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Receipt of HIV/STD Prevention Counseling by HIV-Infected Adults Receiving Medical Care in the United States

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Abstract

Objective—Guidelines recommend risk-reduction counseling by HIV providers to all HIV-infected persons. Among HIV-infected adults receiving medical care in the United States, we estimated prevalence of exposure to three types of HIV/sexually transmitted disease (STD) risk-reduction interventions and described the characteristics of persons who received these interventions.

Design—Data were from the Medical Monitoring Project (MMP), a supplemental HIV surveillance system designed to produce nationally representative estimates of behavioral and clinical characteristics of HIV-infected adults receiving medical care in the United States.

Methods—Descriptive analyses were conducted to estimate the exposure to each type of HIV/STD risk-reduction intervention. Bivariate and multivariable analyses were conducted to assess associations between the selected correlates with each exposure variable.

Results—About 44% of participants reported a one-on-one conversation with a health care provider about HIV/STD prevention, 30% with a prevention program worker, 16% reported participation in a small group risk-reduction intervention, and 52% reported receiving at least one of the three interventions in the past 12 months. Minority race/ethnicity, low income, and risky sexual behavior consistently predicted greater intervention exposure. However, 39% of persons who reported risky sex did not receive any HIV/STD risk-reduction interventions.

Conclusions—HIV-infected persons in care with fewer resources or those who engaged in risk behaviors were more likely to receive HIV/STD risk-reduction interventions. However, less than half of HIV-infected persons in care received HIV/STD prevention counseling from their provider, an intervention that has been shown to be effective and is supported by guidelines.

Keywords

HIV/STD prevention counseling; HIV-infected persons; Medical Monitoring Project

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Disclaimer

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Conflicts of Interest

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Introduction

More than 1.1 million persons are living with HIV (PLWH) in the United States (1). While many PLWH reduce risk behaviors after learning that they are infected (2), some continue to engage in risky behavior at some point after their diagnosis (3, 4). Maintaining safer behaviors over a lifetime can be challenging. Providing prevention interventions that reduce the risk of HIV transmission or acquisition of other sexually transmitted diseases (STDs), in addition to HIV treatment and care for improving the health of PLWH are critical components of the U.S. National HIV/AIDS Strategy (NHAS) (5).

Meta-analyses (3, 6) show that behavioral interventions for PLWH significantly reduce sexual risk behaviors. Research trials have shown evidence that brief one-on-one HIV risk-reduction interventions delivered by providers/clinicians during clinical care visits can reduce sexual risk behaviors of HIV-positive patients (7, 8). Evidence-based recommendations and clinical guidelines (9, 10) emphasize that health care providers in clinic settings should offer prevention counseling during routine clinic visits to all PLWH regarding how they can protect themselves or their partners from getting HIV and other STDs. However, little is known regarding what percentage of PLWH who receive care in the United States have been exposed to HIV prevention counseling and whether prevention counseling is reaching PLWH who need it.

The primary objective of this paper is to estimate prevalence of exposure to 1) individual-level HIV/STD prevention counseling provided by health care workers, 2) individual-level HIV/STD prevention counseling provided by prevention program workers, 3) small group HIV/STD risk-reduction interventions. These are the types of behavioral risk-reduction interventions that are more commonly implemented in clinical and non-clinical settings. The second objective is to describe the characteristics of the PLWH who received each of the risk-reduction interventions. We were particularly interested in determining whether HIV-infected persons who had fewer socioeconomic resources and engaged in high risk sexual and drug using behavior were more or less likely to receive these interventions. These findings can provide information on the reach of HIV/STD risk-reduction interventions among PLWH receiving medical care in the United States and whether these behavioral interventions are appropriately targeted.

Methods

The Medical Monitoring Project (MMP) is a supplemental HIV surveillance system designed to produce nationally representative estimates of behavioral and clinical characteristics of HIV-infected adults receiving medical care in the United States (11-13). MMP is a complex-sample, cross-sectional survey. For the 2009 data collection cycle, first 17 U.S. states and territories were sampled from the 50 U.S. states, Washington DC, and Puerto Rico based on probability proportional to size, then facilities providing HIV care, and finally adult persons aged 18 years or older receiving at least one medical care visit in participating facilities between January and April 2009. Data were collected via face-to-face interviews and medical record abstractions from June 2009 to May 2010. All sampled states

and territories participated in MMP: California (including the separately funded jurisdictions of Los Angeles County and San Francisco), Delaware, Florida, Georgia, Illinois (including Chicago), Indiana, Michigan, Mississippi, New Jersey, New York (including New York City), North Carolina, Oregon, Pennsylvania (including Philadelphia), Puerto Rico, Texas (including Houston), Virginia, and Washington. Of 603 sampled facilities within these states or territories, 461 participated in MMP (facility response rate 76%), and of 9,338 sampled persons, 4,217 completed both an interview and a linked medical record abstraction (adjusted patient-level response rate 51%). Data were weighted based on known probabilities of selection at state or territory, facility, and patient levels. In addition, data were weighted to adjust for non-response using predictors of patient-level response including facility size, race/ethnicity, time since HIV diagnosis, and age group via linkage with the local HIV surveillance system.

Many of the variables of interest had a 12 month recall period (see below) and behaviors reported by those diagnosed less than 12 months ago could represent the behaviors that they had engaged in before they knew they had HIV. For the present analysis we excluded persons who were diagnosed less than 12 months ago because we were interested in evaluating participants' experience only after HIV diagnosis. We also excluded persons whose data were flagged as questionable by the interviewers because they were high on drugs or too sick to answer questions appropriately. Thus, this analysis includes information on 4092 participants. After weighting for probability of selection and non-response, these 4092 participants are estimated to represent the population of 409,283 HIV-infected adults diagnosed for at least one year who received medical care in the United States between January and April 2009.

Ethics Statement

MMP was determined to be a non-research activity in accordance CDC's Guidelines for Defining Public Health Research and Public Health Non-Research. However, some participating states or territories and facilities obtained local Institutional Review Board (IRB) approval to conduct MMP when required locally.

Measures

Outcome Measures—We assessed exposure to three types of HIV/STD risk-reduction interventions in the past 12 months with the following questions: (1) During the past 12 months, have you had a one-on-one conversation with a doctor, nurse, or other health care worker about ways to protect yourself or your partners from getting HIV or other sexually transmitted diseases?; (2) During the past 12 months, not including when you may have been tested for HIV, have you had a one-on-one conversation with an outreach worker, counselor, or prevention program worker about ways to protect yourself or your partners from getting HIV or other sexually transmitted diseases?; (3) During the past 12 months, have you participated in an organized session involving a small group of people to discuss ways to protect yourself or your partners from getting HIV or other sexually transmitted diseases? These questions were asked consecutively in the interviews. We also created an overall measure of intervention exposure indicating exposure to any of the three types of HIV/STD risk-reduction interventions in the past 12 months.

Potential Correlates—We assessed the sociodemographic variables of age in years (18-24, 25-34, 35-44, 45-54, 55 or more), gender (male, female, transgender), race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, other), education (less than high school, high school, more than high school), and household income (less than \$20,000, 20,000-39,999, 40,000 or more). We also examined whether, in the past 12 months, a participant had been homeless, incarcerated, had health insurance, and was born in the United States. Number of years since HIV diagnosis was dichotomized into less than 5 years vs. 5 years or more.

Participants also reported whether they had engaged in behaviors in the past 12 months such as drinking before or during sex; using non-injection drugs before or during sex; using stimulant drugs such as crack, cocaine, or methamphetamine; and having any unprotected vaginal and/or anal sex with HIV-negative or unknown status partners. The participants were also categorized into four sexual risk groups based on self-reported sexual behavior in the past year or self-identified sexual orientation: MSM (men who reported sex with at least one man or men who self-identified as gay or bisexual), MSW only (men who reported sex with women only or men who self-identified as heterosexual), WSM (women who reported sex with at least one man or women who self-identified as heterosexual or bisexual), and other (people who were not categorized into any of the above). Information about self-identified sexual orientation was used for participants who did not report being sexually active in the past 12 months.

We also included three health status measures. Self-reported diagnosis of an STD indicates whether participants' health care providers had told them they had syphilis, gonorrhea, chlamydia, herpes, genital warts, or any other STD in the past 12 months. Depression was measured using the Patient Health Questionnaire (PHQ-8) which consists of eight of the nine criteria on which the Diagnostic and Statistical Manual of Mental Disorders, 4th Edition (DSM-IV) diagnosis of depressive disorders is based (14). Information about HIV viral load suppression (most recent viral load test documented as undetectable or < 200 copies/ml) was obtained from participants' medical records and was dichotomized into suppressed viral load vs. not suppressed viral load.

Statistical Analysis—We conducted descriptive analyses by examining the frequency and weighted frequency of each selected correlate and outcome variable. We also conducted bivariate analyses to assess associations between the selected correlates with each outcome variable. Unadjusted prevalence ratios (PRs) and 95% confidence intervals were calculated for bivariate analyses.

We conducted four separate multivariable logistic regression models to examine the associations between outcome variables and correlates. All variables with p-value < 0.05 from the bivariate test result were included in the multivariable model after testing for multicollinearity. Adjusted prevalence ratios (APRs) and 95% confidence intervals were calculated using the full model in multiple regression analyses. All estimates incorporated MMP sample weights to account for probability of selection and nonresponse and appropriately specified the subpopulation analyzed to the software. Variance estimation used Taylor series linearization to account for the complex sample design. All analyses were

conducted using SAS System for Windows (release 9.2; SAS Institute Inc., Cary, N.C.) and SAS-Callable SUDAAN (release 10.0; Research Triangle Institute, Research Triangle Park, N.C.).

Results

Sample Description

Table 1 describes the demographic and risk behavior characteristics of participants in the sample. A majority were between ages 35-54 (66%), male (71%), and racial/ethnic minorities (65%). Almost two-thirds (65%) had an annual income less than \$20,000. Thirteen percent reported having unprotected sex with HIV-negative or unknown status partners and 11% reported using stimulant drugs. Almost half (47%) were MSM, and about a quarter each were MSW only (24%) and WSM (27%). Approximately 13% self-reported an STD diagnosis in the past 12 months, and a little less than three-quarters (72%) had most recent viral load documented in the medical record to be suppressed.

Exposure to HIV/STD Risk-Reduction Interventions

Forty-four percent, an estimated 179,172 HIV-infected persons who were diagnosed for at least one year and received medical care in the United States, reported they had a one-on-one conversation with a health care provider about HIV/STD prevention. Thirty percent, an estimated 121,624 persons, reported they had such a conversation with a prevention program worker, and 16%, an estimated 65,881 persons, reported they had participated in a small group intervention in the past 12 months (Table 2). Overall, 52%, an estimated 211,820 persons, reported exposure to any of the three types of HIV/STD risk-reduction interventions. Among persons who self-reported unprotected sex with an HIV-negative or unknown status partner, only 61% received any risk-reduction interventions (Table 3). Among persons who self-reported an STD diagnosis in the 12 months prior to interview, only 63% received any risk-reduction interventions.

Correlates of exposure to HIV/STD risk-reduction interventions

Table 3 shows bivariate and multivariable correlates of exposure to each type of HIV/STD risk-reduction intervention. Among the significant bivariate correlates of exposure to one-on-one conversations with a health care provider about HIV/STD prevention, multivariable analysis showed that younger age (except for 45-54), racial/ethnic minority status, lower education (< high school vs. >high school), lower annual income (<\$20,000 vs. \$40,000), homelessness, diagnosed with HIV <5 years, unprotected sex with an HIV-negative or unknown status partner, and self-reported STD diagnosis remained significantly associated with exposure to prevention counseling by health care providers.

For exposure to one-on-one conversations with a prevention program worker about HIV/STD prevention, younger age, racial/ethnic minority status, lower income, homelessness, diagnosed with HIV <5 years, unprotected sex with an HIV-negative or unknown status partner, and self-reported STD diagnosis remained significant correlates in multivariable analysis. For participation in a small group intervention to discuss HIV/STD prevention, racial/ethnic minority status, lower income (<\$20,000 vs. \$40,000), 5 years

post HIV diagnosis, stimulant drug use, unprotected sex with an HIV-negative or unknown status partner, and self-reported STD diagnosis remained significant correlates in multivariable analysis. Finally, younger age, racial/ethnic minority status, lower education, lower income (<\$20,000 vs. \$40,000), homelessness, diagnosed with HIV <5 years, non-injection drug use before or during sex, unprotected sex with an HIV-negative or unknown status partner, and self-reported STD diagnosis were significantly associated with exposure to any of the three types of HIV/STD risk-reduction interventions in multivariable analysis.

For all the outcomes, MSM status was significantly associated with *less* exposure to HIV/STD risk-reduction interventions in bivariate analysis but the association was no longer significant in multivariable analysis. Additional analyses (results not shown in Table 3) found that MSM status did not significantly predict intervention receipt when we adjusted for race and income in the multivariable models.

Discussion

We found that less than half of our clinic-based sample reported receiving individual-level HIV/STD prevention counseling from health care providers even though evidence-based guidelines (9, 10) recommend providing risk-reduction counseling to all HIV-infected patients during their routine clinic visits. Exposure to individual-level prevention counseling from prevention program workers and to small group interventions was even lower. Exposure to any of the three types of interventions was reported by just more than half of HIV-infected adults receiving medical care in the United States. These figures are indicative of missed prevention opportunities and room for improvement in providing prevention counseling in the clinical setting.

Several barriers may limit the provision of prevention counseling. Time and resource constraints are significant barriers to implementing risk screening and risk-reduction prevention interventions particularly in clinic settings (15-18). Our estimate using weighted MMP data shows approximately 180,000 of HIV-infected persons in care received one-on-one prevention counseling from providers. This estimate could indicate the amount of provider time that has been used for prevention counseling. The estimate also suggests that additional resources (i.e., counseling for an additional 230,000 patients per year) are needed to provide services in accordance with recommended guidelines.

Other barriers to counseling include providers' beliefs that behavioral change among HIV-infected patients is unlikely (19), or that they lack skills or feel uncomfortable in discussing risk behaviors with their patients (15, 18, 20). However, training on brief risk screening methods that do not require much of providers' time and on brief risk-reduction interventions can enhance comfort, skills, and motivation of providers (20-22). Recently, Myers and colleagues (23) demonstrated that training for providers increased the delivery of prevention counseling, and suggested strategies that could be employed in clinic settings such as clinician training on behavioral prevention, establishment of formal written guidelines for delivering behavioral interventions, and development of peer support among clinicians. Implementing these strategies might increase the percentage of patients who receive risk-reduction counseling from their providers.

We found that people who had fewer resources and those who engaged in risk behaviors were more likely to receive HIV/STD risk-reduction interventions. Across the three types of HIV/STD risk-reduction interventions, minority race/ethnicity, low income, risky sexual behavior, and self-reported STD diagnosis consistently predicted intervention exposure. However, their levels of intervention exposure were not sufficiently high. For example, only half of those who had unprotected sex with an HIV-negative or unknown status partner reported receiving one-on-one prevention counseling from health care providers. Close to 40% of persons who had risky sexual behavior and 40% of those who self-reported an STD in the past year received no risk-reduction intervention of any kind, indicating substantial room for improvement in delivering interventions to those who need it the most.

One common multivariable correlate of intervention exposure that is worth noting is years since HIV diagnosis. Unlike other common multivariate correlates that we examined, the pattern of association was different for individual-level versus small group interventions. Compared to those who had been diagnosed with HIV for 5 or more years, people who were more recently diagnosed with HIV were more likely to be exposed to individual-level interventions and less likely to participate in small group interventions. This finding suggests that individual and group-level interventions may reach different segments of the HIV-infected population. People who have been diagnosed with HIV longer may prefer a group format where they may be more comfortable to meet, share stories with, and seek support from their peers to cope with HIV infection, while people who are more recently diagnosed with HIV may prefer to work on a one-on-one basis with health care providers or prevention program workers to address individual prevention needs as they learn to integrate their diagnosis into their lives.

We found significant bivariate associations indicating that MSM were less likely to receive HIV/STD risk-reduction interventions compared to non-MSM. This pattern is concerning because it suggests that MSM, the subgroup most affected by HIV in the US, may be underutilizing HIV/STD risk-reduction interventions. These bivariate associations, however, were not significant when race and income were considered in multivariable analysis. This pattern suggests that the significant bivariate association between MSM status and lower exposure to interventions could be due to the fact that those identified as MSM were more likely to be white and higher income (confirmed in additional analyses, results not shown), which are characteristics found to be associated with less exposure to risk-reduction interventions. It is possible that white and wealthier MSM may not be identified by health care workers or prevention program workers as being in need of prevention counseling. They may also be more likely than other MSM to receive care at facilities where those interventions may not be readily available (e.g. private practices).

Limitations of this analysis are as follows. First, the analysis focused only on HIV-infected persons receiving medical care who had been diagnosed for at least one year, and thus does not reflect the experiences of HIV-infected persons who are not receiving care or persons who are more recently diagnosed with HIV. Since MMP recruits participants only from care facilities, it is reasonable to assume that estimated proportions of all HIV-infected and diagnosed persons receiving prevention counseling are expected to be lower. Second, the combined response rate (which combined facility-level and patient-level response rates) is

moderate and thus the estimates are subject to non-response bias. However, extensive non-response analysis was conducted using demographic and clinical information of respondents and non-respondents via linkage with the local HIV surveillance system. Adjustments were made to reduce non-response bias of the MMP data as part of the process of developing analysis weights. Third, data are cross sectional, and thus no causality could be established. Fourth, except for viral load data obtained from medical records, data are self-reported responses to interviewer-administered data collection and thus are subject to social desirability and recall biases. Related to this issue, providers and patients may have different perceptions of risk-reduction interventions. Thus, it is possible that providers might have delivered risk-reduction counseling, but patients might not perceive receiving such counseling. Similarly, some PLWH may not always be aware of the specific profession (e.g., health care providers vs. prevention program worker) of the person delivering counseling and the distinction between the two types of one-on-one counseling. Moreover, the measures of intervention exposure do not capture elements such as counseling frequency, content, intensity, and quality, nor do they capture exposure to other types of interventions such as structural- level interventions.

Conclusion

Individual and small-group interventions for people living with HIV are recommended as an important component of comprehensive HIV care and treatment (24). Our analysis of a nationally representative sample of HIV-infected persons in HIV clinical care showed that those who had fewer resources or those who engaged in risk behaviors were more likely to receive HIV/STD risk-reduction interventions. However, levels of intervention exposure, particularly for individual-level prevention counseling delivered by health care providers, are low, given the fact that all of the participants in the sample are clinic patients and thus presumably should have had an opportunity to receive provider counseling. Those who engage in high risk transmission behaviors may need to be prioritized for receipt of interventions with a goal to reach as close to 100% as possible. Because the MMP survey is conducted annually, CDC will monitor progress toward this goal to ensure that the delivery of risk-reduction interventions are maximized to achieve high impact prevention.

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Table 1

Demographic and behavioral characteristics of HIV-infected adults receiving medical care in the United States, Medical Monitoring Project, 2009

	<i>n</i> ^a	% ^b (95% CI)
Age		
18-24	95	2.3 (1.6-3.0)
25-34	459	11.0 (9.7-12.2)
35-44	1093	26.7 (25.4-28.1)
45-54	1609	39.4 (37.6-41.2)
55+	836	20.6 (19.1-22.0)
Gender		
Male	2926	71.1 (67.9-74.3)
Female	1104	27.3 (24.1-30.4)
Transgender	62	1.6 (1.1-2.1)
Race/Ethnicity		
White	1368	34.9 (28.4-41.4)
Black	1676	41.1 (33.2-49.1)
Hispanic	859	19.3 (14.3-24.2)
Other ^c	189	4.7 (3.7-5.7)
Education		
<High School	951	22.6 (20.0-25.1)
High School Diploma or equivalent	1123	26.7 (24.1-29.4)
>High School	2017	50.7 (46.0-55.3)
Household Income		
<20k	2619	64.5 (60.0-68.9)
20k to 39,999	669	17.6 (15.3-19.9)
40k and up	672	17.9 (14.8-21.0)
Foreign born		
Yes	518	13.2 (11.1-15.3)
No	3571	86.8 (84.7-88.9)
Homeless in past 12 month		
Yes	371	8.8 (7.6-10.2)
No	3721	91.2 (90.0-92.4)
Incarcerated in past 12 month		

	n^a	%^b (95% CI)
Yes	226	5.6 (4.6-6.6)
No	3863	94.4 (93.4-95.4)
Had health insurance in past 12 month		
Yes	3345	81.2 (77.5-84.9)
No	740	18.8 (15.0-22.5)
Years since HIV diagnosis		
Less than 5 years	859	21.6 (19.7-23.5)
5 years or longer	3228	78.4 (76.5-80.3)
Drank before or during sex in past 12 month		
Yes	971	23.9 (22.1-25.8)
No	3087	76.1 (74.2-77.9)
Used non-injection drugs before or during sex in past 12 month		
Yes	486	11.8 (10.3-13.4)
No	3577	88.2 (86.6-89.7)
Used stimulant drugs in past 12 month		
Yes	444	10.5 (9.0-12.1)
No	3633	89.5 (87.9-91.0)
Had unprotected sex with HIV-negative or unknown status partner in past 12 month		
Yes	521	12.8 (11.3-14.3)
No	3452	87.2 (85.7-88.7)
Same or opposite sex sexual behavior/orientation		
MSM	1892	46.5 (41.9-51.1)
MSW only	1001	23.7 (21.0-26.3)
WSM	1076	26.5 (23.4-29.5)
Other	123	3.3 (2.5-4.2)
Self-reported diagnosis of STD in past 12 month		
Yes	523	12.6 (10.6-14.5)
No	3538	87.4 (85.5-89.4)
Met criteria for any depression		

	<i>n</i> ^a	% ^b (95% CI)
in past 2 weeks		
Yes	1003	25.5 (23.7-27.3)
No	3045	74.5 (72.7-76.3)
Viral Suppression^d		
Suppressed viral load	2949	72.1 (68.9-75.4)
Not suppressed viral load	1143	27.9 (24.6-31.1)

^aTotal N= 4,092. Because of missing data, total does not always add up to 4,092.

^bPercentage was calculated from weighted frequencies (not on this table)

^c“Other” includes Asian, Native Hawaiian or Alaskan Native, Multiracial, and unknown race

^dSuppressed = most recent viral load test documented in the medical record to be undetectable or < 200 copies/ml

Abbreviations: 95% CI=95% confidence interval; STD=sexually transmitted diseases; HIV=human immunodeficiency virus; MSM=MSM only and MSMW (men who have sex with men and women); MSW only=men who have sex with women [only]; WSM=WSM (women who have sex with men) only and WSMW (women who have sex with men and women)

Estimated prevalence and population size estimates of exposure to HIV/STD prevention counseling by HIV-infected adults receiving medical care in the United States, Medical Monitoring Project, 2009

Table 2

	n^a	%^b(95% CI)	Population estimates (95% CI)
Had one-on-one conversation w/ doctor, nurse, or other health care worker about HIV/STD prevention	1856	43.9 (39.0-48.8)	179,172 (156,162 – 202,182)
Had one-on-one conversation w/ outreach worker, counselor, or prevention program worker about HIV/STD prevention	1276	29.8 (25.7-33.9)	121,624 (105,931 – 137,317)
Participated in organized session involving small group to discuss HIV/STD prevention	724	16.1 (13.2-19.1)	65,881 (55,311 – 76,451)
Participated in any of the three types of HIV/STD prevention interventions	2169	51.9 (47.2-56.6)	211,820 (186,714 – 236,927)

^aTotal N= 4,092.

^bPercentage was calculated from weighted frequencies (not on this table)

Abbreviations: 95% CI=95% confidence interval; STD=sexually transmitted diseases; HIV=human immunodeficiency virus

Table 3

Associations between demographic and behavioral characteristics and exposure to HIV/STD prevention counseling interventions among HIV-infected adults receiving medical care in the United States, Medical Monitoring Project, 2009

	Had one-on-one conversation with doctor, nurse, or other health care worker about HIV/STD prevention			Had one-on-one conversation with outreach worker, counselor, or prevention program worker about HIV/STD prevention			Participated in organized session involving small group to discuss HIV/STD prevention			Exposed to any of the three types of HIV/STD prevention interventions		
	n (%) ^a	PR	APR	n (%)	PR	APR	n (%)	PR	APR	n (%)	PR	APR
Age												
18-24	66 (71)	1.98 ^{*b} (1.69-2.31)	1.54 [*] (1.22-1.93)	49 (51)	2.24 [*] (1.71-2.93)	1.56 [*] (1.08-2.25)	19 (18)	1.18 (0.74-1.88)		71 (75)	1.74 [*] (1.50-2.03)	1.37 [*] (1.09-1.73)
25-34	266 (56)	1.56 [*] (1.34-1.82)	1.30 [*] (1.10-1.54)	188 (37)	1.64 [*] (1.35-1.98)	1.26 [*] (1.01-1.57)	77 (15)	0.99 (0.78-1.27)		305 (64)	1.48 [*] (1.30-1.69)	1.25 [*] (1.09-1.43)
35-44	529 (46)	1.29 [*] (1.16-1.44)	1.19 [*] (1.06-1.34)	356 (31)	1.38 [*] (1.20-1.58)	1.23 [*] (1.06-1.44)	198 (17)	1.13 (0.93-1.37)		604 (54)	1.25 [*] (1.13-1.37)	1.14 [*] (1.04-1.26)
45-54	693 (42)	1.16 [*] (1.02-1.33)	1.12 (1.00-1.25)	495 (29)	1.28 [*] (1.10-1.48)	1.22 [*] (1.05-1.41)	307 (17)	1.13 (0.90-1.42)		828 (50)	1.16 [*] (1.05-1.29)	1.12 [*] (1.03-1.23)
55+	302 (36)	Ref	Ref	188 (23)	Ref	Ref	123 (15)	Ref		361 (43)	Ref	Ref
Race												
White	400 (28)	Ref	Ref	248 (17)	Ref	Ref	144 (10)	Ref		502 (36)	Ref	Ref
Black	927 (53)	1.92 [*] (1.72-2.14)	1.71 [*] (1.54-1.91)	641 (36)	2.10 [*] (1.77-2.48)	1.63 [*] (1.36-1.94)	368 (19)	2.03 [*] (1.59-2.59)		1055 (62)	1.75 [*] (1.57-1.94)	1.59 [*] (1.43-1.76)
Hispanic	445 (52)	1.86 [*] (1.63-2.12)	1.58 [*] (1.36-1.83)	327 (37)	2.15 [*] (1.73-2.67)	1.60 [*] (1.29-2.00)	174 (20)	2.13 [*] (1.67-2.72)		509 (59)	1.68 [*] (1.50-1.88)	1.46 [*] (1.29-1.64)
Other	84 (48)	1.73 [*] (1.38-2.16)	1.58 [*] (1.29-1.94)	60 (34)	1.94 [*] (1.48-2.54)	1.57 [*] (1.22-2.04)	38 (21)	2.18 [*] (1.35-3.53)		103 (59)	1.67 [*] (1.38-2.03)	1.57 [*] (1.33-1.85)
Education												
<High School	517 (53)	1.41 [*] (1.29-1.54)	1.16 [*] (1.06-1.26)	377 (38)	1.57 [*] (1.32-1.85)	1.08 (0.93-1.25)	210 (19)	1.30 (0.97-1.74)		586 (61)	1.34 [*] (1.24-1.45)	1.12 [*] (1.03-1.21)
High School	567 (47)	1.25 [*] (1.14-1.36)	1.08 (0.99-1.17)	410 (33)	1.36 [*] (1.18-1.57)	1.05 (0.90-1.18)	221 (18)	1.23 (0.92-1.63)		665 (57)	1.25 [*] (1.16-1.34)	1.10 [*] (1.03-1.18)
>High School	771 (38)	Ref	Ref	489 (24)	Ref	Ref	293 (14)	Ref		917 (45)	Ref	Ref
Income												

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	Had one-on-one conversation with doctor, nurse, or other health care worker about HIV/STD prevention			Had one-on-one conversation with outreach worker, counselor, or prevention program worker about HIV/STD prevention			Participated in organized session involving small group to discuss HIV/STD prevention			Exposed to any of the three types of HIV/STD prevention interventions		
	n (%) ^a	PR	APR	n (%)	PR	APR	n (%)	PR	APR	n (%)	PR	APR
<20k	1335 (49)	1.63* (1.40-1.89)	1.25* (1.09-1.43)	1009 (37)	3.60* (2.70-4.81)	2.65* (2.03-3.46)	585 (21)	3.11* (2.24-4.30)	2.44* (1.76-3.38)	1565 (58)	1.65* (1.46-1.86)	1.33* (1.17-1.52)
20k to 39,999	265 (40)	1.31* (1.12-1.54)	1.14 (0.99-1.31)	156(24)	2.33* (1.79-3.03)	1.97* (1.56-2.49)	69 (10)	1.45 (0.95-2.20)	1.33 (0.90-1.97)	305 (45)	1.28* (1.12-1.47)	1.13 (1.00-1.28)
40k and up	199 (30)	Ref	Ref	69(10)	Ref	Ref	47 (7)	Ref	Ref	233 (35)	Ref	Ref
Foreign born												
Yes	265 (51)	1.20* (1.04-1.39)	1.02 (0.89-1.17)	170 (32)	1.10 (0.88-1.36)		86 (15)	0.91 (0.68-1.20)		303 (59)	1.15* (1.01-1.32)	1.02 (0.89-1.16)
No	1591 (43)	Ref	Ref	1106 (29)	Ref		638 (16)	Ref		1866 (51)	Ref	Ref
Homeless in past 12 month												
Yes	219 (59)	1.39* (1.22-1.58)	1.20* (1.06-1.36)	171 (45)	1.60* (1.36-1.87)	1.21* (1.03-1.43)	104 (26)	1.69* (1.38-2.08)	1.26 (0.99-1.59)	250 (68)	1.35* (1.20-1.52)	1.18* (1.05-1.32)
No	1637 (42)	Ref	Ref	1105 (28)	Ref	Ref	620 (15)	Ref	Ref	1919 (50)	Ref	Ref
Incarcerated in past 12 months												
Yes	122 (53)	1.21* (1.01-1.45)	0.95 (0.76-1.18)	105 (46)	1.60* (1.29-1.98)	1.18 (0.95-1.47)	53 (23)	1.47* (1.09-2.00)	1.06 (0.79-1.41)	142 (61)	1.20* (1.02-1.39)	0.96 (0.80-1.15)
No	1733 (43)	Ref	Ref	1169 (29)	Ref	Ref	671 (16)	Ref	Ref	2025 (51)	Ref	Ref
Had health insurance												
Yes	1487 (43)	0.88 (0.77-1.02)		1022 (29)	0.87 (0.71-1.05)		599 (16)	1.02 (0.80-1.30)		1742 (51)	0.90 (0.80-1.01)	
No	366 (48)	Ref		252 (34)	Ref		125 (16)	Ref		424 (57)	Ref	
Years since HIV diagnosis												
Less than 5 years	483 (54)	1.32* (1.21-1.44)	1.23* (1.12-1.36)	340 (38)	1.38* (1.21-1.59)	1.32* (1.15-1.51)	137 (14)	0.80* (0.66-0.98)	0.75* (0.62-0.91)	546 (62)	1.26* (1.18-1.35)	1.21* (1.12-1.30)
5 years or longer	1371 (41)	Ref	Ref	935 (28)	Ref	Ref	586 (17)	Ref	Ref	1621 (49)	Ref	Ref
Drank before												

	Had one-on-one conversation with doctor, nurse, or other health care worker about HIV/STD prevention			Had one-on-one conversation with outreach worker, counselor, or prevention program worker about HIV/STD prevention			Participated in organized session involving small group to discuss HIV/STD prevention			Exposed to any of the three types of HIV/STD prevention interventions		
	n (%) ^a	PR	APR	n (%)	PR	APR	n (%)	PR	APR	n (%)	PR	APR
or during sex												
Yes	467 (46)	1.06 (0.95-1.19)		326 (32)	1.12 (0.97-1.29)		184 (17)	1.10 (0.94-1.28)		552 (55)	1.09 (0.99-1.20)	
No	1372 (43)	Ref		938 (29)	Ref		534 (16)	Ref		1598 (51)	Ref	
Used non-injection drugs before or during sex												
Yes	239 (48)	1.09 (0.97-1.23)		176 (34)	1.17 (1.00-1.37)		95 (18)	1.17 (0.96-1.43)		296 (59)	1.16* (1.05-1.29)	1.20* (1.08-1.33)
No	1606 (43)	Ref		1094 (29)	Ref		624 (16)	Ref		1859 (51)	Ref	Ref
Used stimulant drugs												
Yes	221 (46)	1.06 (0.92-1.21)		179 (37)	1.29* (1.11-1.51)	1.09 (0.93-1.28)	121 (25)	1.65* (1.29-2.12)	1.50* (1.10-2.05)	269 (58)	1.14* (1.02-1.27)	0.98 (0.88-1.10)
No	1633 (44)	Ref		1095 (29)	Ref	Ref	602 (15)	Ref	Ref	1896 (51)	Ref	Ref
Had unprotected sex with HIV-negative or unknown status partner												
Yes	283 (52)	1.23* (1.06-1.42)	1.22* (1.08-1.38)	196 (35)	1.22* (1.03-1.44)	1.25* (1.06-1.48)	120 (20)	1.28* (1.08-1.52)	1.25* (1.04-1.50)	327 (61)	1.21* (1.06-1.39)	1.18* (1.05-1.32)
No	1506 (42)	Ref	Ref	1037 (29)	Ref	Ref	576 (15)	Ref	Ref	1766 (50)	Ref	Ref
Opposite or same sex partner												
MSM	734 (38)	Ref	Ref	473 (24)	Ref	Ref	274 (14)	Ref	Ref	890 (46)	Ref	Ref
MSW only	505 (50)	1.34* (1.22-1.47)	1.08 (0.99-1.18)	366 (36)	1.48* (1.30-1.69)	1.12 (0.99-1.28)	190 (18)	1.27 (1.00-1.62)	0.80 (0.56-1.15)	570 (57)	1.25* (1.14-1.37)	1.03 (0.96-1.11)
WSM	562 (49)	1.32* (1.19-1.45)	1.02 (0.94-1.12)	390 (33)	1.36* (1.16-1.60)	1.00 (0.84-1.18)	228 (17)	1.26* (1.03-1.54)	0.80 (0.52-1.23)	638 (57)	1.23* (1.13-1.34)	1.00 (0.92-1.08)

	Had one-on-one conversation with doctor, nurse, or other health care worker about HIV/STD prevention			Had one-on-one conversation with outreach worker, counselor, or prevention program worker about HIV/STD prevention			Participated in organized session involving small group to discuss HIV/STD prevention			Exposed to any of the three types of HIV/STD prevention interventions		
	n (%) ^a	PR	APR	n (%)	PR	APR	n (%)	PR	APR	n (%)	PR	APR
Other	55 (42)	1.12 (0.93-1.36)	0.89 (0.72-1.09)	47 (38)	1.57* (1.24-1.98)	1.14 (0.91-1.44)	32 (25)	1.80* (1.28-2.51)	0.78 (0.53-1.15)	71 (58)	1.26* (1.09-1.46)	1.04 (0.89-1.21)
Self-reported diagnosis of STD												
Yes	303 (56)	1.32* (1.15-1.52)	1.24* (1.10-1.41)	212 (36)	1.27* (1.06-1.52)	1.19* (1.01-1.41)	136 (22)	1.45* (1.23-1.72)	1.40* (1.17-1.66)	337 (63)	1.25* (1.10-1.41)	1.17* (1.05-1.31)
No	1538 (42)	Ref	Ref	1052 (29)	Ref	Ref	585 (15)	Ref	Ref	1816 (50)	Ref	Ref
Had any depression in past 2 weeks												
Yes	471 (46)	1.08 (0.97-1.20)		354 (35)	1.23* (1.07-1.42)	1.13 (0.94-1.35)	208 (20)	1.32* (1.12-1.56)	1.16 (1.00-1.36)	559 (56)	1.10* (1.02-1.18)	1.04 (0.95-1.14)
No	1365 (43)	Ref		912 (28)	Ref	Ref	511 (15)	Ref	Ref	1588 (51)	Ref	Ref
Viral suppression												
Suppressed viral load	1273 (42)	Ref	Ref	861 (28)	Ref	Ref	505 (16)	Ref	Ref	1495 (50)	Ref	Ref
Not suppressed viral load	583 (49)	1.16* (1.05-1.27)	0.99 (0.91-1.08)	415 (34)	1.22* (1.11-1.35)	0.99 (0.90-1.09)	219 (17)	1.11 (0.93-1.31)		674 (57)	1.15* (1.06-1.24)	0.98 (0.91-1.06)

^aPercentage was calculated from weighted frequencies (not on this table)

^b. * p<0.05

Abbreviations: 95% CI=95% confidence interval; PR=prevalence ratio; APR=adjusted prevalence ratio; STD=sexually transmitted diseases; HIV=human immunodeficiency virus; MSM=MSM only and MSMW (men who have sex with men and women); MSW only=men who have sex with women [only]; WSM=WSM (women who have sex with men) only and WSMW (women who have sex with men and women)