. of sexual partners: 11 • 60% did not use condom during most recent vaginal intercourse • Moderate ATOD use	2.9 (195)	3.0 (92)
High rate of marijuana use and sexual activity	All used marijuana frequently and almost all had had sexual intercourse in past year • Median no. of sexual partners: 4 • 56% did not use condom during most recent vaginal intercourse • Almost all regretted AOD use in sexual situation; 43% reported other illegal drug use	2.9 (179)	1.7 (33)

Continued

TABLE 2—Continued

Sex for money	All reported having engaged in sex for money in past 5 years • Median no. of sexual partners: 4 • 54% did not use condom during most recent vaginal intercourse • Variations in ATOD use; overall moderate use	1.1 (64)	6.8 (140)
Abstaining	Never engaged in any ATOD use and never had sexual intercourse	1.2 (84)	0.6 (22)
Injection drug use	All had injected drugs in past 6 years • Median no. of sexual partners: 3 • 68% not use condom during most recent vaginal intercourse • More than half used marijuana; half had used other illegal drug in past month	1.3 (73)	0.4 (10)
Male-male sexual activity	All had had male-male sexual activity in past 6 years • Median no. of sexual partners: 3 • 45% did not use condom during most recent vaginal intercourse • 36% used marijuana; 15% had used other drug in past month; most were occasional drinkers	1.1 (61)	0.7 (21)
Marijuana and other drug use	Most reported heavy marijuana use; all reported other illegal drug use • Median no. of sexual partners: 4 • 64% did not use condom during most recent vaginal intercourse • One third regretted AOD use in a sexual situation in the past year	0.9 (47)	0.3 (9)
Total		100 (6257)	100 (2449)

Note. ATOD = alcohol, tobacco, and other drug use; AOD = alcohol and other drug use. Risk behavior patterns are ordered from most to least normative for the entire wave III sample (including respondents of all races). Pattern descriptions also were based on the entire wave III sample. Percentages may not sum to total because of rounding.

^aWeighted percentage yielding national probability estimate.

^bNumber of partners with whom respondent had had sexual relations, derived from respondent's report of romantic and sexual relationships in past 6 years.

^cAsked only of those who reported having engaged in vaginal intercourse in the past 12 months.

TABLE 3—Sexually Transmitted Disease and HIV Infection Prevalences (95% CI), by Race and Risk Behavior Pattern: National Longitudinal Study of Adolescent Health Wave III, 2001–2002

Risk Behavior Pattern	White	Black ^a
Few partners, low ATOD use	3.2 (1.9, 5.1)	20.3 (17.2, 23.7)
Light alcohol consumption and sexual activity	3.1 (2.0, 4.9)	17.4 (12.4, 24.0)
Low risk behavior	0.5 (0.2, 1.5)	12.4 (7.3, 20.1)
Tobacco use and sexual activity	3.3 (2.1, 5.3)	25.2 (14.3, 40.6)
Binge drinking	2.3 (1.1, 4.6)	15.6 (9.3, 25.2)
Substance use and sexual activity	3.4 (1.6, 7.0)	22.0 (9.7, 42.6)
Regret related to AOD use and sexual activity, high AOD use	3.5 (2.0, 6.3)	19.2 (7.9, 39.8)
Regret related to AOD use and sexual activity, moderate AOD use	3.5 (1.8, 6.4)	19.9 (12.3, 30.6)
Marijuana use	4.8 (2.6, 8.6)	14.2 (6.8, 27.3)
Multiple sexual partners	3.4 (1.4, 7.8)	9.7 (4.7, 18.9)
High rate of marijuana use and sexual activity	4.5 (2.0, 10.0)	22.5 (7.3, 51.8)
Sex for money	9.3 ^b (3.4, 23.1)	23.2 (17.2, 30.5)
Injection drug use	7.8 ^b (3.1, 18.4)	23.4 (4.8, 65.1)
Male-male sexual activity	6.7 ^b (2.3, 18.1)	33.8 (14.3, 60.9)
Marijuana and other drug use	7.5 ^b (1.9, 25.8)	28.8 (11.2, 56.5)

Note. CI = confidence interval; ATOD = alcohol, tobacco, and other drug use; AOD = alcohol and other drug use. Risk behavior patterns are ordered from largest (most normative) to smallest.

^aAll prevalence estimates were greater than the sample's overall prevalence (6%).

^bGreater than the sample's overall prevalence (6%).

the behavior groups, with “light alcohol consumption and sexual activity” being the modal pattern.

Infection Prevalence by Race

Risk behavior patterns are again ordered from most to least normative in Table 3, with prevalence of infection presented according to race and behavior pattern. Among White young adults, the STD and HIV infection prevalence was lower than the overall prevalence of 6% for all of the risk behavior patterns with the exception of the 4 least normative and most risky patterns (engaging in sex for money, injection drug use, male-male sexual activity, and marijuana or other drug use). By contrast, prevalences for Black young adults were above 6% for all 15 risk behavior patterns.

Unadjusted odds of STD/HIV infection were significantly higher among Black than among White young adults for 11 of the 15 risk behavior patterns (Table 4). For example, in the few partners and low alcohol, tobacco, and other drug use group, odds of

TABLE 4—Prevalence Odds Ratios for Blacks Relative to Whites From Logistic Regression Models of STD and HIV Infection: National Longitudinal Study of Adolescent Health Wave III, 2001–2002

	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Few partners, low ATOD use ^a (n = 1613)	7.8 (4.5, 13.4)	7.1 (4.1, 12.3)
Light alcohol consumption and sexual activity ^a (n = 1368)	6.3 (3.5, 11.4)	5.8 (3.2, 10.6)
Low risk behavior ^b (n = 1016)	28.9 (7.8, 107.0)	24.9 (7.1, 87.2)
Tobacco use and sexual activity ^a (n = 864)	9.1 (3.7, 22.7)	9.1 (3.8, 21.6)
Binge drinking ^a (n = 648)	8.0 (3.0, 21.0)	6.4 (2.0, 20.6)
Substance use and sexual activity ^a (n = 556)	9.7 (2.6, 36.0)	8.7 (2.1, 35.2)
Regret related to AOD with sexual activity, high AOD use ^a (n = 487)	7.8 (2.3, 25.7)	7.2 (1.7, 30.2)
Regret related to AOD with sexual activity, moderate AOD use ^a (n = 458)	3.9 (1.5, 10.1)	4.0 (1.6, 9.9)
Marijuana use ^a (n = 387)	3.3 (1.1, 10.0)	3.4 (1.2, 9.6)
Multiple partners ^a (n = 285)	3.0 (0.9, 9.9)	2.7 (0.8, 9.3)
High rate of marijuana use and sexual activity ^a (n = 208)	6.2 (1.3, 29.7)	6.8 (1.9, 24.7)
Sex for money ^a (n = 196)	2.8 (0.9, 9.2)	2.7 (0.8, 9.4)
Injection drug use ^c (n = 72)	7.0 (0.8, 64.3)	18.7 (0.1, 5647.3)
Male–male sexual activity ^d (n = 82)	7.1 (1.5, 33.5)	9.8 (1.8, 52.8)
Marijuana and other drug use ^e (n = 54)	4.8 (0.7, 31.2)	7.4 (1.4, 38.5)

Note. STD = sexually transmitted disease; OR = odds ratio; CI = confidence interval; ATOD = alcohol, tobacco, and other drug use; AOD = alcohol and other drug use. Respondents reporting that they had never had vaginal intercourse were coded as having missing data for age at first intercourse; therefore, only those reporting having ever engaged in vaginal intercourse were included in the analyses (except in the case of the low risk behavior and male–male sexual activity patterns, in which there was little theoretical rationale for control for first vaginal intercourse).

^aAdjusted for gender, marital status, school dropout, functional poverty, and age at first intercourse.

^bAdjusted for gender, marital status, school dropout, and functional poverty.

^cAdjusted for gender, school dropout, functional poverty, and age at first intercourse. Marital status was dropped from the model owing to a lack of within-cluster variability in the association between this covariate and STD and HIV infection.

^dAdjusted for marital status, school dropout, and functional poverty.

^eAdjusted for gender, functional poverty, and age at first intercourse. Marital and school dropout were eliminated from the model owing to a lack of within-cluster variability in the association between each of these covariates and STD and HIV infection.

any STD or HIV infection were 7.8 (95% CI=4.5, 13.4) times higher among Black than among White young adults. Odds ratios for race were not statistically significant for the multiple partners, engaging in sex for money, injection drug use, and marijuana or other drug use risk behavior patterns, which were all among the least normative patterns. In each case, and especially for those in the injection drug use and marijuana or other drug use groups, odds ratios were large. However, because of the small sample sizes, estimates were imprecise, as evidenced by the wide confidence intervals. As can be seen in Table 4, adjustment for gender, marital status, school dropout status, functional poverty, and age at first sexual intercourse had little effect on the relation between race and infection status.

DISCUSSION

Large HIV and STD racial disparities exist in the United States. Public health research and policy efforts have been guided by the premise that the best way to prevent HIV and other STDs is by targeting risk behaviors at the individual level.³² However, the current findings, derived from a large, nationally representative sample of young adults, indicate that this strategy may be appropriate for Whites (because their STD risk increases only when their behavior is very risky) but not for Blacks. Our results suggest that Black young adults are at very high risk for STDs, even when their behavior is normative. The implication is that factors in addition to personal behavior are influencing high infection rates in this group. Our findings also corroborate research demonstrating that

racial differences in STDs persist after control for indicators of SES.^{11,33}

Racial disparities probably reflect environmental, institutional, and contextual differences between Blacks and Whites. For example, sexual mating patterns are largely segregated according to race,^{34,35} and Blacks are more likely than Whites to cross high- and low-risk behavior groupings when choosing sexual partners.³⁵ This combination of assortative (like with like) mixing by race and disassortative mixing by risk group may create a “perfect storm” effect for Blacks that results in very high STD and HIV rates. Considering that the most important determinant of STD and HIV acquisition is the infection status of one’s partner, Blacks in both high- and low-risk groups are more likely to encounter an infected partner given this combination of assortative and disassortative mixing.

Addressing racial disparities in STD and HIV prevalence is extremely sensitive, and policy makers must proceed carefully, with dialogue and consensus among all community groups. Nevertheless, it is critical that the problem be addressed with due speed and guided by scientific findings. Given the documented higher prevalence of STDs among Black than White young adults, a more aggressive strategy to reach all Black young adults is needed, such as offering free universal screening to this population.

We recommend a media campaign informing Blacks of the high prevalence of HIV and other STDs across behavior groups, reducing the stigma associated with testing and an STD diagnosis, and encouraging young adults to be tested on an annual basis. We also recommend that information, testing, and treatment services be offered through nontraditional venues such as churches and beauty salons, as well as through colleges, prison and jail facilities, and health care venues. In addition, we recommend that surveillance be conducted to monitor whether prevalence is reduced over time and whether subgroups (such as men) are routinely being tested.

Finally, we recommend further research into structural factors that may account for some of the racial STD and HIV disparities in evidence. For example, we believe that an important area for future research is the possible link between the disproportionate

incarceration of Blacks (relative to Whites) and STD and HIV disparities. The incarceration disparity is enormous: the US Bureau of Justice Statistics estimates that, if current trends continue, 1 in 3 Black males will spend time in prison during their lives, compared with 1 in 17 White males.³⁶ Several studies have noted a relation between STD and HIV infections and incarceration,^{37–40} but a better understanding of causal mechanisms and opportunities for prevention is needed.

This study involved a number of limitations. Sexual and substance use risk behaviors were measured via self-reports and could have been underestimated. However, computer-assisted self-interviewing technology was used in Add Health; this methodology has been found to increase reporting of sensitive behaviors, and there are indications that it is effective across racial/ethnic groups.⁴¹ The measure of condom use that was used to assign individuals to behavior pattern groups was limited to most recent intercourse, which may not have been representative of participants' overall condom use behavior. Valid measurement of condom use has posed challenges to researchers generally, given that study participants may not recall condom use behavior accurately or may be influenced by social desirability issues.⁴²

Moreover, SES is a complex construct, and its measurement is further complicated when, as a result of their age group, participants' incomes may be equally low whether they are enrolled in college or have dropped out of school. Our 2 indicators were dichotomous and could have obscured effects of SES at more detailed levels. Nevertheless, the variables we used did capture a pair of important and different dimensions of SES: education (as measured using school dropout status) and a summary of the effects of low income (as measured using our functional poverty variable).

Our findings suggest that STD and HIV prevention efforts should be focused at the individual behavior level for Whites but at the population level for Blacks, because infection prevalence among Blacks is elevated regardless of behavior patterns. Given the consistent evidence that sexual mating patterns are segregated according to race, we suggest policy strategies that will reduce infection in the

burdened population. Most STDs can be cured, and the health and life span of individuals infected with HIV can be greatly increased by current therapies. In addition, the spread of HIV may be reduced through prompt diagnosis and treatment, given that antiretroviral treatment reduces viral load and thus, risk of transmission.⁴³ Many STDs increase the likelihood of both infectivity of and susceptibility to HIV infection, so reducing prevalence will also help to prevent the spread of HIV.⁴⁴ The burden of HIV and STD morbidity and mortality is high. We have the tools to greatly lower disease rates, and appropriate efforts should be directed toward reaching this important public health goal. ■

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Contributors

D.D. Hallfors originated the ideas for this article, supervised all aspects of its development and execution, and wrote the discussion section. B.J. Iritani wrote the initial draft of the other sections and conducted all data analyses. W.C. Miller consulted on the framework of the article and critically reviewed and revised early drafts. D.J. Bauer provided leadership on the statistical methods for the article.

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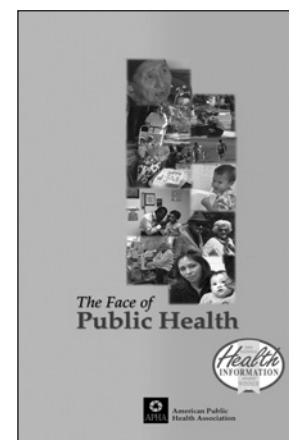
Human Participant Protection

This study was approved by the institutional review board of the Pacific Institute for Research and Evaluation. Participants in the National Longitudinal Study of Adolescent Health provided written informed consent.

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