

# Associations of Race/Ethnicity With HIV Prevalence and HIV-Related Behaviors Among Young Men Who Have Sex With Men in 7 Urban Centers in the United States

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**Abstract:** Using data from a multisite venue-based survey of male subjects aged 15 to 22 years, we examined racial/ethnic differences in demographics, partner type, partner type-specific condom use, drug use, and HIV prevalence in 3316 US black, multiethnic black, Latino, and white men who have sex with men (MSM). We further estimated associations of these factors with HIV infection and their influence on racial/ethnic disparities in HIV prevalence. HIV prevalences were 16% for both black and multiethnic black participants, 6.9% for Latinos, and 3.3% for whites. Paradoxically, potentially risky sex and drug-using behaviors were generally reported most frequently by whites and least frequently by blacks. In a multiple logistic regression analysis, positive associations with HIV included older age, being out of school or work, sex while on crack cocaine, and anal sex with another male regardless of reported condom use level. Differences in these factors did not explain the racial/ethnic disparities in HIV prevalence, with both groups of blacks experiencing more than 9 times and Latinos experiencing approximately twice the fully adjusted odds of

infection compared with whites. Understanding racial/ethnic disparities in HIV risk requires information beyond the traditional risk behavior and partnership type distinctions. Prevention programs should address risks in steady partnerships, target young men before sexual initiation with male partners, and tailor interventions to men of color and of lower socioeconomic status.

**Key Words:** ethnic groups, HIV risk factors, epidemiology, young adults, homosexuality, drug use, sexual behavior

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In the mid-1990s, HIV seroprevalence surveys carried out among young men who have sex with men (MSM) identified alarmingly high levels of HIV infection and unsafe sexual practices,<sup>1–6</sup> and some epidemiologists projected that this generation of MSM might eventually experience HIV prevalence levels similar in magnitude to those found during the epidemic's peak.<sup>2</sup> These studies further revealed that the HIV risk was not evenly distributed across the young populations sampled. Among the most striking disparities was the higher HIV prevalence among Latino and black/African-American men.<sup>1,3,5,6</sup> For example, in the first published multisite analysis of the Young Men's Survey (YMS), Latinos (6.9%) and blacks (14%) were, respectively, 2 and 4 times as likely as whites (3.3%) to be infected.<sup>6</sup> City-specific analyses<sup>3,7,8</sup> reported similar racial disparities, as did an earlier survey of young MSM in San Francisco.<sup>1,7</sup>

Published analyses further indicated that the racial/ethnic disparities observed in these and other studies did not appear to be due to differences in reported sexual behavior, drug use, socioeconomic status (SES), or sexually transmitted disease (STD) history.<sup>1,2,5,6,9</sup> The corresponding multiple regressions, however, were developed using variable-selection strategies employing strict statistical testing criteria that some-

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times resulted in the exclusion of known HIV risk factors (eg, unprotected sex). Such strategies can lead to biased statistical tests and estimates of association.<sup>10</sup> Also, past approaches have not always taken into account potential racial/ethnic differences in partners' potential HIV risk level and partner-specific risk behaviors. These differences may partly explain observed racial disparities, because likelihood of infection is influenced both by an individual's level of participation in unprotected intercourse and needle sharing and his likelihood of doing so with an HIV-infected partner. Hence, a greater propensity toward unprotected sex with high-risk partners may be an important factor in increasing black and Latino men's HIV risk.

To understand better why HIV risk differs by race/ethnicity, we used data from phase 1 of the YMS to (1) examine racial/ethnic differences in SES, risk behaviors, and partnership types relevant to risk level of partnership networks; (2) examine associations of these factors with HIV infection; and (3) evaluate whether differences in these factors explained observed racial/ethnic disparities in HIV prevalence. We hypothesized that compared with white MSM, proportionally more black and Latino men would report factors potentially associated with high-risk partners and behaviors. These included low SES; sex with nonsteady, injection drug-using (IDU), and HIV-positive partners; exchange of sex for drugs or money; and use of stimulants during sex. Low SES may also increase HIV infection risk through its association with reduced access to quality medical care and the frequent clustering of high-risk behaviors in low-income neighborhoods (and hence among participants' potential sex partners). To examine the potential influence of these factors on racial/ethnic disparities in HIV infection, we compared the age and fully adjusted odds of infection for black, multiethnic black, and Latino YMS participants with those for white participants. According to our hypothesis, compared with the age-adjusted odds of infection, adjustment for all hypothesized factors in the full model should reduce the relative odds of infection when comparing men of color to white men.

## METHODS

### Young Men's Survey Design

As described elsewhere, the YMS sampling method was applied in each of 7 urban US centers.<sup>6,11</sup> Briefly, a wide variety of venues frequented by young MSM were identified through formative research and on-site enumerations. A sampling frame was constructed, excluding needle exchange sites, street locations attended predominantly by sex workers, and service settings for HIV-seropositive MSM. Based on the on-site enumerations, 4-hour sampling frames were constructed of venues and specific daytime periods (eg, Fridays from 10:00 PM to 2:00 AM) where and when a minimum of 7 eligible men might be encountered. Each month, 12 or more venues and

their associated daytime periods were randomly selected and scheduled from updated sampling frames. During sampling events, 1 interviewer counted all men who entered defined areas at each venue and appeared to be less than 30 years of age. When not conducting interviews, recruiters consecutively approached and briefly interviewed the counted men to assess their eligibility.

Eligibility criteria were age 15 to 22 years and current residence in an eligible local county or borough in the 7 YMS sites. Sexual behavior and identity were not eligibility criteria. Those agreeing to participate were accompanied to a mobile unit, where a trained interviewer obtained informed consent, administered a standardized English or Spanish questionnaire, conducted prevention counseling, and obtained blood specimens for HIV testing. Participants were reimbursed \$40 to \$50 (depending on the YMS site) and scheduled to receive their test results within 2 weeks. Specimens were tested for HIV-1 antibodies at local laboratories with US Food and Drug Administration-licensed assays.

To minimize duplicate enrollment, all men were asked whether they had already participated in the YMS. In addition, the Miragen Antibody Profile Assay<sup>12,13</sup> was used to test specimens of suspected duplicate participants. When antibody profiles matched, only data from the first interview and specimen were analyzed. The YMS multisite protocol was approved by institutional review boards at the Centers for Disease Control and Prevention (CDC) and at the state and local institutions conducting the survey.

After the initial data collection was completed at 3 of the YMS sites (Los Angeles, Dallas, and Miami), the study was continued to increase the enrollment of black respondents. Venues and sampling times continued to be sampled randomly, but only the potentially eligible young men at each site who appeared to be of African descent were offered study participation. This additional phase increased overall black/African-American participation by 35%.

### Measures

The major risk factors of interest were sociodemographic (race, age, and SES), sexual (number of male partners of each type and partner type-specific condom use), and drug-related (use of injection drugs and sex while using stimulants or poppers). Below, we outline how these risk factors were collected and categorized in our analyses.

Interviewers asked each respondent his racial/ethnic background and coded it into 1 of 8 categories. We reclassified those respondents who specified a single background for the "other" and "mixed race/multicultural" categories per the race and ethnic standards for federal agencies and administrative reporting<sup>14</sup> (eg, we reclassified "Persians" as whites and "Latin Americans" as Latinos). We reclassified "mixed race/multicultural" respondents specifying "black" or African

descent backgrounds and “Caribbean/West Indian” respondents as “multiethnic blacks.” We chose to group these participants together, because previous analyses indicated that “mixed race/multicultural” YMS respondents specifying some African descent background were as likely as “black/African-American” participants to have HIV and more likely than other “mixed race/multicultural” participants to be infected.<sup>6</sup>

SES indicators in the YMS included current homelessness, parents’ highest level of education, respondent’s educational level, and employment/school enrollment status. Because HIV prevalence did not differ except among those with parents in the highest educational level, these respondents were compared with all others. Respondents who had completed high school or whose highest completed grade level was at or above that expected for their age were compared with those below their expected grade level (expected age for completed grade levels: ninth grade = 16 years, 10th grade = 17 years, and 11th grade = 18 years). Respondents who were currently in school or working were compared with those who were unemployed and not in school.

For the previous 6-month period, the survey assessed number of male sexual partners and frequency of condom use for receptive and insertive anal sex with each of the following partner types: (1) exchange: “sex in exchange for things you or they needed”; (2) nonsteady: “pickups, one-night stands, or casual partners” with whom the respondent had sex once or twice; and (3) steady: “steadies, regulars, or lovers” with whom the respondent had sex 3 or more times. For insertive and receptive anal sex with each partner type, we compared each of the following groups with those who always used condoms: persons who sometimes and never used condoms and persons who had no sex or just oral sex (with or without condoms). We also compared respondents reporting an HIV-positive or IDU male partner or a male partner of unknown HIV or IDU status with those reporting no HIV-positive and no IDU partners. These variables were scaled as follows: 1 = known HIV-infected or IDU partner; 0.5 = partner of unknown status; 0 = no IDU, HIV-infected, or unknown status partners (referent).

Nitrate inhalant and stimulant use (eg, cocaine, crack cocaine, and uppers/speed/amphetamines) were classified into 3 mutually exclusive categories. Those who had ever used the drug (“lifetime users”) and those who reported having sex while “high or buzzed” on the drug in the previous 6 months were each compared with nonusers. Lifetime users of injection drugs and those who had shared needles were compared with nonusers.

## Data Analyses

To examine how the potential HIV risk factors varied by race/ethnicity, we examined frequencies and medians by

racial/ethnic group for the total study population. Pearson  $\chi^2$  tests were used to evaluate frequency distributions, and the multisample median (Brown-Mood) test was used to produce the  $\chi^2$  statistic for the median scores.

To examine associations with HIV prevalence, we limited our analysis to participants who were potentially at risk for HIV infection via sex with another man in the previous 6 months by excluding those who reported previously testing HIV-positive, those not reporting any oral or anal sex with another male in the time period, and those with missing or indeterminate HIV test results. We used logistic regression to estimate the age and fully adjusted associations of each risk factor with HIV-antibody status in this subsample. Number of years since first anal sex, number of lifetime male sexual partners, YMS site, drug use in lifetime, and all risk factors of interest were controlled for in the full model.

Finally, because of concerns about possible differential misreporting of risk behaviors, we conducted sensitivity analyses and compared interviewers’ level of confidence in participants’ survey responses (“some doubts” vs. “confident”) by racial/ethnic group. Records coded “not confident at all” or found to have contradictory responses throughout were excluded.

## RESULTS

### Enrollment and Description of Study Sample

Of all potentially eligible young men approached, 88% ( $n = 28,244$ ) answered the eligibility screening questions and 62% ( $n = 4569$ ) of the 7350 known to be eligible enrolled (persons intercepted multiple times were counted once). Race/ethnicity was not obtained for 3% of those intercepted. Among the intercepted young males of known race/ethnicity, persons of other or multiethnic backgrounds were most likely (94%) and Latinos were least likely to accept the initial intercept (89%). Persons of other or multiethnic backgrounds were also most likely to enroll (77%) compared with 61% of blacks, 64% of Latinos, 61% of whites, and just 52% of Asian/Pacific Islanders.

After removing 182 records because Miragen testing indicated previous participation, 38 records were removed because of validity concerns, 9 because subjects were later determined to be age ineligible, 141 because subjects had not yet had sex, and 454 because subjects had only had sex with women. The remaining sample of 3745 unduplicated respondents was further limited to 1259 whites, 814 blacks, 1042 Latinos, and 201 multiethnic blacks (178 “multiracial/multicultural” respondents and 23 Caribbean/West Indians), leaving a study sample of 3316. The remaining 170 (9.6% HIV infected) “multiracial/multicultural” participants, 208 (2.9% HIV infected) Asian/Pacific Islanders, 45 (6.7% HIV infected) American Indians, and 6 (0% HIV infected) “un-

**TABLE 1.** Distribution of Reported Risk Behaviors by Race/Ethnicity Among 3316 Black/African-American, Multiethnic Black, Hispanic/Latino, and White/Caucasian MSM Respondents to the Young Men's Survey (7 US cities, 5/24/94–10/20/98)

Socioeconomic and Behavioral Characteristic	Black/African American (n = 814) %	Multiethnic Black (n = 201) %	Hispanic Latino (n = 1042) %	White/Caucasian (n = 1259) %	P*
Currently homeless	2.1	6.0	1.7	3.4	0.002
At expected grade level for age/high school graduate	87.7	89.6	82.6	89.8	<0.001
Parent attended graduate school	12.4	14.5	5.8	22.3	<0.001
Median age at first anal sex with male partner (interquartile range Q1–Q3)	16 15–18	16 14–18	17 15–18	17 16–19	<0.001†
In lifetime, median number of male partners (interquartile range Q1–Q3)	6 3–15	6 3–16.5	7 3–20	7 3–20	0.025†
> 20 lifetime partners	19.2	23.8	26.5	26.2	0.05
In past 6 months, any sex with					
Exchange partner	11.9	11.9	10.5	10.4	0.656
Nonsteady partner	49.3	58.2	57.6	59.7	<0.001
Steady partner	68.9	63.7	70.9	67.0	0.092
In past 6 months, sex with an IDU male partner					
Yes	5.9	8.0	7.5	10.6	<0.001
Don't know	11.2	9.0	13.5	16.8	
No	82.9	83.1	79.0	72.6	
In past 6 months, sex with an HIV+ male partner					
Yes	4.8	4.0	6.0	6.1	0.001
Don't know	17.3	12.4	23.2	20.6	
No	77.9	83.6	70.8	73.2	
Lifetime history of using					
Injection drugs	3.1	5.5	6.0	9.9	<0.001
Shared needles	0.6	4.0	1.6	4.3	<0.001
Uppers/speed	16.2	28.9	44.0	49.6	<0.001
Powder cocaine	11.6	23.4	35.8	38.8	<0.001
Crack cocaine	4.6	7.5	10.0	12.2	<0.001
Nitrite inhalants (poppers)	6.4	17.9	23.8	28.8	<0.001

\*Probability values from  $\chi^2$  test comparing the racial/ethnic groups.

†Probability value from multisample median  $\chi^2$  test comparing median scores between the racial/ethnic groups.

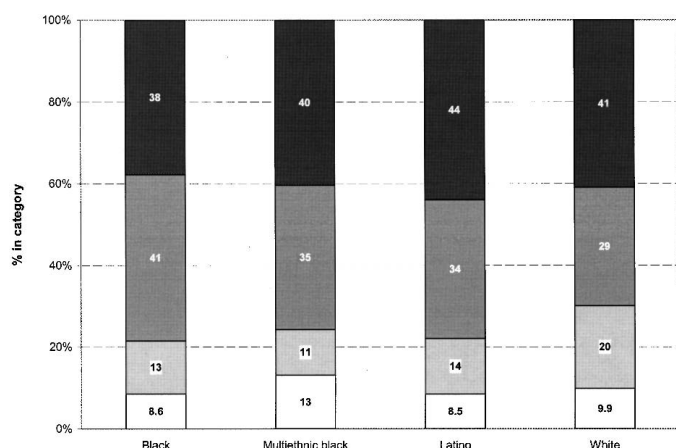
knowns” were excluded because of small numbers of prevalent infections.

Median age was 19 years for multiethnic blacks and 20 years for each other group. Only 11% of the study participants were under the age of 18 years. Parents' education differed ( $P < 0.001$ ), with white participants more likely to have a parent who had attended graduate or professional school (22.3%) than other groups (5.8%–14.5%). Most respondents (81%–84%) were in school or working and had either completed high school or were at or above the expected grade level for their age (82.6%–89.6%) (Table 1). Current homelessness was uncommon and reported by only about 2% of Latinos and blacks, 3.4% of whites, and 6.0% of multiethnic blacks.

### Lifetime and 6-Month Sexual Behaviors

YMS participants reported having a median of 6 to 7 male partners since they first began having anal or oral sex with male partners. The distribution of lifetime number of partners differed by race/ethnicity ( $P = 0.025$ ), with black participants least likely to report 20 or more partners. Median age at initiation of oral sex with male partners was 15 years for all groups. Age at initiation of anal sex differed ( $P < 0.001$ ), with Latinos and whites initiating it later than both groups of black participants (17 vs. 16 years of age; see Table 1).

Median number of male partners during the previous 6 months was 2 for all racial/ethnic groups, and unprotected anal sex was common. Among those respondents who had had anal



**FIGURE 1.** Distribution of highest risk of sexual behavior reported in the previous 6 months among 3316 black, multiethnic black, Latino, and white men who have sex with men respondents aged 15 to 22 years to the Young Men's Survey (7 US cities, 5/24/94–10/20/98). Unprotected anal sex (dark shading), protected anal sex (dark gray shading), only oral sex (light gray shading), and no oral or anal sex (no shading).

sex, whites were most likely (59%) and blacks least likely (48%) to report having had unprotected anal sex. Nevertheless, participation in anal sex differed by race ( $P < 0.001$ ). A larger proportion of whites (20%) than all other groups (11%–14%) did not have recent anal sex and reported only oral sex with male partners (Fig. 1).

Racial/ethnic differences were observed in the proportion reporting sex with a nonsteady ( $P < 0.001$ ), IDU ( $P < 0.001$ ), or HIV-positive ( $P = 0.001$ ) partner in the previous 6 months, with 49.3% of black MSM reporting a nonsteady partner compared with 57.6% to 59.7% of multiethnic black, Latino, and white MSM. Across racial/ethnic groups, 60% of those reporting anal sex with exchange or nonsteady partners always used condoms. In contrast, only 48% of those reporting anal sex with steady partners always did so. Among those who did not, 47% reported knowing that their steady partner was HIV-negative as a reason for nonuse (not shown). A small proportion of respondents reported recent sex with a known HIV-positive (4.0%–6.1%) or IDU partner (5.9%–10.6%); however, larger proportions reported not knowing whether any of their partners had HIV or injected drugs (see Table 1).

### Lifetime and 6-Month Drug Use

Reported lifetime use of injection drugs varied among racial/ethnic groups ( $P < 0.001$ ), with 3.1% of blacks reporting use compared with approximately 6% of Latinos and multiethnic blacks and 9.9% of whites. With the exception of multiethnic blacks, fewer than half of the IDU subjects in each group reported having ever shared needles.

Uppers/amphetamines/speed were the stimulants reported most frequently by all racial/ethnic groups, including

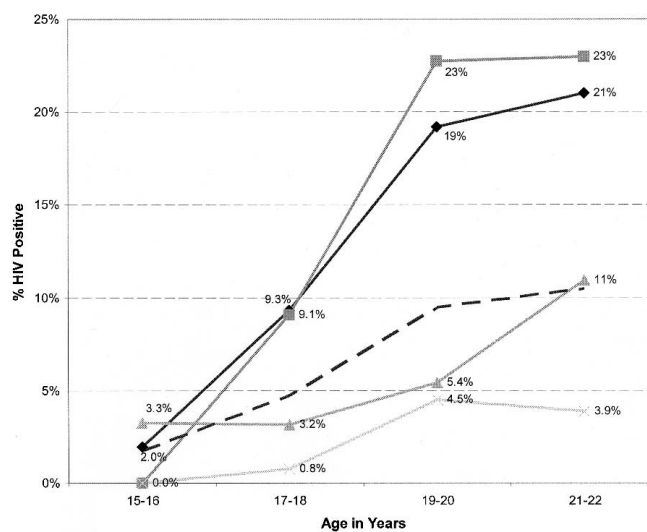
more than 40% of whites and Latinos, 28.9% of multiethnic blacks, and just 16.2% of blacks ( $P < 0.001$ ). This pattern of relatively high levels of reported lifetime drug use among whites and Latinos, relatively low levels among blacks, and intermediate levels among multiethnic blacks was also seen for powder and crack cocaine and nitrite inhalants (see Table 1). Close to 2% of respondents reported having sex in the past 6 months while high or buzzed on crack cocaine; this percentage did not differ by race/ethnicity. Approximately 8% reported having sex under the influence of nitrite inhalants, amphetamines, or powder cocaine, with racial/ethnic distributions similar to the lifetime patterns described previously.

### Bivariate Associations With HIV and Race/Ethnicity

HIV prevalence varied dramatically by race and ethnicity, from 16% among black and multiethnic black respondents to 6.9% among Latino and 3.3% among white respondents ( $P < 0.001$ ). As seen in Figure 2, age was strongly associated with HIV prevalence, ranging from just 1.7% HIV infected among participants aged 15 to 16 years to 10.5% HIV infected among participants aged 21 to 22 years. None of the white participants less than 18 years old tested HIV positive, whereas 4.9% (6/123) of young blacks, 4.9% (2/41) of young multiethnic blacks, and 2.3% (3/130) of young Latinos tested HIV positive. For all groups, HIV prevalence rose more than 60% between the ages of 17 to 18 years and 19 to 20 years.

### Age-Adjusted Associations With HIV Risk

Compared with whites, the age-adjusted odds of HIV infection were 7.8 and 9.5 times higher for blacks (95% con-



**FIGURE 2.** HIV seroprevalence by age reported among 3316 black, multiethnic black, Latino, and white men who have sex with men respondents aged 15 to 22 years to the Young Men's Survey (7 US cities, 5/24/94–10/20/98). Black (◆), multiethnic black (■), Latino (▲), white (○), and everyone (○).

**TABLE 2.** Age- and Fully Adjusted Estimates for the Associations of HIV With Race, Age, Sexual Behaviors, and Lifetime Drug Use Among 2929 Black, Latino, and White MSM Respondents to the Young Men’s Survey (7 US cities, 5/24/94–10/20/98)

Covariate	Age-Adjusted		Fully Adjusted*	
	OR	95% CL	OR	95% CL
<b>Demographic</b>				
Race or ethnicity (vs. white/Caucasian)				
Black/African American	7.8	5.1, 12	9.1	5.4, 15.3
Multiethnic black/Caribbean	9.5	5.4, 17	10.2	5.2, 20.0
Latino/Hispanic	2.4	1.5, 3.8	1.9	1.1, 3.3
Age in years (by 2)	1.6	1.3, 1.9	1.6	1.3, 2.0
Parents’ highest educational level (graduate/professional school vs. all other)				
Currently homeless	2.5	1.2, 4.9	0.91	0.36, 2.3
Currently in school/working	0.42	0.31, 0.58	0.64	0.43, 0.95
At expected grade level for age	0.46	0.32, 0.65	0.79	0.50, 1.2
<b>Sex-related</b>				
In past 6 months, number of†				
Exchange partners (by 10)	1.1	0.98, 1.1	0.81	0.64, 1.0
Nonsteady partners (by 10)	1.1	0.97, 1.3	1.1	0.88, 1.3
Steady partners (by 4)	1.1	0.84, 1.4	0.72	0.48, 1.1
In past 6 months, sex with a				
Known HIV-positive person vs. no	1.6	1.0, 2.5	1.3	0.75, 2.3
Known injection drug user vs. no	1.1	0.73, 1.7	0.61	0.33, 1.1
<b>Drug-related</b>				
In lifetime, ever used (vs. never used)				
Injection drugs	1.8	1.1, 2.9	0.95	0.39, 2.3
Shared needles for drug injection	2.9	1.5, 5.5	6.8	2.1, 22
In past 6 months, high/buzzed on drug during sex (vs. never used drug)				
1.2	0.76, 1.9	0.83	0.46, 1.5	
Amphetamines				
Powder cocaine	1.4	0.90, 2.2	1.3	0.78, 2.1
Crack cocaine	4.0	2.1, 8.0	3.3	1.1, 9.8
Nitrite inhalants (poppers)	1.6	1.0, 2.4	1.5	0.71, 3.0

\*Model also controls for study site (Baltimore, Dallas, Los Angeles, Miami, New York, San Francisco, and Seattle), lifetime drug use, number of lifetime sexual partners, years since first anal sex, and the partner type-specific condom use levels in Table 3.

†To make the effect estimates associated with the numbers of each partner type more meaningful,<sup>54</sup> we rescaled the variables. Different scales were chosen because respondents tended to report higher numbers and ranges of nonsteady and exchange rather than steady partners. An OR of 1.1 for exchange partners corresponds to a 10% increase in the relative odds of infection for every 10-partner increase in number of exchange partners.

confidence limits [CL]: 5.1, 12) and multiethnic blacks (95% CL: 5.4, 17), respectively, and 2.4 times higher for Latinos (95% CL: 1.5, 3.8; Table 2). Because HIV infection was so common among the black participants, these adjusted odds ratios (ORs) cannot be interpreted to mean that blacks are more than 8 to 10 times more likely to have HIV but do reveal a many times greater occurrence of infection among black than white MSM. Odds of infection increased about 60% with every 2-year increase in age. Positive age-adjusted associations with HIV were observed for current homelessness, sex with an HIV-

positive partner, sex while on crack cocaine or nitrite inhalants, and injection drug use. Associations with being currently employed or in school and being at or above the expected grade level were protective (see Table 2).

The associations of HIV infection with partner type-specific 6-month condom use for anal sex are shown in Table 3. Across partner types, higher age-adjusted odds of infection are seen comparing those who inconsistently used condoms with those who always used condoms but, contrary to expectation, not when comparing those who never used condoms

**TABLE 3.** Age and Fully Adjusted Estimates for the Associations of HIV With Level of Partner Type–Specific Condom Use in Past 6 Months Among 2929 Black, Latino, and White MSM Respondents to the Young Men’s Survey (7 US cities, 5/24/94–10/20/98)

	Age-Adjusted		Fully Adjusted*	
	OR	95% CL	OR	95% CL
Level of unprotected receptive anal sex with				
Exchange partners				
Used condoms never vs. always	0.55	0.11, 2.7	1.5	0.21, 10
Used inconsistently condoms vs. always	1.3	0.55, 2.9	0.58	0.18, 1.9
No anal sex vs. used condoms always	0.32	0.17, 0.58	1.0	0.45, 2.5
Nonsteady partners				
Used condoms never vs. always	0.62	0.24, 1.6	0.81	0.28, 2.3
Used condoms inconsistently vs. always	1.6	1.0, 2.7	1.4	0.76, 2.7
No anal sex vs. used condoms always	0.83	0.58, 1.2	0.87	0.55, 1.4
Steady partners				
Used condoms never vs. always	0.79	0.48, 1.3	0.86	0.42, 1.8
Used condoms inconsistently vs. always	1.1	0.76, 1.7	1.4	0.81, 2.3
No anal sex vs. used condoms always	0.56	0.40, 0.79	0.55	0.35, 0.85
Level of unprotected insertive anal sex with				
Exchange partners				
Used condoms never vs. always	0.69	0.14, 3.3	0.70	0.10, 4.8
Used condoms inconsistently vs. always	2.4	1.1, 5.2	1.4	0.46, 4.3
No anal sex vs. used condoms always	0.44	0.25, 0.76	0.46	0.23, 0.95
Nonsteady partners				
Used condoms never vs. always	0.91	0.37, 2.2	1.5	0.53, 4.3
Used condoms inconsistently vs. always	1.7	1.0, 2.9	1.3	0.69, 2.5
No anal sex vs. used condoms always	1.1	0.74, 1.5	1.4	0.86, 2.2
Steady partners				
Used condoms never vs. always	0.96	0.58, 1.6	1.0	0.51, 2.1
Used condoms inconsistently vs. always	1.0	0.67, 1.6	0.63	0.35, 1.1
No anal sex vs. used condoms always	0.84	0.59, 1.2	0.65	0.41, 1.0

\*Model also controls for study site (Baltimore, Dallas, Los Angeles, Miami, New York, San Francisco, and Seattle), lifetime drug use, number of lifetime sexual partners, years since first anal sex, and all variables in Table 2.

with those who always used condoms. Those who did not have any anal sex with the partner type generally had the lowest age-adjusted odds of infection.

### Fully Adjusted Associations With HIV Risk

Adjustment for the risk factors of interest did not reduce the HIV ORs when comparing those of black racial backgrounds with whites and resulted in only a 21% attenuation of the OR when comparing Latinos with whites (age-adjusted OR = 2.4, fully adjusted OR = 1.9; see Table 2).

Compared with the age-adjusted results, the positive associations of recent sex with HIV-positive, exchange, and nonsteady partners weakened, as did the negative associations with expected grade level. Current homelessness was not as-

sociated with HIV infection in the fully adjusted regression analysis. Sex while high on crack cocaine was the 6-month behavior with the strongest positive association with HIV. Number of lifetime of partners, years since first anal sex, and sharing needles for drug injection were also positively associated with HIV.

In the fully adjusted model, the protective association with reporting no anal sex (as compared with consistent condom use) remained for receptive and insertive sex with steady partners and for insertive sex with exchange partners. As observed in the age-adjusted analyses, positive but imprecise associations were observed among persons who inconsistently used condoms with steady and nonsteady partners compared with consistent condom users (see Table 3). In a separate

analysis (not shown), we found a very high relative odds of infection comparing participants who used condoms inconsistently or not at all 6.1 (95% CL: 2.4, 15.6) and participants who always used condoms 5.2 (95% CL: 2.0, 13.3) with those reporting no anal sex.

### Potential Misreporting

Interviewers indicated that they had “some doubts” about the respondents’ answers for just 5.3% of all records included here. Doubts in confidence varied little by race, occurring among 6.3%, 5.5%, 4.3%, and 5.3% of surveys with black, multiethnic black, Latino, and white respondents, respectively ( $P = 0.31$ ).

Sensitivity analyses were calculated to evaluate further the potential effect of misreporting. First, we examined how severe exaggeration of condom use would affect the adjusted ORs, comparing blacks and Latinos with whites by imputing lower condom use levels for each group. Specifically, all members of each race/ethnicity were separately converted from always users to inconsistent users or from inconsistent users to never users, and the multiple regression analyses were recalculated. The resulting ORs for each race/ethnicity differed by less than 8% compared with the original ORs. Second, we examined the potential effect of misreporting of recent sex with known HIV-positive partners. Assuming a sensitivity of just 50% for correctly classifying HIV-positive partners among HIV-positive participants and 100% among HIV-negative participants, HIV-positive participants reporting no known HIV-positive partners were randomly reassigned HIV-positive partners (specificity assumed to be 100% for both groups). Multiple regressions were again run separately for each race/ethnicity using the reclassified data. The resulting race/ethnicity ORs each differed by less than 2% compared the original ORs.

## DISCUSSION

### Race/Ethnicity

Contrary to our hypothesis, substantial racial and ethnic disparities in the odds of HIV infection remained after adjustment for the risk factors of interest. The racial/ethnic distribution of these risk factors reveals, however, that this is what one should expect in our multivariate analyses, given that blacks reported similar or substantially lower risk factor levels than did whites, whereas Latinos reported similar risk behaviors and somewhat lower SES than whites.

One possible explanation for the persistent racial disparities may relate to race-specific patterns of sexual networks not captured in the YMS data. For example, at least 3 studies have indicated that transfer of HIV infection from older to younger cohorts of men perpetuates the HIV epidemic among young MSM.<sup>15–17</sup> Because older gay cohorts have higher HIV prevalences,<sup>17,18</sup> older partners are more likely to be infected.

Three studies indicate that black MSM are more likely than other men to have partners of a different age than themselves (Bingham T. Gay Urban Men’s Health Study 2001, unpublished data)<sup>19,20</sup> or to initiate their homosexual activity with an older man.<sup>19</sup> In addition, black MSM are more likely than other MSM to have black sexual partners<sup>20</sup>; hence, their partner pool likely has a high background HIV prevalence. Our data on respondents’ partners did not take these factors into account.

Knowledge of one’s HIV serostatus has been shown to be low among YMS study participants, particularly among black study participants, of whom only 7% of those testing HIV antibody-positive reported a previous HIV diagnosis.<sup>21</sup> Lack of awareness of one’s HIV infection likely contributes to greater levels of unprotected sex with serodiscordant partners among black MSM. Although relatively few black participants reported HIV-positive partners, knowledge of their partners’ HIV status was likely inaccurate, given that few black HIV-infected participants were aware of their own HIV status. Nevertheless, our sensitivity analysis revealed that even a substantial increase in recent sex with positive partners does not account for the observed racial/ethnic disparities.

Another possible explanation for the contradictory data on HIV and risk factor prevalence in these data relates to unmeasured sexual behaviors such as anal sex frequency. For example, black and Latino MSM may be at greater infection risk than whites because a greater proportion of their sexual encounters involve anal sex, which poses the highest HIV transmission risk. Although few published studies report this information, we identified 2 in which black MSM were more likely than white MSM to report anal sex and less likely to report oral sex or mutual masturbation.<sup>19,22</sup> Magana et al<sup>23</sup> and Carrier<sup>24</sup> have identified qualitative evidence of a similar preference among Mexican MSM. Unfortunately, none of these data are recent. Although total numbers of oral and anal sex partners were similar across groups, greater proportions of the Latino and black participants’ partners may have been anal sex partners than was the case for whites. Consistent with this hypothesis is the earlier age at anal (but not oral) sex initiation among the black than white participants and the white participants’ greater propensity toward exclusively oral sex in the past 6 months.

Finally, biologic differences may contribute to increased levels of HIV transmission and susceptibility among the black and Latino YMS participants. These may include genetic differences such as a lower prevalence of homozygous and heterozygous CCR5 delta delete alleles that can promote resistance through nonfunctional CCR5 receptor sites, which can block the HIV virus from entering CD4<sup>+</sup> cells,<sup>25,26</sup> or physiologic differences such as a lower prevalence of circumcision.<sup>27</sup> A US study composed of more than 60% MSM found that the CCR5 mutation was 5 times more common among whites than blacks and Latinos.<sup>25</sup> Other data indicate that cir-



cumcision rates among the cohort of newborns represented in YMS (born 1972–1983) were 11% to 14% higher among whites than blacks<sup>28,29</sup> and up to 50% higher among whites than Latinos.<sup>29</sup>

Research on the reliability and validity of self-reported sexual behaviors and condom use has shown mixed results,<sup>30–33</sup> and few studies have focused on MSM or on racial differences. Our examination of interviewer confidence did not provide evidence that misreporting by any particular group contributed to our inability to account for the racial/ethnic disparities in these data. An analysis of the Los Angeles YMS data found a low rate of detectable errors,<sup>34</sup> and our sensitivity analysis indicated that even large-scale misreporting of condom use and recent sex with HIV-infected partners does not account for the racial/ethnic disparities. These findings further support the validity of the YMS data.

### Respondent Age

As expected, older participants were more likely to be HIV-positive than were younger participants, although, the positive association with age does not appear to be solely due to increasing numbers of sexual partners over time. The OR associated with age remained largely unchanged in the full model that controlled for lifetime number of partners and number of years since first intercourse with men. Older YMS participants may have also been more likely than younger participants to be exposed to HIV infection by older male partners.

### Socioeconomic Status

We found important associations between SES indicators and HIV. Others have found lower HIV prevalence with increasing education<sup>9,35</sup> and current school enrollment<sup>5</sup>; we found lower prevalence among those both currently in school and at the expected grade level or employed and among those with a parent at the highest educational level. Low SES has been associated with numerous negative health outcomes, particularly infectious diseases, and at the neighborhood or zip code level with reported AIDS rates.<sup>36,37</sup>

### Sexual Behaviors

As expected, HIV risk differed by reported partner type and partner-specific condom use; however, consistent condom use did not always appear protective compared with inconsistent use or nonuse. Persons who did not report anal sex in the previous 6 months had the lowest risk, even when compared with those who always used condoms. This was most consistently observed for sex with steady partners. Given that participants were more likely to report sex with a steady partner than with an exchange or nonsteady partner and that steady partnerships involved at least 3 sexual encounters, a significant amount of HIV transmission may occur within these partnerships. Researchers in Amsterdam identified a similar pattern among young MSM in the middle to late 1990s.<sup>38</sup>

Sex with HIV-infected partners was only associated with seropositivity in the age-adjusted model, and sex with IDU and exchange partners showed little association with seropositivity. Perhaps the increased risk associated with these partner types was offset by a greater tendency toward oral (rather than anal) sex and toward careful condom use for anal sex.

### Substance Use

Compared with whites, we found the lowest levels of stimulant use among blacks, followed by multiethnic blacks and Latinos. These data are consistent with national surveys of young people.<sup>39</sup> As expected and consistent with previous research, crack cocaine use,<sup>35,40,41</sup> sex while high on crack cocaine, and sharing needles for drug injection<sup>1,2,5,6</sup> were strongly associated with HIV infection. Contrary to expectation, having sex while high on uppers/speed/amphetamines was not associated with HIV after full adjustment. Others have found methamphetamines to be associated with unprotected sex,<sup>42,43</sup> condom failure,<sup>44</sup> and HIV infection among MSM.<sup>45,46</sup> Our failure to observe the same could be due to chance.

### Limitations

YMS limitations include its incomplete information on sexual behaviors, reliance on self-report, and cross-sectional study design. As already discussed, numbers of anal sex acts and partners were not separately quantified, thereby presenting a major limitation. Condom failure or misuse was also not reported and may have been common, given the respondents' young age and fairly recent initiation of anal sex as well as the inconsistent findings regarding associations between condom use and HIV status. Poor recall, concerns about stigma, and cultural differences in language use<sup>47–49</sup> may have led to differential misreporting of risk behaviors. Study interviewers, however, reported few problems with survey questions, were generally confident in respondents' answers, and represented a diversity of races/ethnicities. Finally, a large proportion of the sampled population was not surveyed because the potential respondent refused the intercept (12%) or the interview once offered participation (38%).

Our findings may be generalizable to young MSM who are like those examined here—those who reside in US urban centers and who socialize in areas or businesses frequented by large numbers of other young MSM. Because the YMS sampling areas tended to be located in areas of the county or borough where the residents were predominantly white, YMS data may be generally less representative of MSM of color. For example, some research indicates that black MSM frequently socialize in informal nongay-identified settings<sup>50,51</sup> and that significant proportions of Latino MSM do not attend gay-identified settings.<sup>52</sup>

## CONCLUSIONS

The inability here and elsewhere<sup>1,2,5,9,53</sup> to account for racial differences in HIV prevalence among young men is troubling. Our findings call into question the assumption that homosexual and bisexual men of color are at elevated risk for HIV because they have not responded to or been reached by existing HIV prevention efforts. According to self-report, black and Latino men do not appear to be at higher risk because they are more likely than white men to have more partners, have unprotected sex, have sex with nonsteady or exchange partners, use stimulants, or inject drugs. Although levels of adherence to prevention can be greatly improved among all young MSM, these data suggest that the elevated risk among MSM of color may result from processes more complex than a higher likelihood of unprotected sex or drug use.

Given the high HIV prevalence among the 17- and 18-year-old men of color surveyed and the dramatically higher prevalence among men aged 19 and 20 years, targeted efforts to prevent further spread of HIV among MSM and their partners, both male and female, should start in early adolescence. Implementation of effective interventions at this developmental stage requires overcoming numerous political challenges and employing culturally relevant approaches and materials. Prevention efforts should further specifically address HIV risk in steady partnerships, given that anal sex with steady partners emerged in these data and elsewhere as an important potential risk factor. Unprotected sex among uninfected monogamous partners is not risky for HIV transmission. Nevertheless, it is unlikely that most of the young MSM sampled had established both that their relationship was mutually monogamous and that their partners, or themselves in some cases, did not have HIV before initiating unprotected anal sex. Venue-based strategies could be used to recruit young MSM, particularly those who are unemployed and out of school, into prevention programs.

Future research on HIV in MSM populations should explicitly address alternative hypotheses for racial/ethnic disparities by examining the age and racial/ethnic makeup of the respondents' sexual networks, measuring potential misreporting with questions that assess participants' tendencies to provide inconsistent and socially desirable responses, and employing qualitative techniques to identify other influences on HIV risk. Venue selection can be expanded and recruitment methods enhanced to help increase participation and ensure inclusion of a representative sample of each racial/ethnic group, and race/ethnic-specific studies can be conducted to provide sufficient numbers for within-group comparisons.

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