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Respondent-Driven Sampling in a Multi-Site Study of Black and Latino Men Who Have Sex with Men

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Abstract

Purpose—Respondent-driven sampling (RDS) was used to recruit four samples of Black and Latino men who have sex with men (MSM) in three metropolitan areas to measure HIV prevalence and sexual and drug use behaviors. We compared demographic and behavioral risk characteristics of participants across sites, assessed the extent to which the RDS statistical adjustment procedure provides estimates that differ from the crude results, and summarized our experiences using RDS.

Methods—From June 2005 to March 2006 a total of 2,235 MSM were recruited and interviewed: 614 Black MSM and 516 Latino MSM in New York City, 540 Black MSM in Philadelphia, and 565 Latino MSM in Los Angeles County. Crude point estimates for demographic characteristics, behavioral risk factors and HIV prevalence were calculated for each of the four samples. RDS

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Analysis Tool was used to obtain population-based estimates of each sampled population's characteristics.

Results—RDS adjusted estimates were similar to the crude estimates for each study sample on demographic characteristics such as age, income, education and employment status. Adjusted estimates of the prevalence of risk behaviors were lower than the crude estimates, and for three of the study samples, the adjusted HIV prevalence estimates were lower than the crude estimates. However, even the adjusted HIV prevalence estimates were higher than what has been previously estimated for these groups of MSM in these cities. Each site faced unique circumstances in implementing RDS.

Conclusions—Our experience in using RDS among Black and Latino MSM resulted in diverse recruitment patterns and uncertainties in the estimated HIV prevalence and risk behaviors by study site.

INTRODUCTION

Although they represent only 2% of the United States population, men who have sex with men (MSM) account for an estimated 61% of all new HIV infections in U.S. [1,2] In 2010, among HIV-positive MSM, new diagnoses among Blacks (37%) and Latinos (23%) were disproportionately higher than among Whites (37%) in comparison to the racial/ethnic distribution of the U.S. population (13%, 15%, and 66%, respectively).[2] Given the burden of HIV in minority MSM populations, it is imperative to conduct research to identify factors that place Black and Latino MSM at risk for infection and to facilitate the design and implementation of targeted behavioral and biomedical interventions.

Black and Latino MSM are often difficult to recruit into research studies. It is particularly challenging to recruit representative samples of MSM because there are no sampling frames from which to generate a probability sample.[3] Silvestre et al. explored recruitment barriers for Black and Latino men in urban settings and noted that recruiting MSM of color required attention to cultural norms of the "target" group, use of members of the "targeted" community, and the use of promotional materials that were accepted by community members.[4] Fernandez et al. describe the use of Internet methods to recruit Latino MSM in Miami.[5] They found that men recruited through Internet chat rooms did present at physical study sites, although formative work in the community and inclusion of members of the targeted community were necessary to ensure their successful recruitment.

Venue-based (time-space) sampling has been the most broadly used method to recruit MSM populations for HIV behavioral research.[3,6] The Centers for Disease Control and Prevention (CDC) first implemented venue-based sampling in 1994 with the multi-site Young Men's Survey;[7] this method continues to be used to recruit MSM ages 18 years and older for CDC's National HIV Behavioral Surveillance system.[8] Despite its widespread use, some

experts believe that venue-based sampling may miss non-gay-identified or minority MSM who do not frequent predominantly gay-identified venues.[3]

In this report we describe the use of Respondent-Driven Sampling (RDS),[12] a form of chain-referral sampling, for recruiting four samples of Black and Latino MSM in three U.S. metropolitan areas. RDS has increased in popularity as a means to reach persons from hard-to-reach populations for which construction of a sampling frame is not feasible, such as injection drug users,[9] ecstasy users,[10] and Latino MSM.[11] We were particularly interested in 1) describing the RDS recruitment statistics across our study sites; 2) comparing the demographic and behavioral risk characteristics across each site; 3) assessing the extent to which the RDS statistical adjustment produces estimates that differ from the crude results, especially with respect to estimating HIV prevalence and behavioral risk; and 4) describing benefits and problems associated with using RDS as a sampling strategy, as well as suggesting recommendations for future studies that recruit Black and Latino MSM.

METHODS

Data were collected as part of the CDC's Brothers y Hermanos (ByH) study. The chief aims of the study included identifying the structural, psychological, socio-cultural and behavioral factors associated with elevated HIV transmission among Black and Latino MSM. From June 2005 through March 2006, Latino MSM were recruited in Los Angeles County and New York City, and Black MSM were recruited in New York City and Philadelphia. To be eligible, participants had to 1) be male (and identify as such), 2) identify as Black or Latino, 3) be 18 years of age or older, 4) report sex (oral, anal sex or mutual masturbation) with another male in the past 12 months, and 5) be a resident of New York City, NY, Philadelphia, PA, or Los Angeles County, CA. Men who were HIV-positive, HIV- negative, or of unknown serostatus were eligible to participate.

Participant Recruitment

Recruitment for ByH has been described.[13,14] Briefly, an initial set of target population members ("seeds") were selected using a quota so that approximately two thirds of the seeds recruited would be gay-identified, and approximately half of the seeds would be less than 30 years of age. We also attempted to recruit equal numbers of seeds who were HIV-positive, HIV-negative, and unknown HIV status to help diversify the initial sample of recruits by serostatus. Based on prior experience, additional seeds were selected if the pace of recruitment slowed to the point where few potential participants per week would present for interview appointments. Seeds and the individuals they recruited were encouraged to refer (using study coupons) up to three eligible individuals from their social networks to participate as the next wave of enrollees, with the process continuing until a sample size of 500 per study site was achieved.

Data Collection Procedures

Study enrollment took place in project offices located in office buildings, community-based organizations (gay and non- gay identified), community health centers or neighborhood storefront offices. After screening for eligibility and obtaining written informed consent,

participants completed an Audio Computer-Assisted Self-Interview (ACASI). The ACASI was available in English and Spanish and took approximately 45 minutes to complete. Next, all participants, except those who disclosed that they had been previously diagnosed as HIV-positive, were tested for HIV using a rapid, oral fluid HIV- antibody test (OraQuick Advance; OraSure Technologies, Inc., Bethlehem, PA). Men with a preliminary positive result on the rapid test, and those who disclosed that they were already HIV positive, provided a blood specimen for confirmatory testing through Western blot assay.

All participants were paid $50 for their participation in the interview and HIV test. Participants earned an additional $15–$20 for each eligible person who they successfully recruited. The protocol was approved by the Institutional Review Boards at CDC and the local study sites.

Measures of Participant Attributes

The study questionnaire included questions on demographics, HIV testing history, behavioral variables, and psychosocial factors. To assess recent (past 3 months) sexual and substance use behaviors, participants were asked about insertive and receptive protected and unprotected anal sex, protected and unprotected vaginal sex, number of male and female sex partners, and use of alcohol and non- prescription drugs (marijuana, crystal methamphetamine, crack, cocaine, heroin, amyl nitrites and 'club drugs' [Ketamine, Ecstasy, Gamma hydroxybutyrate]).

To generate weighted RDS estimates of the demographic, behavioral and HIV prevalence variables, participants were asked to provide the number of MSM in their social network. Specifically, to measure size of social networks, men were asked: "Approximately how many *men who have sex with men* in [City] do you know personally? That is, you know their name, who they are, and how to contact them; they also know you *and* you have seen them in the last 6 months." Of the total number of these men, participants were asked how many were 18 years or older and of the same race/ethnicity as themselves (i.e., Black or Latino). Men were also asked to describe their relationship with the person who recruited them into study, e.g. friend, acquaintance, sexual partner, relative, or co-worker.

Statistical Analysis

Data analysis was conducted using the RDS Analysis Tool (RDSAT) 5.[6] (Heckathorn, Cornell University, Ithaca, NY) and SAS 9.1 (SAS Institutes, Cary, NC). Crude point estimates for demographic characteristics, behavioral risk factors and HIV prevalence were calculated for each of the four samples. We used RDSAT to obtain local population-based estimates of each sampled population's characteristics. RDSAT weights the crude estimates by using self-reported network sizes as well as each participant's tendency to recruit network members with similar demographic and behavioral characteristics, also called "homophily". The goal of weighting with RDS is to adjust for participants' tendency towards homophily and to provide point estimates more reflective of a random selection of the population's network members. Ninety-five percent confidence intervals (95% CI) for the RDSAT-adjusted point estimates were also generated. Differences in the adjusted point

estimates for demographics and risk behaviors compared across the four samples were determined by identifying non-overlapping 95% CIs.

RESULTS

A total of 2,235 MSM were recruited and interviewed: 614 Black MSM and 516 Latino MSM in New York City (NYC), 540 Black MSM in Philadelphia, and 565 Latino MSM in Los Angeles County.

Recruitment Characteristics and Patterns

Recruitment characteristics are provided in Table 1. The Philadelphia sample was obtained over the shortest period of time as well as from the fewest productive seeds (i.e., seeds that produced at least one recruitment wave) and recruitment waves. The Los Angeles sample of participants distributed the greatest number of recruitment coupons. The NYC Latino sample had the largest average network size of MSM of the same race/ethnicity.

Demographic and Risk Behavior Characteristics

Table 2 provides characteristics of seeds and final samples. Despite the intention to select and enroll similar seeds at each of the four study sites, there were differences between sites in the number and characteristics of seeds who participated in the project. For example, the Los Angeles site recruited more HIV positive and homosexually identified Latino seeds than did the NYC Latino site. The NYC Black site recruited a larger proportion of young MSM seeds compared with the Philadelphia site.

At each of the four study sites, the characteristics of the final sample differed greatly from the characteristics of the seeds. In every case, recruited participants were older than average and reported lower income than the seeds at that site. Recruits were less likely to be employed full-time and more likely to report being unemployed or disabled. At the study sites recruiting Black men, recruits were less likely to identify as gay and more likely to identify as bisexual. At the New York Black and Los Angeles Latino sites, recruits were more likely to report being HIV positive.

Statistical Adjustments for RDS Method

Table 3 presents the crude sample characteristics and the RDSAT-adjusted demographic and risk characteristics for the four samples. The adjusted estimates were fairly similar to the crude estimates at each site for demographic characteristics such as age, income, education and employment. At the NYC Latino site, however, the adjusted demographic distribution was considerably older and lower in income than the crude sample distribution.

Among the sexual behaviors, the adjusted estimates of the prevalence of risky sexual behaviors were lower than the crude estimates. For three of the samples, the adjusted HIV prevalence estimates were lower than the crude estimates. The adjusted estimated HIV prevalence among the NYC Latino participants, however, was greater compared to the crude estimate, and had a larger magnitude of difference compared to the other three samples. It should be noted that in the NYC Latino sample, the HIV-positive enrollees had a much

smaller adjusted average network size than the HIV-negative enrollees (3.9 vs. 9.8), resulting in RDSAT assigning a larger population weight (2.7 vs. 0.6) to the HIV-positive group.

DISCUSSION

Our experience using RDS to enroll and to estimate HIV prevalence, risk behaviors and psychosocial factors among Black and Latino MSM resulted in diverse recruitment patterns and potential uncertainties in the estimated HIV prevalence, risk behaviors, and demographic distributions by study site.

The RDS weighted adjustments are inversely related to social network size.[15] For example, in our study the HIV-positive group had a much smaller adjusted network size than the HIV negative group in the NYC Latino sample, resulting in RDSAT assigning a larger population weight to adjust the HIV prevalence upward. Because network size is a key factor in RDSAT adjustments, unreliable measurement of network sizes may lead to unstable adjustments. This situation may have occurred with adjusted HIV prevalence in the NYC Latino sample since overall mean network sizes were larger compared to the other samples. The other three study samples had equivalent network sizes for their HIV-positive and -negative sub-samples, resulting in a smaller magnitude of change.

Participants' homophily also affects the population estimates in that a higher level of homophily will limit the sample's representativeness of the populations of Black and Latino MSM in these cities.[15] For example, although not provided in the tables, homophily statistics were quite different between HIV-positive and HIV-negative MSM in the NYC Latino sample. Furthermore, the adjusted estimate for income distribution in the NYC Latino sample was mostly affected by homophily but not by network size.

Implementation Considerations

Many of the differences in demographic characteristics across the four samples may reflect real diversity in population characteristics in each city; however, some differences may be due to the way data collection was conducted at each site. Implementation differences also include inevitable variations based on the collaborating organizations involved in data collection and the location of data collection sites in each city. Other implementation differences occurred as the research team at each site made recruitment adjustments to achieve study samples perceived to be more reflective of the underlying population of MSM. These variations are important to examine because they raise questions about when RDS protocols should be flexible and how revisions in procedures such as using special incentives, adding seeds, and limiting the number of coupons that a participant could distribute may affect the final sample. First, the location of data collection activities and the organizations involved may have affected who was willing to participate as well as the type of person recruiters decided to invite to the study. In Philadelphia, data collection took place at two Lesbian, Gay, Bisexual and Transgender (LGBT) organizations in Center City, as well as one non-LGBT organization serving African Americans in North Philadelphia. The NYC Black participants completed interviews at a project-specific office in lower Manhattan. The lack of identification with a service organization, particularly an LGBT service organization, may have increased the comfort of participants; however, having just one location may have

decreased participation of men from more distant boroughs. Local variation also occurred among the types of seeds that were productive in recruiting participants. The NYC Latino sample had productive seeds that were young and HIV negative. Philadelphia's most productive seeds were over the age of 40 and unemployed or disabled. Many of the productive seeds in the NYC Black sample were HIV-positive. RDS principles state that seed characteristics should not affect the representativeness of the final sample if equilibrium (when sample composition is independent of the initial seeds) is reached.[12,15]

One of the principal benefits of the RDS method is the potential ability to obtain an unbiased sample of a hard-to-reach population. Specifically, RDS may provide population-based estimates of underlying population parameters if (1) the sample reaches equilibrium through a sufficient number of waves or cycles of participant recruitment and (2) study participants randomly refer members of their social network to the study.[16] Based on previous experience conducting RDS in other populations, it is possible to attain equilibrium through sufficiently long recruitment chains, generally after six waves. In this study, well over 6 recruitment waves were obtained prior to reaching the target sample size of 500 in each study site. Less apparent, however, is whether study participants referred persons to the study randomly from their social network. Some participants in the study informed field staff that, in order to make sure they received their recruitment compensation, they deliberately chose to recruit men who were most likely to participate. This strategy may have resulted in a large number of low- income and unemployed participants. In Los Angeles, the study became known as a study for HIV-positive MSM, with 51% of the Latino study population disclosing an HIV- positive serostatus. Similarly in NYC, 56% of the enrolled Black participants were self-reported HIV- positive. While other studies in NYC have generated high HIV prevalence estimates among Black MSM,[17] we are not aware of any HIV prevalence estimates in Los Angeles County that approach the RDSAT-adjusted estimate (or the lower confidence limit) produced by the sample of Latino MSM. As a point of reference, estimates obtained from the 2008 National HIV Behavioral Surveillance cycle among MSM in the same cities indicated HIV seropositivity of 31% among Blacks and 15% among Latinos in NYC; 12% among Blacks in Philadelphia; and 19% among Latinos in Los Angeles County.[18]

Based on our reservations about the validity of a number of RDSAT-adjusted estimates obtained in this study, we think that our application of RDS did not perform well in the estimation of HIV prevalence across the four study sites. This outcome may have been influenced by the study's emphasis on performing HIV testing. If the study had not included the HIV testing component, it is possible that we would not have observed the bias toward referral of known HIV-positive men in the Los Angeles Latino and NYC Black samples. In other words, at these two sites, we suspect that HIV-positive participants anticipated that their HIV-positive contacts would feel more comfortable enrolling compared with their HIV negative and unknown status contacts.

Despite these concerns, the use of RDS can be beneficial for accessing hard-to-reach populations, in this case sub-groups of Black and Latino MSM who may not be accessible at more gay-identified public venues using a time-location sampling approach. RDS may be considered as a more economical or innovative method for recruiting important groups for

public health research or intervention given that the burden of recruitment is on the participants and not the study staff.[19,20] In addition, RDS has the potential to provide access to more hidden layers of the population who are not known to project staff and who would not volunteer to participate on their own.[21] For example, only 45.4% and 26.6% identified as homosexual in the adjusted samples of Black MSM in New York City and Philadelphia, respectively. While the proportions of Latino MSM identifying as homosexual were higher in the adjusted samples for New York City (71.2%) and Los Angeles (61.8%), the RDS method likely facilitated the enrollment of higher proportions of bisexually and heterosexually identified MSM than would have been possible using time-location methods.

We hope that our experiences with RDS described here will inform future studies using this sampling methodology. Other investigators have shared their experiences and have offered suggestions for conducting RDS.[22,23] The importance of conducting comprehensive formative work cannot be over-emphasized. Formative research can help investigators to select appropriate incentives, identify appropriate data collection venues, determine the target population's social network characteristics, and to better anticipate their willingness to participate and refer others to the study. Close monitoring of the recruitment process is also important so that investigators can identify irregularities and biases that may need attention before the sample becomes mono-dimensional and study results are irretrievably skewed. As investigators attain greater experience with RDS, this methodology has the potential to generate increasingly accurate estimates of population parameters pertaining to a variety of behavioral and health domains.

Acknowledgments

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Table 1

RDS Recruitment Characteristics for Four Brothers y Hermanos Study Data Collection Sites, 2005–06

Recruitment Characteristics	NYC Black (n= 614)	Philadelphia Black (n= 540)	NYC Latino (n= 516)	Los Angeles Latino (n= 562)
Study Period (date)	8/3/2005–3/31/2006	6/16/2005–12/10/2005	7/14/2005–3/14/2006	6/27/2005–3/24/2006
Total Recruitment Time (weeks or days)	35 weeks	26 weeks	36 weeks	39 weeks
# Seeds	36	21	16	25
# Productive Seeds[*]	17	10	13	15
% Productive	47.2%	47.6%	81.3%	60.0%
# Coupons Distributed	1281	1179	1548	2350
# Recruitment Waves	19	11	22	22
Participants' Network Size of MSM (mean # of persons, 95% CI)	23.7 (19.7, 27.7)	14.7 (12.5, 16.9)	37.1 (31.6, 42.6)	19.2 (15.6, 22.8)
Participants' Network Size of MSM of Same Race/Ethnicity (mean # of persons, 95% CI)	18.7 (15.6, 21.8)	12.8 (10.9, 14.7)	23.2 (20.1, 26.3)	18.1 (15.5, 20.7)

[*] Productive seeds produced at least one recruitment wave.

CI, confidence interval.

Table 2

Characteristics of Seeds and Final Samples for Four Brothers y Hermanos Study Data Collection Sites, 2005–06

	NYC Black		Philadelphia Black		NYC Latino		Los Angeles Latino	
	Seeds % (n= 36)	Final Sample % (n= 614)	Seeds % (n= 21)	Final Sample % (n=540)	Seeds % (n= 16)	Final Sample % (n= 516)	Seeds % (n= 25)	Final Sample % (n= 562)
Age								
<35	61.1	22.9	47.6	16.5	81.3	76.2	76.0	37.7
35	38.9	77.1	52.4	83.5	18.8	23.8	24.0	62.3
Annual Income								
<$10,000	33.3	56.5	47.6	61.9	12.5	39.3	20.8	64.6
$10,000	66.7	43.5	52.4	38.1	87.5	60.7	79.2	35.5
Education Level								
Less than High School	8.3	21.5	14.3	25.4	0.0	15.3	8.0	29.0
High School Grad/GED	30.6	48.1	33.3	48.1	56.3	46.7	36.0	39.1
Some College or Degree	61.1	30.4	52.4	26.5	43.8	38.0	56.0	31.8
Employment Status								
Full time	41.7	13.7	38.1	12.2	75.0	36.2	52.0	25.2
Part-time/occasional	30.6	19.3	42.9	24.1	0.0	29.1	40.0	26.3
Unemployed/Retired	22.2	45.2	9.5	40.6	12.5	25.2	4.0	26.8
Disabled	2.8	21.8	9.5	23.0	12.5	9.5	4.0	21.8
Born in the U.S.	94.4	90.6	95.2	92.2	81.3	59.5	44.0	27.2

	NYC Black		Philadelphia Black		NYC Latino		Los Angeles Latino	
		Final		Final		Final		Final
	Seeds % (n= 36)	Sample % (n= 614)	Seeds % (n= 21)	Sample % (n= 540)	Seeds % (n= 16)	Sample % (n= 516)	Seeds % (n= 25)	Sample % (n= 562)
Sexual Identity								
Homosexual	75.0	55.6	71.4	38.1	56.3	78.1	76.0	70.1
Bisexual	16.7	32.1	28.6	42.6	37.5	14.7	20.0	23.3
Heterosexual/Other	8.3	12.3	0.0	19.3	6.3	7.2	4.0	6.6
Self-reported HIV Status								
Negative	61.1	34.6	61.9	57.1	62.5	54.7	52.0	38.4
Positive	33.3	55.9	33.3	27.4	18.8	16.9	32.0	51.3
Unknown	2.8	1.8	4.8	5.4	12.5	7.8	4.0	2.5
Never tested	0.0	7.7	0.0	10.1	6.3	20.6	12.0	7.9

Table 3

Crude Distributions of Demographic and Risk Characteristics and Adjusted Distributions Controlling for Network Size and RDS Recruitment Patterns, Brothers y Hermanos Study, 2005–06

	NYC Black (n= 614)		Philadelphia Black (n= 540)		NYC Latino (n= 516)		Los Angeles Latino (n= 562)	
	Crude %	Adjusted % (95% CI)	Crude %	Adjusted % (95% CI)	Crude %	Adjusted % (95% CI)	Crude %	Adjusted % (95% CI)
Age (years)								
< 35	22.9	20.3 (15.8, 25.3)	16.5	15.5 (11.0, 19.4)	76.2	50.6 (41.0, 60.0)	37.7	33.7 (28.0, 39.4)
35	77.1	79.7 (74.7, 84.2)	83.5	84.5 (80.6, 89.0)	23.8	49.4 (40.0, 59.0)	62.3	66.3 (60.6, 72.0)
Annual Income								
< $10,000	56.5	63.5 (58.3, 68.0)	61.9	68.6 (64.1, 73.7)	39.3	56.8 (50.0, 65.3)	64.6	67.8 (62.0, 73.1)
$10,000	43.5	36.5 (32.0, 41.7)	38.1	31.4 (26.3, 36.0)	60.7	43.2 (34.7, 50.0)	35.5	32.2 (26.9, 38.0)
Education Level								
Less than High School	21.5	24.9 (20.1, 28.8)	25.4	28.5 (23.3, 32.5)	15.3	24.8 (18.8, 31.4)	29.0	33.8 (29.0, 38.9)
High School/GED	48.1	52.5 (48.0, 58.2)	48.1	51.3 (46.4, 56.6)	46.7	46.1 (39.7, 52.4)	39.1	38.2 (33.1, 42.9)
College or higher degree	30.4	22.6 (18.5, 27.1)	26.5	20.2 (16.8, 24.6)	38.0	29.1 (23.4, 35.1)	31.8	28.0 (23.5, 32.7)
Employment History								
Full time	13.7	11.0 (7.5, 13.6)	12.2	7.3 (5.3, 9.6)	36.2	23.6 (18.3, 29.1)	25.2	24.6 (20.0, 30.4)
Part-time/occasional	19.3	17.9 (13.9, 22.4)	24.1	23.7 (19.0, 28.3)	29.1	27.5 (20.7, 32.5)	26.3	26.6 (21.9, 31.2)
Unemployed/Retired	45.2	46.5 (41.6, 51.7)	40.6	44.7 (39.5, 50.3)	25.2	25.2 (20.4, 31.9)	26.8	29.1 (23.6, 33.5)
Disabled	21.8	24.6 (20.4, 29.8)	23.0	24.3 (19.7, 28.6)	9.5	23.7 (15.8, 33.3)	21.8	19.7 (15.4, 24.6)
Born in the U.S.	90.6	90.1 (86.8, 93.1)	92.2	87.4 (83.4, 91.2)	59.5	50.8 (42.8, 59.2)	27.2	27.4 (21.9, 33.0)
Sexual Identity								
Homosexual	55.6	45.4 (39.0, 50.6)	38.1	26.6 (21.2, 31.3)	78.1	71.2 (65.9, 77.7)	70.1	61.8 (54.5, 67.7)

	NYC Black (n= 614)		Philadelphia Black (n=540)		NYC Latino (n= 516)		Los Angeles Latino (n= 562)	
	Crude %	Adjusted % (95% CI)	Crude %	Adjusted % (95% CI)	Crude %	Adjusted % (95% CI)	Crude %	Adjusted % (95% CI)
Bisexual	32.1	35.8 (31.0, 40.9)	42.6	46.4 (41.3, 52.0)	14.7	21.5 (14.9, 27.0)	23.3	27.3 (22.2, 33.1)
Heterosexual/Other	12.3	18.9 (14.8, 24.1)	19.3	26.9 (21.9, 32.6)	7.2	7.3 (4.9, 10.0)	6.6	11.0 (7.6, 15.5)
Ever tested for HIV	92.4	90.1 (86.9, 93.2)	90.0	87.7 (84.1, 91.0)	79.4	79.1 (73.8, 84.3)	92.2	90.5 (87.3, 93.8)
Self-reported HIV Status								
Negative	34.6	43.2 (36.4, 51.6)	57.1	59.5 (52.7, 65.1)	54.7	29.8 (22.9, 36.0)	38.4	43.2 (36.8, 50.4)
Positive	55.9	45.2 (36.9, 52.3)	27.4	22.0 (16.9, 28.2)	16.9	49.4 (41.3, 60.9)	51.3	41.7 (34.8, 49.6)
Unknown	1.8	1.5 (0.3, 2.6)	5.4	6.3 (4.0, 9.3)	7.8	5.6 (3.2, 8.4)	2.5	3.4 (1.4, 5.4)
Never tested	7.7	10.2 (7.2, 13.5)	10.1	12.2 (8.9, 16.0)	20.6	15.2 (9.8, 18.7)	7.9	11.8 (7.7, 14.7)
HIV Antibody Positive[1]	66.0	58.0 (47.5, 65.6)	36.2	29.7 (23.2, 36.9)	19.0	51.9 (43.0, 61.8)	56.0	47.4 (39.3, 55.1)
Ever diagnosed with STD (other than HIV)	70.4	65.4 (60.2, 70.3)	63.3	61.8 (56.4, 66.9)	29.5	33.0 (26.6, 40.1)	55.9	51.6 (45.8, 57.6)
In the Past 3 Months:								
Any UAI with males	50.7	42.0 (36.7, 47.2)	37.6	33.2 (28.3, 37.8)	47.1	43.4 (37.2, 50.1)	50.2	45.7 (40.4, 50.9)
UAI, Insertive	37.3	26.5 (22.3, 31.0)	32.0	28.0 (23.0, 32.6)	33.5	28.7 (23.5, 34.5)	30.6	25.3 (20.9, 29.9)
UAI, Receptive	27.9	20.4 (16.8, 24.6)	20.2	14.4 (11.2, 17.5)	27.3	21.5 (17.0, 26.5)	32.4	26.5 (21.9, 31.3)
Exchange sex[2]	20.2	14.9 (11.8, 18.0)	26.5	22.1 (17.9, 26.4)	11.2	7.3 (5.1, 9.6)	15.0	13.2 (9.7, 17.1)
Non-Prescription Drug Use[3]	64.2	61.8 (56.9, 67.1)	65.6	65.0 (59.4, 70.1)	57.9	58.1 (51.4, 64.4)	42.2	39.2 (33.4, 45.0)
Any Alcohol Use	63.5	61.1 (56.0, 66.2)	66.7	65.9 (60.4, 71.0)	70.3	66.9 (60.7, 72.5)	60.9	55.2 (49.4, 61.0)
Sex with Female	21.5	29.0 (24.3, 33.8)	40.2	49.5 (43.6, 56.1)	6.6	12.4 (7.5, 18.0)	9.6	9.2 (6.5 12.2)

STD, sexually transmitted disease. UAI, unprotected anal intercourse.

[1] Determined by the HIV antibody test administered at time of the interview.

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[2] Gave or received money, food or drugs for sex.

[3] Marijuana, crystal methamphetamine, crack, cocaine, heroin, amyl nitrites and 'club drugs' [Ketamine, Ecstasy, Gamma hydroxybutyrate]).

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