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The Prevalence of Undiagnosed HIV Serodiscordance among Male Couples Presenting for HIV Testing

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Abstract

In the United States, a substantial proportion of HIV transmissions among men who have sex with men (MSM) arise from main sex partners. Couples voluntary HIV testing and counseling (CHTC) is used in many parts of the world with male-female couples, but CHTC has historically not been available in the U.S. and few data exist about the extent of HIV serodiscordance among U.S. male couples. We tested partners in 95 Atlanta male couples (190 men) for HIV. Eligible men were in a relationship for ≥ 3 months and were not known to be HIV-positive. We calculated the prevalence of couples that were seroconcordant HIV-negative, seroconcordant HIV-positive, or HIV serodiscordant. We evaluated differences in the prevalence of HIV serodiscordance by several dyadic characteristics (e.g., duration of relationship, sexual agreements, and history of anal intercourse in the relationship). Overall, among 190 men tested for HIV, 11% (n = 20) were newly identified as HIV-positive. Among the 95 couples, 81% (n = 77) were concordant HIV-negative, 17% (n = 16) were HIV serodiscordant, and 2% (n=2) were concordant HIV-positive. Serodiscordance was not significantly associated with any evaluated dyadic characteristic. The prevalence of undiagnosed HIV serodiscordance among male couples in Atlanta is high. Offering testing to male couples may attract men with a high HIV seropositivity rate to utilize testing services. Based on the global evidence base for CHTC with heterosexual couples and the current evidence of substantial undiagnosed HIV serodiscordance among U.S. MSM, we recommend scale-up of CHTC services for MSM, with ongoing evaluation of acceptability and couples' serostatus outcomes.

Keywords

HIV; men who have sex with men; HIV testing; male couples; sexual orientation

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INTRODUCTION

Men who have sex with men (MSM) are the most impacted risk group in the U.S. HIV epidemic (Centers for Disease Control and Prevention, 2012a, 2012b) and are estimated to comprise at least 61% of new HIV infections annually (Prejean et al., 2011). In addition, MSM represent the only U.S. risk group for whom annual HIV diagnoses are increasing–a trend that began in 2000 (Sullivan et al., 2009a) and continued through at least 2009 (Centers for Disease Control and Prevention, 2011b). The number of available prevention services for MSM is disproportionately small compared to their prominence in the U.S. epidemic (Sullivan, Zapata, & Benbow, 2008). Given this, we and others have called for increased attention to developing effective prevention services and interventions to serve MSM (Jaffe, Valdiserri, & De Cock, 2007; Sullivan et al., 2008, 2012).

Innovative prevention approaches need to be aligned with the observed epidemiology of the HIV epidemic among MSM and be congruent with their lives (Sullivan et al., 2012). For example, a substantial proportion of HIV infections among MSM in the U.S. are estimated to arise from main sexual partnerships (Goodreau et al., 2012; Sullivan, Salazar, Buchbinder, & Sanchez, 2009b), but existing HIV testing services in the U.S. are individually-focused. Further, improved services are required that forge links between behavior change and complementary biomedical prevention strategies, including early referral for treatment of men living with HIV (Cohen et al., 2011) and evaluation of high-risk negative MSM for recently FDA approved oral pre-exposure prophylaxis (Grant et al., 2010).

One prevention approach that meets these criteria and has been associated with reductions in HIV transmissions in HIV serodiscordant male-female couples in Africa is couples HIV testing and counseling (CHTC) (Allen et al., 1992; Painter, 2001). We have previously described the high levels of willingness among U.S. MSM to utilize CHTC with male partners (Wagenaar et al., 2012) and have reported on the motivations, barriers, and facilitators of using a CHTC service among MSM (Stephenson et al., 2011). We used data from an RCT of CHCT for male couples to describe two key elements that bear on the possible utility of CHTC for U.S. MSM: prevalence of HIV serodiscordance and HIV seropositivity rate among men presenting for HIV testing as a couple.

METHOD

Participants

Participants were recruited as couples to a randomized prevention study of CHTC versus individual voluntary HIV counseling and testing (iVCT). Participants were recruited through several methods: flyers displayed in community-based organizations and in retail locations in the community; online banner advertisements through Facebook targeting men who reported being in a relationship with another man; peer referral; online publicity on the website of AID Atlanta, a community-based HIV prevention and care provider; and discussion with clients who sought HIV testing at AID Atlanta. For this analysis, our primary interest was the serostatus of the couple (i.e., seroconcordant negative, seroconcordant positive, or serodiscordant), so we did not analyze data by randomized arm. The study was reviewed and approved by Emory University's Institutional Review Board.

Couples were eligible to participate in the study if they were both ≥18 years of age, self-reported being a couple for at least 3 months (couple was self-defined by the participants and did not necessarily imply sexual exclusivity), and were both able to complete study assessments in English.[1] Exclusionary criteria for enrollment included either partner being previously diagnosed with HIV or either partner not willing to accept randomization to a

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couples testing arm. Men were provided $50 per partner for participation in the baseline survey and counseling session.

Procedure

Once consented and enrolled in the research study, each participant separately completed a computer-administered survey. The survey collected information on demographic characteristics, dyadic characteristics (duration of relationship, anal sex or unprotected anal intercourse [UAI] within the partnership in the past 12 months, UAI outside the partnership in the past 12 months, and agreement about sexual exclusivity), and HIV testing history. Couples assigned to the CHTC arm were provided with a couples' testing and counseling service adapted for use with male couples and based on the standard CDC protocol (Centers for Disease Control and Prevention, 2010a). This included pre-test assessment of HIV concerns, skills building around negotiating sexual agreements, and post-test planning for HIV prevention based on the HIV test results of both partners. Couples assigned iVCT were provided with standard prevention counseling and HIV testing, based on the standard CDC Fundamentals of Prevention Counseling protocol (Centers for Disease Control and Prevention, 2001), including pre-test review of risks for HIV infection, and post-test development of an individualized prevention plan. Regardless of arm, screening for HIV antibodies was provided using a rapid test with an oral mucosal transudate platform (OraQuick, OraSure, Bethlehem, PA). Men with preliminary positive rapid test results were immediately referred for collection of blood specimens for confirmatory testing. Final HIV status results reported are based on confirmatory test results.

Statistical Analysis

This analysis focused on individual-level HIV test results and couple-level HIV test results. Individual-level results are reported as the prevalence of newly diagnosed HIV infection by selected demographic characteristics. Couple-level results are reported as the distribution of HIV serostatus of the couples into three categories (concordant HIV negative, concordant HIV positive, and HIV discordant) and by selected dyadic characteristics. We used the Fisher's exact test to identify statistically significant differences in the distribution of results between concordant negative and discordant couples by demographic (individual-level) or dyadic (couple-level) characteristics. Because there were only two concordant positive couples, we did not conduct significance testing with data from concordant positive couples.

Data Quality Procedures—Several steps were taken to reduce the possibility of misclassification of previously diagnosed HIV infections as newly diagnosed. First, the study counselors had also recently worked with many local HIV prevention programs, including programs for persons living with HIV. Thus, they knew some HIV-positive clients through these programs and informed those known HIV-positive clients who presented to the study that the testing study was for men who had not previously been diagnosed with HIV. Second, AID Atlanta, the site for the testing study, is a major referral site for confirmatory HIV testing and initial clinical evaluation for newly identified HIV-positive people in Atlanta. During intake visits for referral to care, individuals with new diagnoses consent to be registered in a local database that captured information on service utilization. Most newly-diagnosed clients identified during the study were entered into this database during linkage to care; clients thought to be newly diagnosed with HIV but found to be already receiving treatment or care services were reclassified retrospectively as ineligible for study participation.

[1]Although not related to the current analysis, additional eligibility and exclusion criteria related to willingness and availability to complete a 3-month follow-up assessment: for eligibility, both were willing to complete a follow-up study visit in 3 months; for exclusion, either partner planning to move from the Atlanta area within 3 months of the initial study visit.

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RESULTS

Sample Characteristics

A total of 213 couples were screened for participation in the study from September 2010 through December 2011. Of these, 53% (N = 113) enrolled in the study. Most of those who did not enroll were not eligible because they had been in a relationship for < 3 months (n = 67) or because one or both partners were already known to be HIV-positive (n = 43) (see Fig. 1). Of the 113 couples who were eligible and enrolled, 16% (n = 18) of the enrolled couples were later excluded because they had been enrolled inappropriately based on information provided to study staff by the participants. Inappropriately enrolled couples were those who had a previous diagnosis of HIV (n = 4, 3%), those who, based on separate responses to the survey questionnaire, were judged not to be authentic couples (n = 13, 11%), or had a previous HIV diagnosis and were not an authentic couple (n = 1, 1%). Data from all couples were reviewed on a couple by couple basis and couples were retrospectively classified as inauthentic by the investigators by consensus. Inauthentic couples typically represented couples whose independent reports contained discrepant information about key aspects of the couple's history, such as location of first meeting, relationship start-dates, living arrangements, and sexual practices. Thus, the final analysis sample consisted of 95 couples (Fig. 1).

Demographic data are shown in Table 1 and characteristics of couples are shown in Table 2. Most participants were African American (72%), the modal age was 18–29 years of age, and about half of men had some educational attainment beyond high school. Most (61%) identified their sexuality as gay or homosexual and the plurality (32%) presented to the study through referral from a community-based organization. The median duration of relationship was 14 months; about one-third reported UAI with a partner outside the relationship in the past 3 months and 46% of couples reported different understandings of their sexual agreements.

HIV Test Results: Individual and Dyadic

Individual—Eleven percent (n = 20) of participants had a positive HIV test. No significant difference was observed in HIV status by age group, race/ethnicity, sexual orientation, or method of recruitment (Table 1). There was a significant association between education level and HIV serostatus: HIV-negative men were disproportionately represented in the higher education categories ($p = .03$).

Dyadic—The results for couples are shown in Table 2. A total of 77 (81%) couples were concordant negative; two couples (2%) were concordant positive, and 16 (17%) couples were discordant (Table 2). There was no statistically significant difference between seroconcordant negative and serodiscordant couples by any of the dyadic characteristics.

Among HIV serodiscordant couples, nearly half reported having UAI in the year before interview. Among HIV discordant couples, nearly two thirds reported different understandings of their agreements about having sex with partners outside the relationship.

DISCUSSION

Among couples presenting for HIV testing as part of a randomized prevention trial of CHTC implemented at a large AIDS service organization, about 1 in 6 was newly identified as serodiscordant and the seropositivity rate among men was 11%. Our observed seropositivity rate was higher than a contemporary serosurveillance study of MSM in Atlanta (6%) (Georgia Department of Public Health, 2010), nearly double the test seropositivity rate

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observed in CDC's social networks approach for recruiting to HIV testing (5.5%) (Centers for Disease Control and Prevention, 2005), and nearly triple the test positivity rate observed for MSM in CDC-supported HIV testing and counseling programs (3.6%) (Centers for Disease Control and Prevention, 2011a). Thus, offering a couples testing service for male couples may be an important opportunity to attract MSM to testing services who have low rates of HIV testing and a high proportion of undiagnosed HIV infection, relative to other testing programs (Chakravarty, Hoff, Neilands, & Darbes, 2012). Additionally, identifying previously undiagnosed discordant male couples, for whom the risk of HIV transmission is extremely high (Baggaley, White, & Boily, 2010), may help men avert infections within discordant couples. Given newer biomedical options for HIV prevention through oral pre-exposure prophylaxis (Grant et al., 2010) and treatment of positive partners in discordant couples (Cohen et al., 2011), it is appealing to consider an intervention which identifies discordant male couples and allows for planning of a comprehensive package of prevention services based on the serostatus of both members of the couple (Sullivan et al., 2012).

Our study did not estimate the extent of HIV serodiscordance among male couples overall, but among male couples presenting for HIV testing, in which neither partner reported himself to be HIV positive. Thus, our results are more informative for service providers than for those wishing to understand the full extent of serodiscordance among all male couples. An analysis of self-reported data from 26 cities participating in the 2008 U.S. National HIV Behavioral Surveillance System for MSM (Gallagher, Sullivan, Lansky, & Onorato, 2007) supports the conclusion that the prevalence of known discordant couples among venue-recruited MSM is lower than the prevalence of unknown discordance: among HIV-negative NHBS participants, only 4% reported that they knew their most recent male sex partner was HIV-positive (Centers for Disease Control and Prevention, 2011b). This difference might be due to serosorting among those who know their HIV status (Steward et al., 2009).

The prevalence of serodiscordance among male couples in other communities may be lower. Atlanta is an urban area with relatively high HIV prevalence among MSM and most of our study participants were black/African American. Even in areas with lower prevalence of serodiscordance, developing services to address the HIV prevention needs of discordant couples should be a priority activity. Innovative approaches to increase HIV testing among MSM are needed to meet the National HIV/AIDS Strategy goals of reducing new HIV infections, increasing access to care, and improving health outcomes for people living with HIV (The White House Office of National AIDS Policy, 2010). CHTC services for MSM are arguably the most efficient way of identifying serodiscordant couples and linking them to prevention efforts and care (World Health Organization, 2012).

Unfortunately, there is currently a dearth of materials and services to which couples can be referred for ongoing HIV prevention and sexual health services, regardless of their HIV status as a couple. This is a critical gap in the prevention portfolio for MSM that needs to be addressed (Beyrer et al., 2012). For example, for men who are in concordant negative relationships, it is important to ensure ongoing access to couples' testing and provide support for couples who may use information about mutually HIV-negative serostatus to negotiate stopping condom use within their relationship. For couples who are concordant HIV positive, tools may be needed to help couples provide mutual support to one another as they seek next steps in linkage to medical treatment and care. In addition, the current model of individually-focused adherence supports needs to be reshaped to address the communal needs of seroconcordant couples. For HIV discordant couples, there is a great opportunity to develop and test interventions or services that utilize the intentions of couples to support one another (Stephenson et al., 2011). This could facilitate linkage to medical treatment and care for positive partners and engage the couple in a discussion of other prevention options, such

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as oral-pre-exposure chemoprophylaxis (Grant et al., 2010) for the negative partner (Mansergh, Koblin, & Sullivan, 2012).

Beyond the framework of couples, we note that offering a couples testing option attracted a group of MSM with a high prevalence of undiagnosed HIV infection. Based on our preliminary qualitative research (Stephenson et al., 2011) and our anecdotal understanding of men's reasons for presenting for HIV testing as a couple, we believe that offering testing to male couples may encourage men to seek testing who might otherwise avoid testing or believe themselves not to be at risk of HIV acquisition. Men in relationships, especially longer-term relationships, have reported to us feeling less need to test for HIV while they are in a serious relationship. The perception of relationship being protective against HIV infection may be flawed given modeling data suggesting that a substantial proportion of new HIV infections among U.S. MSM stem from main partners (Goodreau et al., 2012; Sullivan et al., 2009b). This misperception may be reinforced by prevention messaging focused on the dangers of casual sex.

There were a number of limitations to our analysis. First, data were collected from a community-recruited sample of MSM in a large urban area. The patterns of serodiscordance within couples are likely to be different in less urban areas and in parts of the U.S. with lower HIV prevalence. Further, because participation of our couples was conditioned on their consenting to the possibility of testing jointly, the couples we observed were different from other couples in ways that might be associated with a higher or lower prevalence of serodiscordance. The sample comprised mainly Black participants and HIV seroprevalence rates among Black MSM are higher than among other racial/ethnic groups of MSM (Centers for Disease Control and Prevention, 2010b). Because the study offered a monetary incentive for participation, it is possible that some men who already knew that they were living with HIV presented themselves as being of unknown HIV status for the purpose of participating in the study or that some men who were not actually couples presented as couples for the purpose of participating in the study. The former scenario would lead to overestimation of HIV seroprevalence and the latter might lead to an overestimate or underestimate of "undiagnosed" couple serodiscordance.

To minimize possibilities of misclassification, we engaged staff who worked with known HIV-positive clients in care, used administrative records to attempt to identify persons who had been previously aware of their HIV diagnosis, and used review of data elements from partners' surveys to identify inauthentic couples. Finally, our definition of a "couple" as being partnered for at least 3 months duration likely excluded many couples who had been together for shorter periods of time or who did not identify themselves as a "couple," perhaps because they had agreements that allowed outside partners. To address this concern, we have since developed the marketing for the service using the branding of "Testing Together," to reduce the extent to which men in male sexual partnerships self-select out of the service because they are unsure as to whether they are a "couple" (see www.testingtogether.org).

Based on the results of our study, we believe that HIV serodiscordance is a common situation for male couples in the U.S. and that offering HIV testing and complementary coordinated support services is an important part of a comprehensive approach to HIV prevention for this most at-risk population. Based on evidence from studies of heterosexual couples in Africa (Allen et al., 2003) and experiences in program implementation, the CDC has recommended CHTC for male couples in PEPFAR countries (The U.S. President's Emergency Plan for AIDS Relief (PEPFAR), 2011). The World Health Organization (WHO) (2012) has articulated an important role for couples-based testing in the identification of serodiscordant couples and in the linkage of HIV-positive partners to

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antiretroviral therapy and has recognized the likelihood that male couples throughout the world likely have high levels of serodiscordance. Our data provide evidence from an urban area in the U.S. with a high HIV prevalence in support of the WHO recommendations. Evaluation and implementation of CHTC for MSM in the U.S. is thus an example of a "South to North" technology transfer, in which a successful prevention service developed in Africa has been adapted and applied in the U.S. Based on the broad global evidence base for couples testing and our evidence of substantial serodiscordance among MSM, efforts should be made to scale up the offering of CHTC for male couples and to evaluate the observed prevalence of HIV and serodiscordance in diverse programmatic settings.

Acknowledgments

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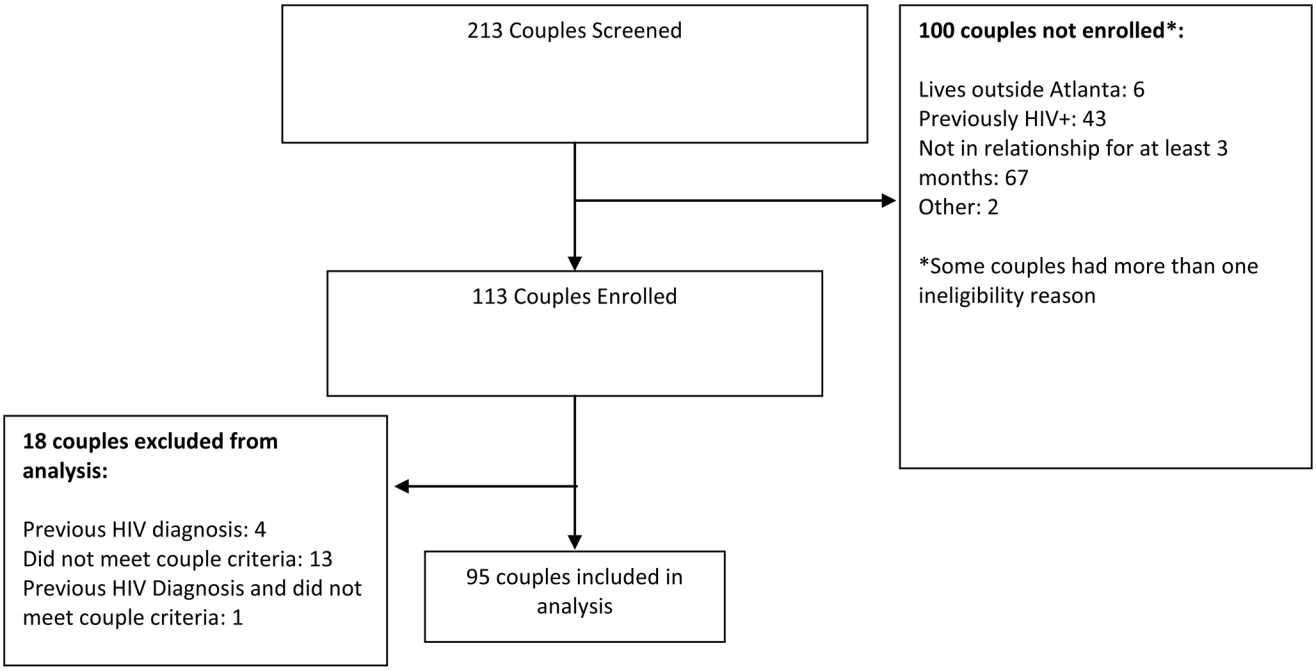

Figure 1.
Diagram of screening, enrollment and exclusions in study of male couples receiving HIV testing as part of a study of couples counseling and testing in Atlanta, 2010–2011.

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Table 1

Individual demographics of 190 men (95 couples) receiving HIV testing as part of a study of couples counseling and testing in Atlanta, 2010–2011.

	Total (N = 190)	HIV+ (N = 20)	HIV− (N = 170)	*p*[*]
	N (%)	N (%)	N (%)	
Age group (years)				.09
18–29	86 (45)	5 (25)	81 (48)	
30–39	57 (30)	10 (50)	47 (28)	
40–49	32 (17)	5 (25)	27 (16)	
≥50	15 (8)	0 (0)	15 (9)	
Race/ethnicity				ns
Asian/Pacific Islander	1 (1)	0 (0)	1 (1)	
Black/African American	137 (72)	17 (85)	120 (71)	
White/Caucasian	30 (16)	0 (0)	30 (18)	
Native American/Alaska Native	1 (1)	0 (0)	1 (1)	
Latino	11 (6)	1 (5)	10 (6)	
Multiracial	10 (5)	2 (10)	8 (5)	
Education				.03
College, post graduate, professional school	36 (19)	1 (5)	35 (21)	
Some college, associate's degree technical	62 (33)	8 (40)	54 (32)	
High school, GED school	70 (37)	6 (30)	64 (38)	
Some high school	19 (10)	3 (15)	16 (9)	
Less than high school	3 (2)	2 (5)	1 (1)	
Sexual Orientation				ns
Heterosexual/Straight	3 (2)	0 (0)	3 (2)	
Homosexual/Gay	116 (61)	15 (75)	101 (62)	
Bisexual	61 (32)	5 (25)	56 (34)	
Other/Queer[a]	10 (5)	0 (0)	10 (2)	
Method of recruitment				ns
Clinic walk-in	20 (11)	3 (15)	17 (10)	
Facebook	8 (4)	0 (0)	8 (5)	
Flyer	36 (19)	3 (15)	33 (19)	
Recruitment	14 (7)	2 (10)	12 (7)	
Referral	60 (32)	6 (30)	54 (21)	
Other/multiple	52 (27)	6 (30)	46 (27)	

[a] Included 6 men who declined to report a sexual orientation

[*] Fisher's Exact test *p* values for differences between HIV+ and HIV- individuals

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Table 2

Couple characteristics and HIV serostatus agreement among 95 male couples (190 men) receiving HIV testing as part of a study of couples counseling and testing in Atlanta, 2010–2011.

	Total couples (N = 95)	Concordant positive couples (N = 2)	Concordant Negative Couples (N = 77)	Serodiscordant Couples (N = 16)	*p**
	N (%)	N (%)	N (%)	N (%)	
Duration of relationship with main partner (months)					ns
1 to 6	14 (15)	0 (0)	11 (14)	3 (19)	
>6 to 12	18 (19)	1 (50)	14 (18)	3 (19)	
>12 to 24	32 (34)	1 (50)	28 (36)	3 (19)	
>24 to 36	7 (7)	0 (0)	6 (8)	1 (6)	
>36	15 (16)	0 (0)	10 (13)	5 (31)	
Missing	9 (9)	0 (0)	8 (10)	1 (6)	
Duration of relationship with main partner, median IQR (months)	14.0 (17.3)	11.3 (1.4)	14.3 (13.3)	14.1 (39.6)	ns
UAI in past year with main partner (reported by either partner)					ns
Yes	64 (65)	2 (100)	54 (68)	8 (47)	
No	31 (35)	0 (0)	23 (32)	8 (53)	
Frequency of anal/oral sex in past year with main partner					ns
1 to 5 times	18 (19)	0 (0)	15 (19)	3 (19)	
6 to 10 times	12 (13)	0 (0)	8 (10)	4 (25)	
Once per month	6 (6)	0 (0)	5 (6)	1 (6)	
2–3 times per month	25 (26)	1 (50)	20 (26)	4 (25)	
Once per week	10 (11)	0 (0)	10 (13)	0 (0)	
2–3 times per week	7 (7)	0 (0)	6 (8)	1 (6)	
≥3 times per week	17 (18)	1 (50)	13 (17)	3 (19)	
UAI with a man other than (and concurrent with) main partner in past 3 months					ns
Yes	32 (34)	1 (50)	26 (34)	5 (31)	
No	63 (66)	1 (50)	51 (66)	11 (69)	
Agreements about sex outside the relationship					ns
Both say monogamy	36 (38)	1 (50)	31 (40)	4 (25)	
Bath say outside sex without conditions	2 (2)	0 (0)	1 (1)	1 (6)	
Both say outside sex with conditions	8 (9)	0 (0)	8 (10)	0 (0)	

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	Total couples (N = 95)	Concordant positive couples (N = 2)	Concordant Negative Couples (N = 77)	Serodiscordant Couples (N = 16)	*p**
	N (%)	N (%)	N (%)	N (%)	
Both say no agreement	4 (4)	0 (0)	3 (4)	1 (6)	
Report different agreements	44 (46)	1 (50)	33 (43)	10 (63)	
One or both missing	1 (1)	0 (0)	1 (1)	0 (0)	
Number of different male sex partners in past 3 months other than main partner					ns
None	63 (66)	1 (50)	51 (66)	11 (69)	
≥ One	32 (34)	1 (50)	26 (34)	5 (31)	

*Fisher's Exact test for differences between concordant negative and discordant couples; no statistical comparisons were made using data from concordant positive couples because of the small number of couples.