Determinants of Recent HIV Infection Among Seattle-Area Men Who Have Sex with Men

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Objectives. We sought to identify HIV-infection risk factors related to partner selection and sexual behaviors with those partners among men who have sex with men (MSM) in King County, Washington.

Methods. Participants were recruited from HIV testing sites in the Seattle area. Recent HIV infection status was determined by the Serologic Testing Algorithm for Recent HIV Seroconversion (STARHS) or a self-reported previous HIV-negative test. Data on behaviors with 3 male partners were collected via computer-based self-interviews. Generalized estimating equation models identified partnership factors associated with recent infection.

Results. We analyzed data from 32 HIV-positive MSM (58 partners) and 110 HIV-negative MSM (213 partners). In multivariate analysis, recent HIV infection was associated with meeting partners at bathhouses or sex clubs, bars or dance clubs, or online; methamphetamine use during unprotected anal intercourse; and unprotected anal intercourse, except with HIV-negative primary partners.

Conclusions. There is a need to improve efforts to promote condom use with casual partners, regardless of their partner's HIV status. New strategies to control methamphetamine use in MSM and to reduce risk behaviors related to meeting partners at high-risk venues are needed. (*Am J Public Health.* 2009;99: S157–S164. doi:10.2105/AJPH.2006.098582)

Men who have sex with men (MSM) continue to be the group most seriously affected by HIV in the United States. Sixty percent of cases among men living with HIV/AIDS are associated with male–male sex, and the number of new annual cases is increasing.[1,2] In a recent study of MSM in 5 US cities, HIV seroprevalence ranged from 18% to 40%; annual seroincidence ranged from 1.2% to 8.0%.[3] Increased survival because of highly effective antiretroviral treatments has increased the number of HIV-infected MSM and may have lessened concern about acquiring HIV among some HIV-negative MSM.[4,5]

Risk factors and epidemiological evidence of ongoing HIV transmission among MSM are well established. However, the influence of partner selection factors as well as concurrent substance use and mental health problems is less well understood.[6–11] Partner selection factors include meeting venues, relationships, and decisions related to serosorting (sexual intercourse with partners of concordant HIV status).

Since the beginning of the HIV/AIDS epidemic, several longitudinal cohort studies have identified risk behaviors for incident HIV infection. Such studies have helped define the leading edge of the epidemic but are costly and logistically challenging. The advent of the Serological Testing Algorithm for Recent HIV Seroconversion (STARHS) has made it possible to assess risk factors related to recent infection using cross-sectional study designs.[12–14] We used STARHS to describe current risks for HIV acquisition among a sample of MSM in the Seattle area (King County), Washington. We compared drug-use and sexual behaviors of recently infected HIV-positive MSM to those of HIV-negative MSM, with a specific focus on partner selection and partner-specific sexual behaviors to identify factors associated with HIV infection.

METHODS

Study Design, Eligibility, and Recruitment

From July 2002 through May 2005, we conducted the Seattle-Area MSM Study (SAMS), a case–control study of HIV risk behaviors among MSM. Potential participants were passively referred to the study from 3 sources: Public Health–Seattle & King County's (Public Health's) sexually transmitted diseases (STD) and HIV/AIDS program clinics (located at Harborview Medical Center in Seattle) referred MSM who had been tested for HIV. Public Health's HIV/AIDS program community-outreach testing sites also referred recently tested MSM. Outreach sites included 3 bathhouses or sex clubs, a mental health counseling center, and a community clinic. Two university HIV clinics referred MSM with recently diagnosed HIV infection.

Participants were eligible if they were 18 years or older, reported having sex with men during the past 6 months, and were able to complete the interview in English. HIV-positive MSM were eligible if recruited within 3 months of their first HIV-positive test result, and HIV-negative men were eligible if recruited within 1 month of testing. We attempted to enroll 2 HIV-negative men from the same site (HIV/AIDS Program clinic/outreach site and STD clinic) for each HIV-positive man enrolled.

Recent HIV infection was defined as HIV infections acquired within the preceding year on the basis of a reactive HIV-1 test combined with a nonreactive less sensitive HIV-1 test (according to STARHS), or a self-reported or verified HIV-negative test within the preceding year. All persons testing HIV positive at the Public Health sites were routinely offered the less sensitive HIV-1 test, which was performed by the Public Health laboratory (Vironostika-LS EIA; Bio Merieux, Raleigh, North Carolina).[12,13] Participants received a monetary incentive, condoms, and information about HIV prevention and social services. No names were collected.

Data Collection

We used audio computer-assisted self-interviewing (ACASI) to collect data on

sociodemographic characteristics, HIV and STD history, HIV testing history, and recent (past 6 months) substance use and sexual behaviors. The self-interviews also collected data about participants' 3 most recent male anal-intercourse partners during the past 6 months (demographic characteristics, HIV status and status disclosure, and sexual behaviors with these partners). HIV-positive participants were also asked to report the same data about the partner who they believed had infected them.

For participants testing at Public Health sites, we used non-name variables (i.e., date of birth, age, race, test location, test result, and HIV pre- and posttest dates) to link ACASI data with clinic record data. We then compared whether risk factors reported at pretest counseling visits differed from those reported by participants when HIV status was known. We assessed the representativeness of HIV-positive participants by comparing their demographic characteristics and injection drug use history with those of MSM clients who tested HIV positive at the same testing sites but did not participate in SAMS. To assess the representativeness of HIV-negative participants, we compared their demographic characteristics, injection drug use history, and sexual behaviors with data collected during HIV pretest counseling visits for all MSM who tested HIV-negative at the same Public Health testing sites. Client-specific data were not available because many persons tested anonymously and their testing dates could not be linked.

Statistical Analysis

This analysis included data from MSM recently infected with HIV and MSM who tested HIV-negative and also reported anal intercourse with another man in the past 6 months. We only included data from men who reported male partners with whom they had anal intercourse prior to being tested for HIV. We compared sociodemographic characteristics, substance use, and sexual behaviors of recently infected participants (cases) versus HIV-negative participants (controls) using the χ^2 or Fisher exact test (binary variables). Because data were limited to the 3 most recent male anal-intercourse partners during the past 6 months, we did not address other sexual partnerships from this time period.

Differences in partner-level data between cases and controls were evaluated with generalized estimating equations, which utilize robust standard errors to account for correlation because of multiple partnerships per person.[15] *P* values were obtained via associated score tests. Variables that were statistically significant in univariate analyses ($P < .05$) were entered into a multivariate model to determine which of these variables were independently associated with recent HIV infection while controlling for recruitment location and sexual orientation. The final model included only those variables that were independently associated ($P < .05$) with recent HIV infection.

When the number of participants is relatively small, as in this study, jackknife estimates of the standard coefficient errors from generalized estimating equations perform better than simple robust estimates in terms of minimizing inflation of the type-1 error in associated hypothesis tests.[16] Therefore, jackknife estimates of standard coefficient errors were used in calculating confidence intervals for the multivariate generalized estimating equations model. Analyses were conducted using SAS 8.2 (SAS Institute Inc, Cary, North Carolina) and Stata 9.1 (StataCorp, College Station, Texas).

RESULTS

Sample, Participation, and Representativeness

Among 77 HIV-positive MSM enrolled, 40 were defined as recently infected, and 38 reported anal intercourse with another man in the past 6 months. Thirty-two of these 38 MSM reported partners with whom they initiated anal intercourse before being diagnosed with HIV and thus were defined as cases. These included 18 MSM with nonreactive less sensitive HIV-1 results, 6 diagnosed with a syndrome of primary HIV infection at an HIV clinic in addition to self-reported previous HIV-negative tests and 8 who self-reported a previous HIV-negative test. Previous HIV-negative test results were verified using medical records for 2 of the 8 MSM.

Of the 138 MSM who tested HIV-negative at the referral sites, 120 reported male anal intercourse in the past 6 months and 110 reported partners with whom they initiated anal intercourse before testing HIV-negative; these men comprised the controls. We enrolled about 25% of all MSM who were diagnosed with HIV at participating Public Health sites during the study period. Nonparticipants were similar to our sample with regard to age ($P = .79$) and race ($P = .64$) but were less likely to have a history of injection drug use ($P < .01$). Public Health pretest counseling data of all HIV-negative MSM did not differ from HIV-negative participants in terms of age ($P = .69$) and race ($P = .25$); the prevalence of ever injecting drugs was lower in the pretest counseling data ($P < .01$). For HIV-negative MSM, the prevalence of unprotected anal intercourse with men of unknown HIV status was higher among the participants included in this analysis ($P < .05$) than in the Public Health pretest counseling data.

Comparison of MSM With Recent HIV Infection and HIV-Negative MSM

Most participants were recruited at a clinic site, although a higher proportion of HIV-negative control participants tested at outreach sites (Table 1). Men with recent HIV infection did not differ from HIV-negative men with respect to age, race, education, or being "out" to people about male–male sex, but were more likely to identify as gay and were less likely to have health insurance. A higher proportion of case participants had tested for HIV at least 4 times in the past 2 years compared with control participants, although this difference was not statistically significant. Mental health and substance use (particularly alcohol and methamphetamine) problems were common but did not differ by HIV status.

Case participants were more likely than were control participants to report frequent use of drugs other than marijuana and tended to report more injection drug use. Drug use (particularly use of methamphetamine and poppers [amyl nitrites]) during unprotected anal intercourse was significantly more prevalent among case participants compared with control participants. Use of sex-associated drugs such as Ecstasy (MDMA), ketamine, and GHB (γ-hydroxybutyrate) was more common among case participants than among control participants; use of these drugs was significantly associated with use of methamphetamine ($P < .001$; data not shown).

Over 70% of case participants and over 55% of control participants reported 5 or

TABLE 1—Sociodemographic Characteristics, Health History, and Drug-Use and Sexual Behaviors of Participants, by HIV Status: Seattle-Area MSM (Men Who Have Sex With Men) Study, King County, Washington, 2002–2005

	Recently HIV-Infected MSM, No. (%)	HIV-Negative	*P*
Total	32 (100)	110 (100)	
Sociodemographic characteristics			
Recruitment site			.05
HAP clinic and other sites[a]	15 (46.9)	30 (27.3)	
HAP outreach sites	4 (12.5)	33 (30.0)	
STD clinic	13 (40.6)	47 (42.7)	
Aged <30 years	10 (31.3)	44 (40.0)	.41
White race	23 (71.9)	81 (75.0)	.82
High school education or less	5 (15.6)	22 (20.0)	.80
Gay sexual orientation[b]	28 (96.6)	81 (76.4)	.02
Out to more than 50% of people they know about their male–male sex	28 (87.5)	82 (74.6)	.15
Had health insurance	10 (31.3)	59 (55.7)	.03
Health history			
Tested for HIV 4 or more times during last 2 years	16 (51.6)	39 (35.5)	.14
Ever diagnosed with mental health problems[c]	13 (40.6)	55 (50.0)	.42
Ever prescribed medication for mental health illness[c]	12 (37.5)	40 (36.7)	≥.99
Substance use problems, past 6 months[d]	9 (29.0)	23 (21.1)	.34
Substance use behaviors (past 6 months)			
Any illicit drug use (except marijuana)	22 (71.0)	68 (62.4)	.41
Used drugs (except marijuana) ≥4 times per wk	6 (18.8)	6 (5.5)	.03
Injection drug use	6 (18.8)	9 (8.2)	.10
Binge drinking last month			.20
No	18 (56.3)	43 (39.1)	
≥5 drinks on 1–3 occasions	6 (18.8)	34 (30.9)	
≥5 drinks on ≥4 occasions	8 (25.0)	33 (30.0)	
Substance use during UAI (past 6 months)			
Methamphetamine	11 (34.4)	14 (12.7)	<.01
Poppers (amyl nitrites)	14 (43.8)	24 (21.8)	.02
Viagra	5 (15.6)	9 (8.2)	.31
Ecstasy (MDMA)	6 (18.8)	1 (0.9)	<.01
Ketamine	3 (9.4)	1 (0.9)	.04
GHB (γ-hydroxybutyrate)	5 (15.6)	4 (3.6)	.03
Cocaine or crack	3 (9.4)	10 (9.1)	≥.99
Alcohol	13 (41.9)	43 (39.8)	.84
Number of male sex partners (past 6 months)			
Total no. of sexual partners			.28
1	1 (3.2)	7 (6.5)	
2–4	8 (25.8)	41 (38.3)	
≥5	22 (71.0)	59 (55.1)	
Exclusive oral sexual partners, no.			.03
0–1	20 (64.5)	45 (42.1)	
2–4	3 (9.7)	33 (30.8)	
≥5	8 (25.8)	29 (27.1)	

Continued

more sexual partners in the past 6 months, and participants' total number of sexual partners did not vary by HIV status. However, compared with recently infected MSM, HIV-negative MSM were significantly more likely to report 2 or more sexual partners with whom they only had oral sex. They were also significantly less likely to report anal intercourse with 5 or more male partners. Unprotected anal intercourse was common but more prevalent among case participants, who were also more likely to report unprotected anal intercourse with HIV-positive men or men of unknown HIV infection status. One fifth of participants stated that they had avoided anal intercourse with someone in the past year because they thought he was HIV-positive, but this behavior did not differ by participants' HIV status.

Comparison of ACASI responses with pretest visit data showed no statistically significant differences in reporting injection drug use history. We also found no statistical differences in reporting anal intercourse with partners of HIV-positive or unknown status among either HIV-positive or HIV-negative MSM (data not shown). Lifetime methamphetamine use was reported more often on ACASI responses than at pretest visits by both case and control participants.

Partner-Level Analysis of Factors Associated With Recent HIV Infection

The 32 men with recent HIV infection reported 58 male anal intercourse partners before HIV diagnosis, including 14 partnerships that continued after HIV diagnosis (Table 2). The 110 HIV-negative controls reported 213 male anal intercourse partners before the HIV test, including 59 partnerships that continued after the test. Partner age discordance and substance use did not differ by participants' HIV status. A higher proportion of case participants' partners were White compared with the partners of control participants; the difference in race/ethnicity, however, was only marginally significant (P=.06).

Although most sexual partners were casual partners (defined as partners with whom participants had had sexual relations 3 or more times but did not consider their primary partner, and partners with whom they had had sexual relations once or twice), the

TABLE 1—*Continued*

Anal intercourse partners, no.			<.01
1	4 (12.5)	28 (25.5)	
2–4	11 (34.4)	56 (50.9)	
≥5	17 (53.1)	26 (23.6)	
UAI and UAI by sexual partners' HIV status (past 6 months)			
Any UAI	30 (93.8)	81 (73.6)	.01
HIV status of sexual partner			
HIV negative	23 (71.9)	60 (54.6)	.10
HIV positive	12 (37.5)	11 (10.0)	<.01
HIV status unknown	17 (53.1)	30 (27.3)	<.01
HIV positive or status unknown	22 (68.8)	35 (31.8)	<.01
Chose not to have sex because potential partner said he was HIV positive (past 6 months)			
Oral sex	5 (16.7)	20 (18.5)	≥.99
Anal intercourse	6 (19.4)	24 (22.0)	≥.99

Note. HAP = HIV/AIDS Program; STD = sexually transmitted disease; UAI = unprotected anal intercourse. Individual categories may not add up to total because of missing data for those specific variables.
[a]Includes 6 HIV-positive participants who were recruited at 2 university HIV clinics.
[b]Excludes participants who responded heterosexual or other (n = 3) or had missing data (n = 4).
[c]Mental health diagnosis was assessed by asking, "Have you ever been treated with medication, counseling, or psychotherapy for depression, anxiety disorder, or other mental health problem?"
[d]Substance use problems were assessed by asking, "In the past 6 months, has your use of alcohol or drugs caused problems with your family or social relationships, job, school, financial, or legal situation?"

majority of whom the participants had known for less than 24 hours before having sex, the context of the partnership formation differed between case participants and control participants. Compared with control participants, case participants more often met sexual partners at bars or dance clubs, in bathhouses or sex clubs, or on the Internet. Case participants were less likely than were control participants to meet sexual partners through other means, which included mostly private parties or friends (cases, 3%; controls, 14%) or local neighborhoods (cases, 3%; controls, 11%).

There was no statistically significant difference between case participants' and control participants' partners' HIV status. However, partnerships involving unprotected anal intercourse with HIV-positive partners and unprotected anal intercourse with partners of unknown status were more common among case participants. Partnerships involving unprotected anal intercourse with a primary partner who was perceived to be HIV-negative were more common among control participants. (Participants were asked if their sexual partners had disclosed their HIV status; it is possible their partners didn't know their correct status or lied to the participants about it; thus we consider partner HIV status to be "perceived" for the purposes of this study.) We only examined partnership relationship differences for perceived HIV-negative partners because 91% of unknown status partners were casual and unprotected anal intercourse with HIV-positive partners conferred risk regardless of partner relationship.

Compared with HIV-negative MSM, recently infected MSM were significantly more likely to report that their partnerships involved use of methamphetamine or poppers during unprotected anal intercourse. Use of other drugs or alcohol during unprotected anal intercourse did not differ by participants' HIV status.

Nineteen (59%) of the 32 recently infected men reported that they could identify the partner who infected them (data not shown). Thirteen (68%) of these 19 partnerships were casual and 13 (68%) had met their partner less than 24 hours before first sexual encounter. Five partners (26%) disclosed they were HIV-positive, although only 2 did so before having sexual relations with the participant. Six (32%) perceived-source partners told participants that they were HIV-negative, and 8 (42%) never disclosed their status. Case participants reported meeting most of their partners at a bathhouse or sex club (37%), or bar or dance club (32%).

In multivariate analysis controlled for recruitment site and sexual orientation, recent HIV infection was independently associated with (1) meeting partners at a bathhouse or sex club (adjusted odds ratio [AOR]=11.5), bar or dance club (AOR=8.2) or online (AOR=6.7); (2) using methamphetamine during unprotected anal intercourse (AOR=9.0); and (3) having had unprotected anal intercourse either with any male partner believed to be HIV positive (AOR=6.8) or of unknown HIV status (AOR=3.4), or with a casual partner believed to be HIV negative (AOR=4.3; Table 3). Control for injection drug use (primarily methamphetamine) and the number of male anal intercourse partners in the past 6 months did not affect the results. Limiting the analysis to partnerships in which the last reported anal intercourse occurred before the HIV diagnosis or test produced similar results (data not shown).

DISCUSSION

Among MSM tested for HIV primarily through a health department counseling and testing program, we found that recent HIV infection was associated with having unprotected anal intercourse (except with HIV-negative primary partners); meeting partners in bathhouses or sex clubs, bars or dance clubs, or online; and use of methamphetamine during unprotected anal intercourse. Our study adds to the growing literature on serosorting and emphasizes its limitations. Many men reported avoiding sexual intercourse with HIV-positive men, and as expected, the behavior of having unprotected anal intercourse with known HIV-positive men was associated with the highest risk. However, like 2 previously published studies,[17,18] we also observed an elevated risk of HIV among men who had unprotected anal intercourse with men whom they believed were HIV-negative.

In our study, the association between recent infection and unproteted anal intercourse with perceived HIV-nagative men was restricted to casual relationships. Moreover,

TABLE 2—Context of Relationships and Behaviors With Recent Male Anal-Sex Partners Among Recently HIV-Infected and HIV-Negative Participants: Seattle-Area MSM (Men Who Have Sex With Men) Study, King County, Washington, 2002–2005

	Anal intercourse partners of 32 recently HIV-infected MSM, No. (%)	Anal intercourse partners of 110 HIV-negative MSM, No. (%)	*P*
Total	58 (100)	213 (100)	
Characteristics of sex partners			
No. of sexual partners in analysis			.69
1	13 (22.4)	39 (18.3)	
2	24 (41.4)	78 (36.6)	
3	21 (36.2)	96 (45.1)	
Last anal intercourse was after HIV diagnosis or HIV test	14 (24.1)	59 (27.7)	.60
Age of sexual partner compared with age of participant			.51
Younger	15 (28.3)	75 (38.1)	
Older	32 (60.4)	105 (53.3)	
Same age	6 (11.3)	17 (8.6)	
Sexual partners' race/ethnicity			.06
White	50 (87.7)	149 (71.3)	
Black	3 (5.3)	24 (11.5)	
Hispanic	3 (5.3)	19 (9.1)	
Other	1 (1.8)	17 (8.1)	
Sexual partners' education			.90
High school or less	14 (24.1)	47 (22.2)	
More than high school	35 (60.3)	136 (64.2)	
Unknown	9 (15.5)	29 (13.7)	
Sexual partners used methamphetamine			NA
No	30 (75.0)	139 (69.9)	
Yes	0 (0)	16 (8.0)	
Unknown	10 (25.0)	44 (22.1)	
Sexual partners injected drugs			.59
No	43 (74.1)	161 (75.6)	
Yes	5 (8.6)	10 (4.7)	
Unknown	10 (17.2)	42 (19.7)	
Context of partnerships and respondents' relationships with sex partners (past 6 months)			
Original meeting location			.01
Bar or dance club	16 (27.6)	37 (17.4)	
Bathhouse or sex club	12 (20.7)	20 (9.4)	
Internet	18 (31.0)	41 (19.3)	
Other places[a]	12 (20.7)	115 (54.0)	
Casual partner[b]	46 (79.3)	146 (69.9)	.16
Knew partner less than 24 hours before first sexual contact	36 (62.1)	108 (50.7)	.14
Sex partners' HIV status and HIV status disclosure (past 6 months[c])			
Sexual partners' HIV status			.14
HIV negative	27 (48.2)	133 (63.6)	
HIV positive	9 (16.1)	15 (7.2)	
HIV unknown	20 (35.7)	61 (29.2)	
Timing of sexual partners' HIV disclosure			.28
Disclosed before first sexual encounter	21 (37.5)	104 (50.5)	
Disclosed after first sexual encounter	15 (26.8)	41 (19.9)	
Did not disclose	20 (35.7)	61 (29.6)	

Continued

among persons who reported knowing who infected them, one third thought they were infected by a partner who told them he was HIV negative. In our study, unprotected anal intercourse with men of unknown HIV status was also associated with HIV infection. Other studies have found that some HIV-positive MSM engage in unprotected anal intercourse with partners of negative or unknown status without first disclosing their own HIV-positive status.[19–21] Studies also have shown that a high proportion of HIV-positive MSM may not know they are infected and that many reduce their high-risk sexual behavior after being diagnosed.[3,22]

Public Health–Seattle & King County recommends that high-risk MSM be screened for HIV and STDs every 3 to 6 months, but many of the high-risk men in our sample had not been tested that often.[23] Our findings emphasize the continuing need to increase knowledge of HIV status by promoting more-frequent testing for high-risk MSM along with efforts to increase consistent condom use, especially with casual partners, regardless of partners' perceived HIV status.

We found a strong association between meeting sexual partners in a bathhouse or sex club and recently acquired HIV, even after we controlled for the number of male anal intercourse partners. Other studies have found a high prevalence of unsafe sex among MSM who frequent bathhouses and noted that this type of venue is particularly popular among many HIV-positive MSM.[11,24] These findings are of concern and highlight the need to find ways to diminish the risks attributable to these environments. We also observed an elevated risk of HIV among men who met partners on the Internet, which is an increasingly popular method for finding sexual partners. A recent meta-analysis revealed that MSM who sought partners on the Internet were more likely to engage in risky sex, although the researchers were unable to discern whether the high-risk sex involved partners met online or offline.[25] Our findings suggest the need to develop interventions that decrease risks associated with Internet-derived sexual partnerships. The increased risk of HIV associated with meeting partners at bars or dance clubs illustrates the importance of expanding and continuing HIV prevention efforts related to these venues.

TABLE 2—*Continued*

Respondents' behaviors with sexual partners (past 6 months)			
UAI by sexual partners' perceived HIV status and partner type			<.01
HIV negative, casual partner[b]	14 (24.1)	36 (16.9)	
HIV negative primary partner[d]	5 (8.6)	41 (19.3)	
HIV positive, any partner	9 (15.5)	8 (3.8)	
HIV status unknown, any partner	18 (31.0)	29 (13.6)	
No UAI	12 (20.7)	99 (46.5)	
Respondents' substance use during UAI (past 6 months)			
Methamphetamine	17 (29.3)	13 (6.1)	.01
Poppers (amyl nitrites)	17 (29.3)	22 (10.3)	.03
Viagra	6 (10.3)	4 (1.9)	.11
Ecstasy (MDMA)	2 (3.5)	4 (1.9)	.54
Ketamine	3 (5.2)	2 (0.9)	.28
GHB (γ-hydroxybutyrate)	7 (12.1)	5 (2.4)	.14
Cocaine or crack	1 (1.7)	8 (3.8)	.39
Alcohol	14 (24.1)	61 (28.6)	.52

Note. UAI = unprotected anal intercourse. Individual categories may not add up to total because of missing data for those specific variables.
[a]Other places include meeting sexual partners at private parties or through friends, in participants' neighborhood, at beaches or parks, work or school, recreational activities, gyms, gay community event, and on telephone sex lines.
[b]Casual partners were defined as partners participants had sexual relations with 3 or more times but did not consider their primary partner, and partners they have had sexual relations with once or twice.
[c]Oral sex or anal intercourse.
[d]Primary partners were defined as partners participants lived with or to whom participants had a special emotional attachment.

The association between recently acquired HIV and methamphetamine use in our study adds to existing evidence that methamphetamine use among MSM is an important risk factor for HIV and other STDs and underscores the need to develop and widely deploy effective methamphetamine treatment and prevention interventions.[6,26–32] Methamphetamine use during unprotected anal intercourse is a particularly important risk behavior. The association persisted even after we controlled for injection drug use. Public health testing sites for high-risk MSM are obvious venues for enhanced HIV prevention efforts, which should include assessment of methamphetamine use and referral to appropriate treatment in areas such as Seattle, where methamphetamine use is common.[33] We also found high frequencies of illicit drug use, binge drinking, substance use, and mental health problems. Although these factors did not differ by HIV status in our study, they have been associated with risk factors for HIV infection in other studies.[7–10,34]

Our study provides a model for identifying factors related to HIV infection in a cross-sectional investigation. The use of STARHS can reduce the need for longitudinal cohorts, which are expensive and logistically complex to manage.[12–14] Although other studies have used STARHS to assess HIV seroincidence in MSM,[35–39] to our knowledge, no reports have focused on enrollment of recently infected MSM to assess risk factors for HIV infection. However, use of STARHS to characterize recent infections also presents challenges. Recruiting MSM with recently diagnosed HIV infection is difficult because of the primary emphasis on addressing medical and psychosocial needs. Our recruitment efforts were limited by our reliance on passive referrals in an attempt to make the study more accessible to men who tested anonymously.

Limitations

Some other limitations should be considered. The study relied on self-reported HIV risk behaviors. Our use of ACASI may have mitigated some of the problems with disclosure of sensitive and stigmatized behaviors.[40–43] Knowledge of HIV status could have contributed to recall bias; however, reporting of selected HIV risk behaviors at the pretest visit and on the SAMS ACASI did not differ substantially. We only asked about sexual relations with 3 male partners in the past 6 months, and we may have missed HIV-related behaviors that occurred earlier or in unreported partnerships. We included sexual partnerships that continued after the HIV test, and unprotected anal intercourse with HIV-positive sex partners may have occurred after some participants were diagnosed with HIV. However, we found similar results when the analysis was restricted to partnerships that ended before the HIV test. Unsafe sex was more common among the HIV-negative SAMS controls compared with pretest data of HIV-negative MSM. The relatively small sample of men in our study may therefore not represent MSM in the broader community.

Conclusions

Our study demonstrates that STARHS can be used to define risk factors in incident HIV infection. The association we observed between recently acquired HIV infection and having unprotected anal intercourse with casual partners perceived to be HIV negative emphasizes the importance of consistent condom use. Relying on partners' reported HIV status to determine when to use or not use condoms, at least in the context of casual partnerships, is inadequate. Also, the strong association that we observed between methamphetamine use and recent infection highlights the need to develop, test, and deploy effective interventions to control methamphetamine use and drug-related sexual risks among MSM.[44–46] Public health STD clinics and other public health HIV testing sites are important venues for delivery of enhanced prevention interventions for this population and should consider screening clients for methamphetamine use and referring affected persons to effective treatment programs. Also, it is imperative that prevention providers target high-risk behaviors related to meeting partners in bathhouses and on the Internet. ■

TABLE 3—Sexual Partnership Factors Associated With Recent HIV Infection Among Participants: Seattle-Area MSM (Men Who Have Sex With Men) Study, King County, Washington, 2002–2005

	Anal intercourse partners of 32 recently HIV-infected MSM[a], No. (%)	Anal intercourse partners of 110 HIV-negative MSM, No. (%)	OR (95% CI)	AOR[a] (95% CI)
Sample, no.	58	213		
Original meeting location				
Bar or dance club	16 (27.6)	37 (17.4)	4.4 (1.6, 11.4)	8.2 (1.5, 45.7)
Bathhouse or sex club	12 (20.7)	20 (9.4)	5.8 (1.7, 19.9)	11.5 (1.7, 77.2)
Internet	18 (31.0)	41 (19.3)	4.2 (1.4, 12.1)	6.7 (1.6, 27.7)
Other places (Ref)	12 (20.7)	115 (54.0)	1.0	1.0
Methamphetamine use during UAI				
Yes	17 (29.3)	13 (6.1)	6.4 (1.9, 21.7)	9.0 (1.5, 55.0)
No (Ref)	41 (70.7)	200 (93.9)	1.0	1.0
HIV status of UAI partner				
HIV negative, casual partner[b]	14 (24.1)	36 (16.9)	3.2 (1.3, 8.0)	4.3 (1.3, 13.9)
HIV negative, primary partner[c]	5 (8.6)	41 (19.3)	1.0 (0.3, 3.0)	1.2 (0.3, 4.9)
HIV positive, any partner	9 (15.5)	8 (3.8)	9.3 (2.7, 31.5)	6.8 (1.3, 35.1)
HIV status unknown, any partner	18 (31.0)	29 (13.6)	5.1 (1.8, 14.4)	3.4 (1.02, 11.6)
No UAI (Ref)	12 (20.7)	99 (46.5)	1.0	1.0

Note. OR = odds ratio; CI = confidence interval; AOR = adjusted odds ratio; UAI = unprotected anal intercourse. Jackknife standard errors were used to calculate the CIs for both the crude and adjusted ORs.
[a]Analyses controlled for recruitment site and respondent's sexual orientation.
[b]Casual partners were defined as partners participants had sexual relations with 3 or more times but did not consider their primary partner, and partners they have had sexual relations with once or twice.
[c]Primary partners were defined as partners participants lived with or to whom participants had a special emotional attachment.

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This article was accepted April 18, 2007.

Contributors

H. Thiede was the principal investigator for the study and supervised study activities; she conducted the analysis and led the writing. H. Thiede and M.R. Golden conceptualized the idea for this article. J.W. Carey and R. A. Jenkins and R.D. Stall had overall responsibility for the study and were instrumental in developing the protocol. H. Thiede, M.R. Golden, E. White, and R. Hutcheson developed the questionnaire. R. Hutcheson was responsible for coordinating data collection. K.K. Thomas consulted on the statistical analysis. All authors helped conceptualize ideas, interpret findings, and review drafts of this article.

Acknowledgments

This study was funded by the Centers for Disease Control and Prevention (cooperative agreement U64/CCU019523).

We would like to thank the Public Health—Seattle & King County Sexually Transmitted Diseases and HIV/AIDS Program clinics, Jef St. De Lore, Jason Naki, Kim Houk, and Richard Burt for their contributions to this study, as well as Erin Picone-DeCaro, Duane Moody, Jamar Barnes, and Karen Andes at the Centers for Disease Control and Prevention.

Note. The findings and conclusion in this report are those of the authors and do not necessarily reflect the views of the Centers for Disease Control and Prevention.

Human Participant Protection

This study was approved by the institutional review boards of the Centers for Disease Control and Prevention and the University of Washington.

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