

# Unrecognized HIV Infection, Risk Behaviors, and Perceptions of Risk Among Young Men Who Have Sex With Men

## *Opportunities for Advancing HIV Prevention in the Third Decade of HIV/AIDS*

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**Summary:** This study evaluated the magnitude and distribution of unrecognized HIV infection among young men who have sex with men (MSM) and of those with unrecognized infection, the prevalence and correlates of unprotected anal intercourse (UAI), perceived low risk for infection, and delayed HIV testing. MSM aged 15–29 years were approached, interviewed, counseled, and tested for HIV at 263 randomly sampled venues in 6 US cities from 1994–2000. Of 5649 MSM participants, 573 (10%) tested positive for HIV. Of these, 91% of black, 69% of Hispanic, and 60% of white MSM (77% overall) were unaware of their infection. The 439 MSM with unrecognized infection reported a total of 2253 male sex partners in the previous 6 months; 51% had UAI; 59% perceived that they were at low risk for being infected; and 55% had not tested in the previous year. The HIV epidemic among MSM in the United States continues unabated, in part, because many young HIV-infected MSM are unaware of their infection and unknowingly expose their partners to HIV. To advance HIV prevention in the third decade of HIV/AIDS, prevention programs must reduce unrecognized infection among young MSM by increasing the demand for and availability of HIV testing services.

**Key Words:** unrecognized HIV infection, young men who have sex with men

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At the beginning of the third decade of the HIV/AIDS epidemic in the United States, more cases of AIDS are reported among men who have sex with men (MSM) than among any other group.<sup>1</sup> Outbreaks of syphilis and gonorrhea among MSM in several cities,<sup>2–4</sup> coupled with high prevalence and incidence of HIV infection<sup>5–9</sup> and the first increase in reported HIV cases after several years of decline,<sup>10</sup> underscore concerns about increasing HIV transmission among MSM.<sup>11</sup>

In response to the unabating HIV epidemic among MSM and other persons at risk for infection, the Centers for Disease Control and Prevention (CDC) announced in 2003 a new set of prevention strategies to reduce HIV transmission in the United States.<sup>12</sup> Foremost among these strategies is to expand testing to increase the proportion of HIV-infected persons who are aware of their infection.<sup>12</sup> This strategy is based on the fact that many persons who know they are infected access care and benefit from advancements in the treatment of HIV disease,<sup>13</sup> take steps to reduce transmission to others,<sup>14–17</sup> and inform partners of potential exposure risks.<sup>18–19</sup>

To effectively use resources to implement this strategy, prevention programs need information on which MSM are at highest risk for unrecognized infection, and among those with unrecognized infection, where they might be tested, factors that influence their decision to test, and their exposure risks to partners who might be reached through partner counseling and referral services. However, with the exception of one report, the magnitude and distribution of unrecognized infection among MSM in the United States are unknown.<sup>20</sup> Moreover, despite considerable research on the prevalence and correlates of HIV testing<sup>21–28</sup> and sexual exposure risks of MSM,<sup>29–34</sup> no reports have focused on MSM with unrecognized infection.

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To help address these prevention needs, we used data from 2 phases of CDC's Young Men's Survey (YMS) to evaluate the magnitude and distribution of unrecognized HIV infection among young MSM. Of those with unrecognized infection, we investigate their use of health care and attendance at public venues where testing might be expanded, and evaluate the prevalence and correlates of delayed testing, low perceived risk for infection, and exposure risks through unprotected anal intercourse (UAI).

## METHODS

### Sampling Procedure

YMS methods have been previously described.<sup>5,7,20,27,35</sup> In summary, YMS was a 2-phase, cross-sectional anonymous survey of men who attend MSM-identified venues in Baltimore, MD; Dallas, TX; Los Angeles, CA; Miami, FL; New York, NY; and Seattle, WA. Identical methods were used in each phase with the exception that men 15–22 years of age were recruited in phase 1 (1994–1998), and men 23–29 years of age were recruited in phase 2 (1998–2000). Venues were identified from advertisements, individual and group interviews, and field observations. Based on these observations, sampling frames were constructed of venues and day-time periods where a minimum of 7 eligible men might be encountered during a 4-hour sampling event.

Each month,  $\geq 12$  venues and their associated day-time periods were randomly selected from updated sampling frames. These venues and periods were then scheduled for sampling in the upcoming month. During sampling events, recruiters consecutively approached and asked men who appeared  $< 30$  years of age to participate in a brief eligibility interview. Eligibility criteria included residing in a locally defined county or borough, being the appropriate age, and having never previously participated in the current research phase.

In a nearby van or office location, trained interviewers obtained informed consent from participants, administered a standard questionnaire, conducted prevention counseling, and obtained blood specimens for HIV testing. Participants were reimbursed \$40–\$50 for their time and were scheduled to receive their test results within 2 weeks. Specimens were tested for HIV at local laboratories with assays licensed by the Food and Drug Administration. Participants who returned for their test results were provided risk-reduction counseling and referrals for health care as needed. Finally, antibody-profile assays were used to test specimens of suspected duplicate participants.<sup>36</sup> When antibody profiles matched, only data from the first interview and specimen were analyzed.

Interviewers rated their confidence in the validity of the participant's answers after each interview. The following criteria were used to code records with low confidence: contradictory responses throughout the interview, open hostility toward interviewers, or impaired judgment from alcohol or drugs. Records coded as having low interviewer confidence were removed from analyses. The YMS protocol was approved by institutional review boards at CDC and at state and local institutions that conducted the survey.

### Measures

A standard questionnaire was used in all cities during each survey phase but was modified between phases. Unless noted, identical or nearly identical measures were used for both phases. Both questionnaires measured a core set of sociodemographic characteristics and lifetime and recent (past 6 months) sexual behaviors. Sex was defined as oral, vaginal, or anal. UAI was defined as not using a condom during at least 1 occurrence of anal intercourse (insertive or receptive) with a male partner. All participants were asked whether they had ever been tested for HIV and reasons for not having been tested previously (if applicable). For previous testers, we asked the number of times tested and the month, year, and results of their most recent test. Participants who tested HIV positive as part of YMS and who reported not ever previously testing positive were defined as having unrecognized HIV infection (infected-unaware). Participants who reported having never previously tested for HIV or having previously tested  $> 1$  year prior to participation were defined as delayed testers. We used a 1-year period because national guidelines recommend that at-risk MSM test for HIV at least annually.<sup>37</sup> In phase 2, participants were asked if they had received any counseling at their previous test within the past year and if anyone at their regular source of health care ever discussed their need for HIV testing.

In phase 1, perceived risk for being infected was measured with the following question: "Which of the following describes how likely it is that you are infected with HIV today?" Participants who answered "No chance of it," "Very unlikely," or "Unlikely" were defined as having low perceived risk, and participants who answered "Likely" or "Very likely" were defined as having moderate to high perceived risk. In phase 2, low perceived risk for being infected was measured with the following question: "Using this card, choose a number that best describes how likely it is that you are HIV positive today." Participants who answered "Very unlikely" or "Unlikely" were defined as having low perceived risk and participants who answered "Somewhat likely," "Likely," or "Very likely" were defined as having moderate to high perceived risk. In phase 1, perceived risk for becoming infected was measured on a 5-point scale (1 = "Do not agree" to 5 = "Strongly agree") with the following question: "There is little chance that I could become infected with HIV, or infect others, from what I do sexually." Participants who answered 4 or 5 were defined as having low perceived risk and participants who answered 1–3 were defined as having moderate to high perceived risk. In phase 2, perceived risk for becoming infected was measured on a 5-point scale (1 = "Very unlikely" to 5 = "Very likely") with the following question: "Using this card, choose a number that best describes how likely it is that you will become HIV positive in your lifetime." Participants who answered 1 or 2 were defined as having low perceived risk and participants who answered 3–5 were defined as having moderate to high perceived risk.

### Analyses

Among MSM who tested HIV positive, we report the proportion with unrecognized infection by city, age group, and

race/ethnicity. We evaluated variables associated with (1) unrecognized infection comparing infected-unaware with non-infected MSM, and among infected-unaware MSM alone, variables associated with (2) delayed testing, (3) perceived low risk for infection, and (4) UAI. For each of these 4 analyses, we first used the Mantel-Haenszel (MH)  $\chi^2$  test to identify statistically significant ( $P < 0.05$ ) associations controlling for city. Because Breslow-Day test results suggested that associations were homogeneous, we pooled the data from all cities. We next used logistic regression to identify factors independently associated with each of the 4 outcomes.<sup>38</sup> For each analysis, we included in the model city, age group, race, and all variables that were moderately associated ( $P < 0.25$ ) in our univariate analyses. Full models were then reduced by the stepwise elimination of insignificant variables with the exception of city, age group, race, and important confounders. We assessed the fit of models using the Hosmer and Lemeshow goodness-of-fit test.<sup>38</sup> For all other analyses reported in the text, we used the MH  $\chi^2$  test controlling for city. All analyses were performed using Statistical Analysis Software (SAS) version 8.2 (SAS Institute, Inc., Cary, NC).

## RESULTS

### Sampling Outcomes

At 263 venues in the 6 cities, staff enrolled 6556 (59%) men of 11,156 who were identified as eligible. Young men

aged 15–20 years were more likely to participate than men aged 21–29 years (65 vs. 56%,  $P < 0.01$ ). Compared with white men, men of mixed race were more likely to participate (68 vs. 57%,  $P < 0.01$ ) and men of Asian race were less likely to participate (48 vs. 57%,  $P < 0.01$ ). Of the 6556 participants, the following were removed from analyses: 178 (3%) duplicates; 52 (1%) who reported data judged by interviewers to be invalid; 116 (2%) who reported never having sex; and 489 (7%) who reported never having sex with men. Of the remaining 5721 MSM, analyses were restricted to 5649 (99%) who had complete HIV laboratory results.

The 5649 participants were recruited at dance clubs (28%); street locations (25%); bars (14%); health clubs, cafes, and retail businesses (12%); gay youth and other social organizations (8%); parks (4%); adult bookstores and bath-houses (3%); and other venues such as gay pride (6%). Recruitment outcomes and sociodemographic characteristics of these participants are provided in Table 1.

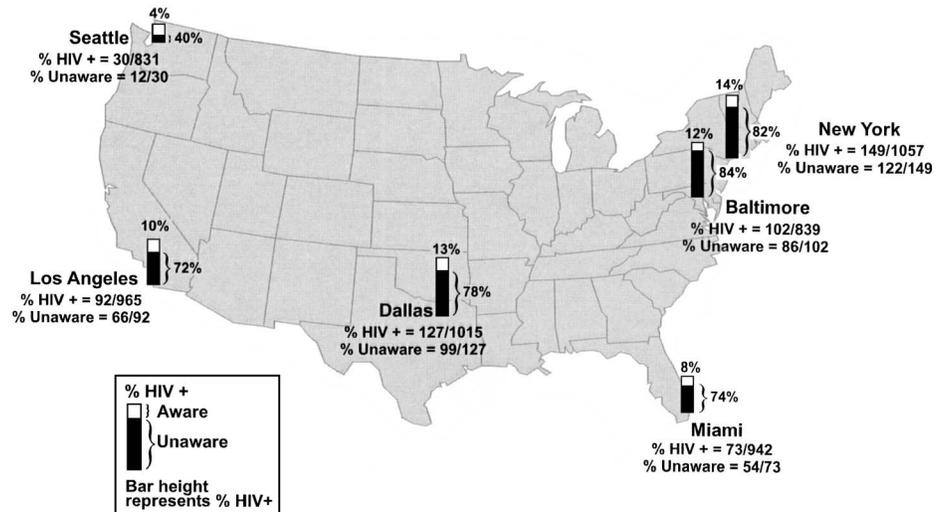
### Magnitude and Distribution of Unrecognized Infection

Of the 5649 MSM, 573 (10%) tested positive for HIV. Of these, 439 (77%) were unaware that they were HIV infected. The proportion of infected men who were unaware of their infection varied by city, age group, and race/ethnicity (Figs. 1 and 2). For both phases combined, 91% of black, 69% of Hispanic, and 60% of white HIV-infected MSM were

**TABLE 1.** Recruitment Outcomes and Sociodemographic Characteristics of MSM Participants, by City

Characteristic	Baltimore	Dallas	Los Angeles	Miami	New York	Seattle	All
Recruitment							
Venues, n	25	34	59	53	47	45	263
Participation rate, %*	58	54	56	66	62	57	59
Enrolled, n	839	1015	965	942	1057	831	5649
Race/ethnicity, %							
Asian	3	2	8	2	5	9	5
Black	35	17	11	12	35	8	20
Hispanic	4	23	36	58	38	6	28
White	55	56	41	27	18	72	44
Mixed/other	3	2	5	1	5	5	3
Age, %							
15–22	42	52	52	51	50	44	49
23–29	58	48	48	49	50	56	51
Education, %							
≤High school	34	38	39	44	47	31	39
At least some college	66	62	61	56	53	69	61
Employment, %							
Unemployed	18	19	31	27	32	19	25
Part or full time	82	81	69	73	68	81	75
Living situation, %							
Parents/relatives	33	26	29	36	44	17	31
Alone/friends/lovers	64	71	66	62	51	77	65
School/other	3	3	3	2	2	4	3
Homeless	0	<1	3	0	3	2	1

\*Among men identified as eligible.



**FIGURE 1.** Prevalence of HIV infection among 15- to 29-year-old MSM and proportion unaware of their infection, 6 US cities, 1994–2000.

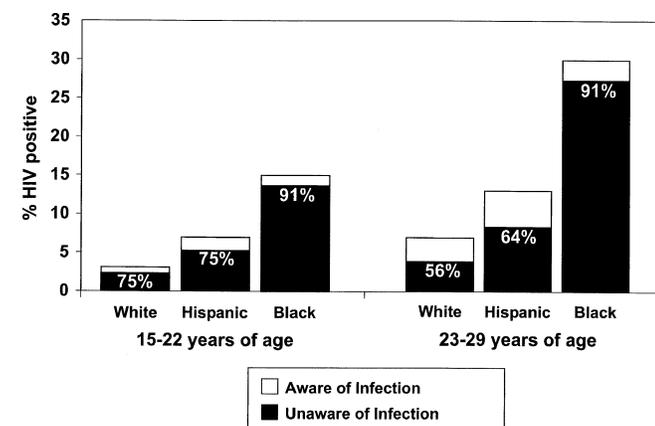
unaware of their infection. Compared with noninfected MSM, infected-unaware MSM were more likely to be residents of cities other than Seattle; older (phase 2 participants); black, mixed race, or Hispanic; less educated; and out of school (Table 2). Within each study phase, older age remained significantly associated with being infected-unaware (data not shown).

**HIV Testing Practices and Correlates of Delayed Testing**

Of the 5649 MSM, 4370 (77%) had tested previously (median number of tests: 2; interquartile range: 1–4). Of the 4037 (71%) MSM who reported that their most recent test result was negative, 8% were found to be HIV infected (by race: 3% among Asians, 4% among whites, 7% among Hispanics, and 21% among blacks). Of the 439 infected-unaware MSM, 360 (82%) had tested previously (median number of tests: 2; interquartile range: 1–4), and 323 (74%) reported that their most recent test result was negative, 4 (<1%) indeterminate, 32 (7%) unknown, and 1 (<1%) refused to answer.

Similar proportions of infected-unaware and noninfected MSM had delayed testing (55 vs. 48%) (Table 2). Among 241 infected-unaware MSM who delayed testing, 79 (33%) had never previously tested and 162 (67%) had last tested >1 year ago. Delayed testing among infected-unaware MSM was associated with perceived moderate to high risk for being infected, not using a regular source of health care, and less than monthly attendance at MSM-identified clubs (Table 3).

Among men who had never previously tested, proportionally more infected-unaware (n = 79) than noninfected MSM (n = 1200) reported not ever testing because they feared learning their results (65 vs. 38%, P < 0.01). In phase 2, high proportions of both infected-unaware (n = 113) and noninfected (n = 1334) MSM who tested in the past year reported that they did not receive any counseling at their most recent HIV test (49 vs. 40%, P = 0.24).



**FIGURE 2.** Prevalence of HIV infection among 15- to 29-year-old MSM and proportion unaware of their infection, by age-group and race/ethnicity, 6 US cities, 1994–2000.

**Potential Locations to Expand Testing**

Similar high proportions of noninfected and infected-unaware MSM reported using a regular source of health care (Table 2). Of the 79 infected-unaware MSM who had never previously tested, 58 (73%) also reported using a regular source of health care. Of health care users in phase 2, no differences were observed in the reported number of provider visits since age 20 between infected-unaware (n = 161) and non-infected MSM (n = 1595) (for both groups, median: 5; inter-quartile range: 2–10). However, proportionally more infected-unaware than noninfected MSM reported that their provider had ever discussed whether they should be tested for HIV (69 vs. 55%; P < 0.01).

Compared with noninfected MSM, infected-unaware MSM were more likely to be recruited at bars, dance clubs, and other locations in MSM neighborhoods (Table 2). In phase 2, 32% of both noninfected (n = 2529) and infected-unaware (n = 271) MSM reported participating in YMS at these and other venues to obtain free tests for HIV and other sexually transmitted infections (STIs).

**TABLE 2.** Comparison of HIV-Infected Unaware and HIV-Negative MSM, 15–29 Years of Age in 6 US Cities, 1994–2000\*

Characteristic	HIV Infected Unaware (n = 439) %	HIV Negative (n = 5076) %	AOR†	95% CI†
<b>City</b>				
Seattle	3	16	Reference	—
Baltimore	20	15	3.4	1.8–6.6
Dallas	23	17	4.5	2.4–8.5
Los Angeles	15	17	3.3	1.7–6.3
Miami	12	17	2.6	1.3–5.1
New York	28	18	3.1	1.6–5.8
<b>Age group (study phase)</b>				
15–22 (phase 1, 1994–1998)	38	50	Reference	—
23–29 (phase 2, 1998–2000)	62	50	1.7	1.3–2.2
<b>Race/ethnicity</b>				
White	19	46	Reference	—
Asian	2	5	1.0	0.4–2.3
Hispanic	24	29	1.8	1.3–2.4
Mixed/other	4	3	3.7	2.1–6.5
Black	51	17	6.8	5.0–9.2
<b>Education</b>				
High school or less	51	38	Reference	—
At least some technical school or college	49	62	0.7	0.6–0.9
<b>Currently in school</b>				
No	77	65	Reference	—
Yes	23	35	0.7	0.6–0.9
<b>Employed</b>				
No	29	24	—	—
Yes	71	76	—	—
<b>Sexual identify</b>				
Straight	1	3	—	—
Gay/bisexual	92	94	—	—
Transgender	5	2	—	—
Unknown/refused	3	2	—	—
<b>Disclosure of sexual orientation</b>				
Out to very few or none	11	12	—	—
Out to at least some	89	88	—	—
<b>Never tested or previously tested &gt;1 year ago</b>				
No	45	52	Reference	—
Yes	55	48	1.3	1.0–1.6
<b>Use regular source of health care</b>				
Private MD or HMO	36	51	—	—
Other provider	36	26	—	—
Do not use or have a regular provider of care	28	22	—	—
<b>Recruitment venue</b>				
Social orgs./parks/other	8	19	Reference	—
Clubs/businesses/street locations	87	78	1.6	1.1–2.3
Adult bookstores/bathhouses	5	3	1.6	0.9–3.0
<b>Attend MSM clubs at least monthly</b>				
No	19	23	—	—
Yes	81	77	—	—
<b>Previous STI</b>				
No	66	82	Reference	—
Yes	34	18	1.6	1.2–2.0
<b>Low perceived risk for being HIV+</b>				
No	41	15	Reference	—
Yes	59	85	0.4	0.3–0.5

(continued on next page)

**TABLE 2.** (continued) Comparison of HIV-Infected Unaware and HIV-Negative MSM, 15–29 Years of Age in 6 US Cities, 1994–2000\*

Characteristic	HIV Infected Unaware (n = 439) %	HIV Negative (n = 5076) %	AOR†	95% CI‡
Low perceived risk for becoming HIV+				
No	56	39	Reference	—
Yes	44	61	0.6	0.5–0.8
Lifetime partners‡				
1–5	21	33	Reference	—
6–19	31	30	1.5	1.1–2.1
≥20	47	37	1.7	1.2–2.3
Exchange partner§				
No	86	92	—	—
Yes	14	8	—	—
Casual partner¶				
No	50	41	Reference	—
Yes	50	59	0.5	0.4–0.7
Steady partner#				
No	23	29	—	—
Yes	77	71	—	—
Anal intercourse (ever)				
No	10	23	Reference	—
Yes	90	77	2.3	1.6–3.3
UAI				
No	49	56	—	—
Yes	51	44	—	—
UAI with low risk partners**				
No	79	73	Reference	—
Yes	21	27	0.7	0.5–0.9
Female partner††				
No	86	84	Reference	—
Yes	14	16	0.8	0.5–1.2
UI with female partners††				
No	93	91	Reference	—
Yes	7	9	0.7	0.4–1.2
Inject drugs (ever)				
No	90	94	Reference	—
Yes	10	6	1.7	1.2–2.5

\*Baltimore, MD; Dallas, TX; Los Angeles, CA; Miami, FL; New York, NY; and Seattle, WA.

†Reported for variables that remained in the reduced logistic regression model predicting unrecognized HIV infection (see “Methods”). All variables in the table were included in the initial full model. Model demonstrated adequate fit based on the goodness-of-fit test ( $P > 0.05$ ).

‡Unless noted, sexual behavior was measured with male partners only in the 6 months preceding the survey interview.

§Partners with whom the participant exchanged sex for drugs, money, or other commodities.

¶Partners considered to be nonsteadies, “pickups,” or one-night stands. Excludes partners who exchanged drugs, money, or other commodities for sex.

#Partners considered to be regulars or lovers. Excludes partners who exchanged drugs, money, or other commodities for sex.

\*\*Reported by participant as either knowing that his partner was HIV negative or believing that he was at low risk for infection.

††In the 6 months preceding the survey interview.

AOR, adjusted odds ratio.

## Prevalence and Correlates of Perceived Low Risk for Infection

Of the 439 infected-unaware MSM, 258 (59%) perceived themselves at low risk for being infected and 193 (44%) perceived themselves at low risk for ever becoming infected. However, proportionally fewer infected-unaware than non-infected MSM perceived themselves at low risk for being or becoming infected (Table 2). Among infected-unaware MSM, perceived low risk for being infected was associated with being younger (phase 1 participants), having previously tested

HIV negative, never having an STI, having fewer lifetime male partners, and not having UAI in the 6 months preceding the survey interview (Table 3). Within each study phase, perceived low risk for being infected remained associated with younger age (data not shown).

## Prevalence of Risk Behaviors and Correlates of UAI

Proportionally more infected-unaware than noninfected MSM reported having >5 male partners and ever engaging in

**TABLE 3.** Sociodemographic and Behavioral Correlates Associated With Delayed Testing, Perceived Low Risk for Being HIV Infected, and Unprotected Anal Intercourse Among 439 15- to 29-Year-Old MSM With Unrecognized HIV Infection, 6 US Cities, 1994–2000\*

Characteristic	Part. n	Delayed Testing		Perceived Low Risk for Being HIV+		Unprotected Anal Intercourse	
		%	AOR† (95% CI)	%	AOR† (95% CI)	%	AOR† (95% CI)
<b>City</b>							
Seattle	12	58	Reference	50	Reference	58	Reference
Baltimore	86	56	0.7 (0.2–2.7)	53	0.8 (0.2–3.1)	47	1.0 (0.2–4.2)
Dallas	99	50	0.6 (0.2–2.2)	57	0.9 (0.2–3.5)	48	1.1 (0.3–4.3)
Los Angeles	66	54	0.6 (0.2–2.2)	59	1.2 (0.3–4.8)	62	1.8 (0.4–7.5)
Miami	54	70	1.5 (0.4–5.9)	64	1.2 (0.3–5.0)	48	1.0 (0.2–4.4)
New York	122	52	0.7 (0.2–2.5)	63	1.1 (0.3–4.5)	49	1.3 (0.3–5.6)
<b>Age group (study phase)</b>							
15–22 (phase 1, 1994–1998)	168	56	1.3 (0.8–2.0)	66	1.7 (1.0–2.7)	54	1.3 (0.8–2.1)
23–29 (phase 2, 1998–2000)	271	54	Reference	55	Reference	48	Reference
<b>Race</b>							
White	82	49	Reference	54	Reference	60	Reference
Asian	7	57	1.6 (0.3–7.8)	57	1.1 (0.2–6.2)	43	0.3 (0.1–2.1)
Black	225	54	1.6 (0.9–2.9)	61	1.0 (0.5–2.0)	45	0.7 (0.4–1.3)
Hispanic	105	61	1.7 (0.9–3.3)	59	1.0 (0.5–2.1)	54	0.7 (0.3–1.3)
Mixed/other	20	55	1.5 (0.5–4.4)	60	1.5 (0.4–5.2)	55	0.6 (0.2–2.0)
<b>Employed</b>							
Yes	311	53	—	60	—	48	Reference
No	128	59	—	56	—	58	1.7 (1.0–2.7)
<b>Sexual identity</b>							
Heterosexual/bisexual/other	126	56	—	63	—	45	Reference
Gay	313	54	—	58	—	53	1.8 (1.1–3.1)
<b>Attend MSM clubs at least monthly</b>							
Yes	356	53	Reference	58	—	51	—
No	83	64	1.8 (1.1–3.1)	65	—	47	—
<b>Perceived risk for being HIV infected‡</b>							
Low	258	50	Reference	—	—	41	Reference
Moderate or high	179	61	1.8 (1.2–2.7)	—	—	64	2.2 (1.4–3.4)
<b>Use regular source of health care</b>							
Yes	315	51	Reference	60	—	48	—
No	124	65	1.8 (1.1–2.9)	57	—	57	—
<b>Prior HIV status§</b>							
Unknown/indeterminate/refused	116	—	—	45	Reference	55	—
Negative	323	—	—	64	2.4 (1.5–4.0)	49	—
<b>Previous STI</b>							
Yes	148	56	—	39	Reference	55	—
No	291	54	—	69	2.6 (1.6–4.2)	48	—
<b>Lifetime partners¶</b>							
1–5	94	51	—	77	2.4 (1.3–4.6)	35	Reference
6–19	138	51	—	69	1.8 (1.0–3.1)	45	1.4 (0.8–2.5)
≥20	207	59	—	44	Reference	61	1.8 (0.9–3.4)
<b>Exchange partner#</b>							
No	377	53	—	62	Reference	48	Reference
Yes	62	65	—	41	0.7 (0.4–1.3)	68	1.8 (0.9–3.7)
<b>Casual partner**</b>							
No	219	55	—	67	Reference	41	Reference
Yes	220	55	—	51	0.7 (0.4–1.1)	60	1.9 (1.2–3.0)
<b>Steady partner††</b>							
No	101	61	—	62	—	34	Reference
Yes	338	53	—	58	—	56	4.3 (2.4–7.6)

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**TABLE 3. (continued)** Sociodemographic and Behavioral Correlates Associated With Delayed Testing, Perceived Low Risk for Being HIV Infected, and Unprotected Anal Intercourse Among 439 15- to 29-Year-Old MSM With Unrecognized HIV Infection, 6 US Cities, 1994–2000\*

Characteristic	Part. n	Delayed Testing		Perceived Low Risk for Being HIV+		Unprotected Anal Intercourse	
		%	AOR† (95% CI)	%	AOR† (95% CI)	%	AOR† (95% CI)
UAI‡‡							
Yes	222	59	—	48	Reference	—	—
No	217	51	—	71	2.2 (1.4–3.5)	—	—

\*Baltimore, MD; Dallas, TX; Los Angeles, CA; Miami, FL; New York, NY; and Seattle, WA.

†Reported for variables that remained in the reduced logistic regression model (see “Methods”). All models demonstrated adequate fit based on the goodness-of-fit test ( $P > 0.05$ ).

‡Variable not included in model predicting perceived low risk for being HIV+ due to auto-correlation with the outcome variable.

§Variable not included in model predicting delayed testing due to auto-correlation with the outcome variable.

¶Unless noted, sexual behavior was measured with male partners only in the 6-month period preceding the survey interview.

#Partners with whom the participant exchanged sex for drugs, money, or other commodities.

\*\*Partners considered to be nonsteadies, “pickups,” or one-night stands. Excludes partners who exchanged drugs, money, or other commodities for sex.

††Partners considered to be steadies, regulars, or lovers. Excludes partners who exchanged drugs, money, or other commodities for sex.

‡‡Variable not included in model predicting unprotected anal intercourse due to auto-correlation with the outcome variable.

anal intercourse and injecting drugs (Table 2). In the 6 months preceding the survey interview, the 439 infected-unaware MSM reported a total of 722 steady and 1531 casual male sex partners (median number of male partners: 2; interquartile range: 1–5). During the same period, the 60 (14%) infected-unaware MSM who reported having female partners reported a total of 233 female sex partners. During this period, 222 (51%) infected-unaware MSM reported having UAI with men (37% unprotected insertive; 39% unprotected receptive), and 31 (7%) reported having unprotected vaginal or anal intercourse with women. Of those who engaged in UAI, 106 (48%) reported not using condoms because either they “knew” they were HIV negative, “knew” their partners were HIV negative, or perceived their partners were at low risk for infection.

Among infected-unaware MSM, UAI was most highly associated with having a steady partner (Table 3). Other associations with UAI included self-perceived moderate to high risk for infection, and being unemployed, identifying as gay, and having a casual partner (Table 3). Compared with MSM who were aware of their infection in the 6 months preceding the survey ( $n = 92$ ), proportionally more infected-unaware MSM reported having UAI because they thought their partners were HIV negative or at low risk for infection (21 vs. 11%; AOR: 2.7;  $P < 0.05$ ).

## DISCUSSION

Our findings suggest that in 5 of 6 US cities surveyed, approximately three-quarters of HIV-infected MSM 15–29 years of age who attend MSM venues are unaware of their infection, and of these, many unknowingly engage in behaviors that can transmit HIV to their male and female sex partners. Affirming our earlier report of very high prevalence of unrecognized infection among 15- to 22-year-old black MSM in the United States, we found that compared with white MSM, black MSM had nearly 7 times greater odds of having unrecognized HIV infection.<sup>20</sup> Despite reporting multiple partners and considerable exposure risks, many MSM with unrecognized infection misperceived that they were at low risk for having or acquiring HIV, and because of their mispercep-

tions, many engaged in behaviors that could transmit HIV. Finally, although most MSM with unrecognized infection had previously tested for HIV, few had tested regularly and over half had not tested in the previous year. These findings underscore the urgency of improving federal, state, and local prevention programs for MSM through interventions that help clarify perceived risk for infection and by increasing the availability of and demand for HIV testing services.

## Increase Availability of HIV Testing Services Health-care settings

Our findings suggest that nearly three-quarters of MSM with unrecognized infection, including those who had never tested, use health-care services. Although proportionally more infected-unaware than noninfected MSM reported discussing the need for testing with their providers (phase 2), nearly a third reported that their providers never discussed HIV testing. To identify and link more infected persons into care, HIV testing should be routinely recommended for all patients in health-care settings where HIV prevalence is  $\geq 1\%$ .<sup>39,40</sup> To increase the proportion of patients who receive their results, providers should consider using rapid HIV tests that are accurate, acceptable, and provide results in approximately 20 minutes.<sup>41–43</sup> In health-care settings where HIV prevalence is  $< 1\%$ , health-care providers should routinely assess patient risks and encourage at-risk MSM to test for HIV and other STIs at least annually.<sup>39,44</sup>

## Outreach

Although increasing the availability of testing at clinical settings may reach many MSM with unrecognized infection, our findings suggest that some young MSM use health care infrequently, some delay testing because they do not use a regular source of health care, and as also suggested by other reports,<sup>45,46</sup> many will take advantage of free testing at MSM-identified venues. Our data suggest that expansion of HIV testing at clubs, bars, and other locations in MSM neighborhoods, rather than at parks and social organizations, may reach more men with unrecognized infection. Although we tested

few men at bathhouses, other studies suggest that expansion of testing at these venues may be particularly important in reaching infected-unaware MSM who might not test elsewhere.<sup>47,48</sup>

### Partner Counseling, Testing, and Referral

Our finding that most MSM with unrecognized infection have ongoing or recent steady partners suggests that partner counseling and referral services (PCRS) might be an effective strategy to reach MSM with unrecognized infection.<sup>49,50</sup> While most infected-aware MSM inform current steady partners,<sup>18,19</sup> those who are younger or asymptomatic are less likely to do so,<sup>51,52</sup> and many do not inform previous partners.<sup>53</sup> The urgency to provide PCRS especially to current and previous steady partners is underscored by our finding that UAI among infected-unaware MSM was strongly associated with having a steady partner. This finding is corroborated by many studies suggesting that UAI is more prevalent among steady partners,<sup>29,32</sup> and 2 recent reports suggesting that a large majority of new infections among younger MSM might be attributed to steady partners.<sup>54,55</sup>

### Increase Demand for Testing

Of MSM with unrecognized infection, we found that nearly 6 of 10 thought they were at low risk for being infected and approximately 4 of 10 thought they were at low risk for ever becoming infected. Thus, perceived low risk for infection might explain, in part, why few had regularly tested for HIV.<sup>13,56</sup> However, our findings also suggest that some infected-unaware MSM delayed testing because they perceived themselves at risk for HIV and feared learning their results. These findings suggest that demand for testing might be increased by efforts that increase awareness of personal risks for infection and the potential uncertainty in determining these risks given the magnitude of unrecognized infection, as well as by efforts that address concerns about testing positive. While additional research is needed to clarify these concerns, they might be addressed, in part, by marketing the benefits of early diagnosis and advancements in HIV care, and emphasizing that access to treatment is available to many without insurance and that laws and organizations exist to help protect against discrimination for those with HIV.<sup>13,43,56</sup>

### Improve Prevention Counseling

Among infected-unaware MSM, we found that (1) nearly half who had been tested within the past year (phase 2) did not receive any counseling, (2) that perceived low risk for infection was associated with having tested HIV negative, and (3) of those who engaged in UAI, approximately half did so because they perceived themselves or their partners to be HIV negative or at low risk for infection. Our findings, thus, support several reports suggesting that many persons who voluntarily test for HIV are not counseled<sup>39,57–59</sup> and that the combination of testing negative with inadequate or no counseling can reinforce behaviors that lead to HIV acquisition and transmission.<sup>60–62</sup>

In accordance with current guidelines, persons who test for HIV should receive high-quality prevention counseling that clarifies risks for infection and steps to reduce those

risks.<sup>39</sup> Our data suggest that prevention counselors should inform MSM that many men are HIV infected despite perceiving themselves to be negative based on previous tests or recent “lower-risk” behavior. Among MSM who had previously tested HIV negative, we found that nearly 1 in 10 were infected overall; among blacks, 1 in 5 were infected. Thus, MSM should be encouraged to consistently use condoms with all partners unless they are in a mutually monogamous relationship in which both partners have *recently* tested HIV negative. Counselors should refer clients who have difficulty in initiating or sustaining safer behavior for more intensive individualized prevention counseling and support services.<sup>63</sup>

### Comparative Findings, Limitations, and Biases

Our reported magnitude of unrecognized infection among young MSM is similar to findings from 1 contemporary and 2 previous venue-based surveys and differs from the national estimate and from 2 previous household surveys. Of venue-based surveys, 70–81% of young HIV-infected MSM recruited in San Diego (2000–2002), San Francisco (1992–1993), and New York City (1990) were unaware of their infection.<sup>64–66</sup> These findings stand in contrast to the national estimate that 25% of all HIV-infected persons are thought to be unaware of their infection.<sup>67</sup> Similarly, 25 and 33%, respectively, of young HIV-infected MSM sampled in households in San Francisco (1992–1993) and South Beach, FL (1996) were found to be unaware of their infection.<sup>68,69</sup> Differences in these findings are likely attributable to sample-size differences, target populations, and the limitations and biases of each method.

Since our survey was limited to 15- to 29-year-old men who attended MSM-identified venues in 6 cities, our findings may not generalize to MSM who are older, who reside in other cities, and who do not attend MSM-identified venues. Our finding on the magnitude of unrecognized infection is also subject to 3 potential upward biases. First, our finding would be biased upwards if proportionally fewer infected-aware MSM attend venues or attend venues as often as infected-unaware MSM. However, of 563 18- to 29-year-old MSM who participated in a household-based telephone survey in 4 US cities from 1996–1998, similar high proportions of infected-aware MSM ( $n = 53$ ) and HIV-negative or unknown MSM ( $n = 474$ ) attended a bar, night club, or dance club in the previous 12 months (94 vs. 97%;  $P = 0.41$ ) (Lance Pollack, PhD, personal communication, November 10, 2003). Also, we observed no difference in monthly or more frequent attendance at gay clubs between infected-aware and infected-unaware participants (84 vs. 81%;  $P = 0.36$ ).

Second, our finding on unrecognized infection would be biased upwards if many infected-aware participants chose not to report that they had tested HIV positive. We did not use computer-assisted self-interviews, which have been found to obtain more sensitive information than face-to-face interviews.<sup>70</sup> Our interviewers, however, did not report that participants were troubled when asked to disclose their most recent test result, and only 2 of 4370 men who had previously tested refused to answer this question.

Lastly, our finding on unrecognized infection would be biased upwards if proportionally fewer infected-aware than

infected-unaware MSM chose to participate in our survey. This bias may be important because 41% of all identified eligible men declined to participate. However, HIV status was not assessed during recruitment and was not a condition of enrollment. Second, a high proportion of unrecognized infection is expected in groups with high HIV incidence and low testing rates. Our sample of young MSM meets both conditions.<sup>7,27</sup> Third, we found that unrecognized HIV infection varied in expected directions in groups with similar testing rates: highest among black MSM with highest HIV incidence, and lowest among white MSM with lowest HIV incidence. Although a lower proportion of HIV-infected MSM from Seattle were unaware of their infection, compared with other cities, proportionally more were white. Moreover, participants from Seattle were more likely to have ever, repeatedly, and recently tested for HIV (data not shown). Finally, in spite of considerable differences in unrecognized infection between black and white MSM in our survey, participation rates between these 2 groups were nearly identical (blacks: 58%; whites: 57%).

Given these limitations and plausible biases, we realize that our reported magnitude of unrecognized infection among young MSM is upwardly biased to some unknown extent. This upward bias, however, probably does not account for the entire difference in magnitude of unrecognized infection reported between venue- and household-based surveys, and with the overall national estimate. Although population-based, household surveys of MSM underrepresent minorities and in particular young black MSM.<sup>6,68,69</sup> Since HIV incidence and magnitude of unrecognized infection are greatest among black MSM, findings on unrecognized infection from these surveys are most likely biased downwards. Similarly, the overall national estimate cannot be applicable to all population segments, especially those with high HIV incidence such as young MSM.

## CONCLUSION

Our findings suggest that the HIV epidemic among young MSM in the United States continues unabated, in part, because many young HIV-infected MSM are unaware of their infection and unknowingly expose many of their partners to HIV. Consistent with previous research,<sup>14-17</sup> we found that proportionally fewer infected-aware than infected-unaware MSM reported HIV transmission behavior with at-risk partners. Clearly, persons who are unaware of their infection can neither take advantage of effective therapies, take steps to reduce transmission to others, nor facilitate testing of partners who might also be infected. To advance HIV prevention in the third decade of HIV/AIDS, national, state, and local prevention efforts must take advantage of opportunities to increase the demand for and availability of testing to reduce the burden of unrecognized HIV infection among young MSM.

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