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HIV among women in the District of Columbia: a continuing epidemic

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Abstract

The epidemiology of HIV in urban centers of the United States such as the District of Columbia (DC) is dynamic with rates of new HIV and AIDS diagnoses as well as risk factors elevated. Correlates of HIV among heterosexual women extend beyond traditional, individual risk factors to structural factors. The purpose of this study was to compare proportions of HIV and correlates of HIV among women participating in National HIV Behavioral Surveillance (NHBS) system in 2006–7 (NHBS Cycle 1) and 2010 (NHBS Cycle 2). Analysis of 677 female participants at elevated risk for HIV revealed high prevalence of individual-level HIV-associated risk factors (e.g., sexual behavior) and socio-structural associated risk factors (e.g., homelessness, incarceration, lack of health insurance). While a greater proportion of women were HIV-infected in Cycle 2, after controlling for the distribution of demographic characteristics to adjust for a change in eligibility criteria, the pooled sample did not reveal a significantly increased proportion of HIV-infected women in Cycle 2. Homelessness and condom use were associated with greater relative odds of HIV after adjustment for confounders, and non-injection drug use was associated with reduced odds. Findings inform our understanding of the continuing HIV epidemic in DC and support development of effective interventions to slow the epidemic among women in DC and similar urban centers.

Keywords

HIV/AIDS; behavioral surveillance; HIV/AIDS prevention; heterosexual women

Background

HIV among women in the United States

The epidemiologic profile of HIV among women in the United States (US), and particularly in urban areas such as Washington, DC, is both dynamic and evolving. As we enter the fourth decade of the HIV epidemic, heterosexual transmission is the leading mode of HIV

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acquisition for incident HIV cases among women [1]. While myriad factors appear to be associated with HIV infection among women, many of them are highly challenging to modify, thwarting prevention efforts. These factors include structural factors (such as poor access to healthcare, HIV screening), [2], poverty, sexual and social networks [3], gender inequities and barriers to successful condom negotiation [4], poor access to HIV care and treatment resulting in elevated viral load of sexual partners [5], and elevated incarceration rates among male partners [6]. Each of these may be both a cause of as well as a consequence of HIV risk behavior, and HIV itself. HIV infection among women has also been linked to individual characteristics such as concurrent sexual partnerships [7,8], non-injection drug use [9], and psychosocial characteristics including intimate partner violence [10], depression [11], and other mental health conditions [12]. Condom use during vaginal and anal sex has been shown to be very low among women [13–15], yet the associations between condom use (and other harm reduction) behavior and the aforementioned socioeconomic risk factors such as poverty, gender inequality, drug use, and mental health conditions often confounded, such that disentangling them for prevention purposes is daunting.

HIV among women in the District of Columbia

HIV among women, particularly minority women, in the US is clustered in geographically concentrated epidemics in “hot spots” where HIV is associated with poverty and highly insular sexual networks [16]. One of these “hot spots” of HIV among women may be found in the District of Columbia (DC), where black women represent 92.4% of all women living with HIV [17] and heterosexual transmission is the most common mode of acquiring HIV and AIDS and the second most common mode overall [17]. Heterosexual transmission bears a considerable proportion of newly diagnosed HIV (not AIDS) infections among black persons in Washington, DC, responsible for 38.3% of infections between 2006 and 2010, compared with 4.6% among white persons and 19.4% among Hispanic individuals [17]. Understanding individual- and population-level risk behaviors among women most at risk for HIV is a critical step towards the development of innovative and more effective prevention approaches. Locally, considerable effort has been devoted towards development of widespread routine and non-traditional HIV testing approaches, linkage into care, and provision of treatment [18], which has resulted in improvements in CD4 count at diagnosis [17] and reductions in the number of late testers [17]. However, among heterosexual women, questions remain about the precise individual- and population-level factors that put them at increased risk.

National HIV Behavioral Surveillance (NHBS) data provide unique insight into behaviors that put persons at risk for HIV, with a focus on community-recruited individuals who do not necessarily access care or prevention services. Following two completed cycles of NHBS among heterosexuals at elevated risk for HIV, Cycle 1 (2006–7) and Cycle 2 (2010), NHBS data provide a rich opportunity to observe changes in the local epidemic over time. The purpose of this study was to characterize women participants in NHBS in DC taken cross-sectionally at two time points and compare and contrast their risk factors for HIV. Findings from this study will enable us to better understand the changing HIV epidemic in DC,

informing development of more effective prevention approaches and ideally slow the epidemic among heterosexual women in DC and similar urban centers in the US.

Methods

NHBS methods have been described extensively elsewhere [19–23]. Briefly, this serial cross-sectional study collects comprehensive demographic, behavioral, service and care utilization, and serological data on three at-risk populations: men who have sex with men (MSM), injection drug users (IDU), and heterosexual men and women at elevated risk for HIV. Face-to-face interviews were conducted by trained interviewers using a multisite protocol overseen by the Centers for Disease Control and Prevention (CDC); data were collected anonymously and focused on risk behaviors antecedent to HIV infection, HIV testing, and use of local HIV prevention services. Following the interview, rapid HIV testing was conducted (OraSure OraQuick Rapid 1/2 *ADVANCE ®*, Bethlehem, PA) and for those who were reactive or reported known HIV-infected status, a confirmatory Western Blot was conducted. Participants screening HIV-positive or in need of any other services were immediately referred into care. Eligible participants lived in the DC Metropolitan Statistical Area as determined by the US Census, reported sex with a member of the opposite gender at least once in the last 12 months, and provided informed consent. There were several differences in the eligibility criteria for recruited participants between the two study years. For the Cycle 1 (2006–7) sample, participants had to be 18–50 years of age at the time of interview while for Cycle 2 (2010) the age limit was 18–60 years of age. In order to recruit in the Cycle 1 sample, participants had to live in protocol-designated high-risk areas, as determined by a complex algorithm that combined poverty (based on census data) and AIDS rates (based on the most up to date estimates available at that time) [24]. In Cycle 2, participants who had a household income less than the U.S. Health and Human Services (HHS) poverty guidelines and/or had a high school diploma or less were eligible to recruit. Finally, in Cycle 1, current (last 12 months) IDU were permitted to recruit network members, but those chains were truncated halfway through the data collection cycle due to their effective network recruitment that posed a challenge in including non-IDU (the intended target population); in Cycle 2, current IDU were not permitted to recruit. It is important to note these methodological differences when making comparisons between the two data collection years. Participants received $25.00 for the interview, $10.00 for the HIV screening, and $10.00 for each eligible participant referred up to $30 total for referrals, and a maximum incentive amount of $75.

Analytic methods

Description of sample

As described elsewhere [24], participants for the heterosexual data collection years of NHBS were sampled using respondent driven sampling (RDS), a chain referral method which is ideal for accessing hard-to-reach populations for whom no sampling frame exists [25–28]. Assuming all requisite assumptions are met, this method provides estimates generalizable to the population of networks from which they are drawn [25–28]. Purposively selected seeds began the referral chains and were interviewed; if eligible, they were then given up to five

coupons to recruit their social or sexual network members, giving rise to subsequent interviewees who recruited three to five of their social or sexual network members. Because RDS was used to recruit, RDSAT v.5.6 (RDS Analysis Tool, Ithaca, NY) was used to generate individualized weights. Since participants who had injected drugs in the prior 12 months were eligible for inclusion in the Cycle 1 data collection year but were dropped in the analysis, bivalent weights (HIV-status by IDU-status) and trivalent weights (HIV-status by gender by IDU-status) were generated to provide estimates for this analysis. In the Cycle 2 data collection year, only bivalent weights (HIV-status by gender) were calculated, as current IDUs were excluded from the study. Weights were generated prior to subsetting women, to ensure accurate generation of individualized weights. This method was applied to both data collection years to ensure consistency in the comparison, and differs slightly from the method used to generate previous HIV estimates [24], although this was not statistically significant; variables with ample sample size were not affected. Individualized weights were imported into SAS version 9.2 (Cary, NC) which was used for analysis.

Model generation

We evaluated unadjusted and adjusted odds ratios (OR) and 95% confidence intervals (CI) describing associations between participant characteristics and HIV infection for the Cycle 2 sample, which had not been previously evaluated, and for the two samples in a pooled logistic model, adjusting for the data collection year. Because of the differences in eligibility for the first and second data collection years, we did not perform hypothesis testing on the unadjusted frequency estimates. For the logistic models, in order to guide our understanding, we used a bivariate screening procedure, where characteristics associated with HIV infection at $p<0.20$ and whose addition or removal yielded a change in estimates of >10% were eligible for inclusion in a final adjusted model, which required a Goodness-of-Fit statistic of >0.20. For variables where so few of the sample possessed the characteristic of interest (e.g., prevention service utilization) that a strong bias would be introduced, we did not include them in the model. The approach taken is exploratory in nature, designed to describe factors associated with HIV infection among women participants in NHBS and not to generalize to the base population.

Results

Demographic characteristics

As shown in Table 1, and given the different inclusion criteria in the two samples, for both Cycle 1 and Cycle 2, the majority of women were over 30 years of age (65.8% and 55.9%, respectively), black (93.6% and 94.2%), and had never been married (62.9% and 64.0%). While all women had to report sex in the last 12 months at least once with a man, a substantial proportion each year reported a bisexual sexual orientation (14.1% and 20.0%). The majority of the women each year had a high school degree (or equivalent) or less (86.2% and 91.7%), over a third were unemployed (43.9% and 36.7%), two-thirds had an annual income of <$10,000 (64.7% and 63.0%), and the majority had health insurance (including Medicare/Medicaid) (89.4% and 75.8%); approximately a fifth were currently homeless (16.9% and 20.1%). Almost half of the women in Cycle 2 reported they had ever

been incarcerated (46.8%), while just over a third of the women in Cycle 1 reported they had been incarcerated (35.6%).

HIV testing and prevention service use

As shown in Table 1, once again, in light of the differing inclusion criteria, 7.5% of women in 2006–7 and 12.1% of women in 2010 were identified as being HIV-positive, of whom approximately one-third were previously unaware of their HIV status. More than three-quarters of the women reported a lifetime history of HIV testing (88.1% and 74.4%, respectively), with approximately half testing in the last 12 months, and somewhat larger proportions in 24- and 12-month testing intervals between the cycles sampled. There was a slightly larger proportion of women reporting they had received any HIV prevention service (not related to HIV testing and counseling) observed in Cycle 2 than in Cycle 1 (20.0% and 29.0%).

HIV-related risk behavior

As shown in Table 1, once again, taking into account differing inclusion criteria, we found the proportions of nearly all HIV-related behaviors at last sex in the Cycle 2 differed compared to Cycle 1 [24]: more women reported having ≥4 casual sex partners in the last 12 months (19.6% and 31.8%, respectively) and having a casual partner at last sex (15.8% and 28.1%), reports of perceived partner's concurrency (48.5% and 65.1%) and self-reported concurrence (40.0% and 56.6%), unprotected vaginal sex (71.3% and 75.3%), and use of alcohol and/or drugs at last sex (13.5% and 20.5%). However, we found similar or slightly lower proportions of non-injection drug use in the past 12 months and of depressive symptomatology (assessed through the Center for Epidemiologic Studies-Depression Scale [29]). Proportions of last sex partner risk characteristics were similar as well, except for reports of last sex partner injecting drugs, which were greater. Each year, approximately half of the women were unaware of their last sex partner's HIV status.

Multivariable models

We examined the Cycle 2 separately in order to compare it with the first cycle, which has been published previously [24]. As shown in Table 2, in Cycle 2, after adjustment for the other variables in the model, women ≥ 35 years of age, those who were homeless at the time of the interview, who had been arrested and/or incarcerated at least once in the last 12 months, and those who reported condom use at last vaginal sex had greater odds of being HIV-positive than their counterparts. This differs from Cycle 1 where we found, after adjustment for the other variables in the model, that ever injecting drugs was associated with HIV-status (OR 4.89; 95% CI 1.44–16.63), as was depressive symptomatology in the past week (OR 3.74; 95% CI 1.24–11.30) in addition to incarceration in the past 12 months (OR 3.77; 95% CI 1.04–13.70).

Table 2 displays a pooled model, which allowed us to harness the strength of the two samples and increase power. While odds of HIV-infection were greater in Cycle 2 than Cycle 1 prior to adjustment for the distribution of characteristics of participants, once those were taken into account, there were no significant differences between the study years. Age ≥ 35 years, current homelessness, and condom use at last vaginal sex continued to be

positively associated with HIV status after adjustment for confounders, while women who reported non-injection drug use in the past 12 months had decreased odds of being HIV-infected compared to those who reported no drug use in the past 12 months.

Discussion

This study offers an important sequel to our previous work on heterosexuals in Washington, DC, now turning our lens to the epidemic among women. Our findings provide insight into women at elevated risk for HIV, as determined by where they live and their social and sexual networks, per CDC's NHBS protocol. In this community-based sample, we found that women socially connected to areas of high poverty as defined by the protocol were themselves overwhelmingly challenged by poverty, which often goes hand in hand with lack of higher education and unemployment. Homelessness and experience with incarceration, depression, and abuse were common and found to be increasing between the two timepoints. While correlates of poverty are to be expected of this sampling strategy (based on location of site and eligibility to recruit), they provide a snapshot of potent day-to-day concerns facing women at elevated risk for HIV in DC. Many of these correlates are on the causal pathway to other high risk behaviors. For example, increased partner concurrency, infrequent condom use, or "survival" sex, and partner abuse [2–15] may result from poverty and lack of resources. Despite encouraging increases in last 12 month HIV testing and uptake of prevention services, participants continue to report low levels of knowledge of their last sex partner's HIV status. Though the limitations outlined below challenge our ability to infer causality or make direct comparisons between data collection years, it remains clear that considerable structural barriers to health and HIV prevention exist among women in DC, and they appear not only in greater proportions in Cycle 2 than in Cycle 1, but they may be associated with decreased levels of condom use and other correlates of HIV infection.

Our findings support those of other authors regarding essential societal and structural factors associated with HIV among women [3–6]. Individual-level behavior is likely to be severely affected by poverty and limited resources. Depression and abuse may make a woman more likely to engage in unprotected sex due to lack of self-esteem or interpersonal power to negotiate condom use and these are likely to accompany poverty [4, 10, 11]. These two independent samples of women in DC at elevated risk for HIV demonstrated considerable challenges to public health in addition to and surrounding HIV; some of these may, in fact contribute to the spread of HIV. While HIV prevalence, after taking confounders and changes in eligibility criteria into account, did not significantly increase in Cycle 2 relative to Cycle 1 in this cross-sectional study, the prevalence estimates were still quite elevated. As the epidemic evolves in DC, structural approaches such as resources for homeless women, specific interventions for women experiencing abuse and depression, and new woman-specific prevention strategies should be pursued.

Limitations and strengths

The primary limitation in this analysis is the pooling of two data collection years of NHBS which were collected using different eligibility criteria. Most importantly, women in Cycle 2 expanded to include older women, and recruitment eligibility was driven by meeting the

definition for lower SES, potentially recruiting a lower socioeconomic sample overall, as well as one that did not allow current IDU to recruit. It is important to note that the Cycle 2 recruitment eligibility criteria also favored recruitment of women who either did not have a high school degree (or equivalent) and/or were living below the HHS poverty guidelines. However, this was not a requirement for entry into the study, and our findings suggest that as a whole, women in both data collection years—irrespective of their eligibility to recruit—were substantially affected by resource limitations. These differences make it challenging to directly compare the samples. However one asset of NHBS is its ability to provide snapshot estimates of those at highest risk for HIV at two points in time, 3 years apart. Especially in DC, rapid shifts in demographics occur with population dynamics and gentrification, such that even in the absence of protocol changes, drawing direct comparisons is a challenge. Other limitations of the study include its reliance on self-report of information, which is prone to poor recall and recall bias. Interviewers are extensively trained and supervised to collect complex behavioral data, thus minimizing these biases to the extent possible. Unfortunately, for most of the indicators collected in NHBS regarding sensitive sexual and drug use behavior, no other method of data collection is available. Finally, the cross-sectional study design itself limits our ability to infer temporality or propose causal mechanisms. Some of our findings may appear counterintuitive. For example, those testing HIV-positive had greater odds of condom use at last sex than those testing negative. Due to the cross-sectional nature of this study, it is not possible to infer temporality; people may well have been infected at the time of last sex and therefore used condoms or, alternately, may have been with a positive or other high risk partner. Due to the difficulty in differentiating new from previous positives, as well as the small sample size of women previously unaware of their status, we opted for inclusion of all positives in the analysis; this may explain this finding, as women who were aware they were positive may have been more likely to use condoms. Similarly, use of non-injection drugs should not be considered a protective characteristic, as it is simply not possible to determine causality from these data. However, this finding as well as those in an in-depth analysis of substance abuse conducted using NHBS data [9], perhaps challenge assumptions regarding what traditional risk factors are for women. It may well be that structural and environmental factors pose a greater risk for women than traditional risk factors such as substance abuse, and this may inform our understanding of novel approaches to reduce HIV in this population.

This analysis has multiple strengths as well. In spite of the above challenges, the strength of the data lies in its ability to provide estimates of behavior among a hidden and hard-to-reach community-based sample that does not systematically access clinical or behavioral health care. NHBS is unique in its ability to examine those persons outside of the clinic waiting room and learn about their behavior and ascertain specimens for anonymous HIV testing. For this analysis, we did not exclude women who had ever injected drugs because in DC. Based on our other work in NHBS in the city among heterosexuals as well as IDU, the tightly woven networks of heterosexuals often includes former injectors; this analysis is therefore more applicable to women in the District, and perhaps similar urban areas, than if we had artificially excluded women who had ever injected. The elevated prevalence of high risk behaviors and structural barriers to HIV prevention is of critical importance; even these imperfect estimates provide us with otherwise unavailable insights. NHBS is designed to

compare cross-sectional samples over time and evaluate for trends, clues about factors that place the population at risk for HIV, so that a profile of the epidemic over time may emerge.

This study is the first of its kind to leverage two NHBS data collection years and focus exclusively at women, a population at ongoing risk of HIV in DC. Generic, individual-level behavioral HIV prevention approaches may be insufficient to slow the HIV epidemic in DC. Innovative and gender-specific strategies that address the needs of women most at risk will be a critical step towards ensuring that the epidemic improves in the coming decade; these strategies should look beyond the individual level behavioral approaches and towards interventions with more far ranging impact. These strategies should also identify ways to support women along the full continuum, from prevention service utilization, access to testing, to treatment and retention in care; many of the correlates of HIV identified in this study are similar to the barriers to retention ultimately experienced by HIV-infected women. These findings suggest an urgent need for innovative approaches to HIV prevention, approaches which focus on the unique needs of resource-limited women and identify effective interventions specifically for them.

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Table 1

RDS-weighted characteristics[+] of female participants in NHBS during two data collection years, Cycle 1 (N=440) and Cycle 2 (N=257).

	Female participants Cycle 1 % (N=440)	Female participants Cycle 2 % (N=257)
Demographic characteristics		
Age (median, IQR) *(not RDS adjusted)*	37 (25 – 43)	34 (24 – 47)
Age (years)		
18–24	24.8	25.2
25–29	9.5	18.9
30–34	10.2	6.5
35–39	13.7	6.8
40–49	39.6	25.7
50–60	2.3	16.9
Race		
White	1.5	0.7
Black	93.6	94.2
Hispanic	0.6	2.0
Other (including multiracial)	4.3	3.1
Marital Status		
Married or living together	17.6	13.3
Separated, divorced, widowed	19.5	22.7
Never been married	62.9	64.0
Sexual Orientation		
Heterosexual	83.9	77.1
Homosexual	1.9	2.8
Bisexual	14.1	20.0
Educational Attainment		
Less than high school graduate	35.5	37.3
High school graduate/GED	50.7	54.4
Some college or bachelor's degree	13.8	8.4
Employment Status		
Unemployed	43.9	36.7
Employed (part or full time, or student)	45.6	48.0
Retired/disabled	10.5	15.3
Yearly Household Income		
$0 to $9,999	64.7	63.0
$10,000 or more	35.3	37.0
Has Health Insurance (including Medicare or Medicaid)	89.4	75.8
Housing		
Formerly homeless	6.5	17.9

	Female participants Cycle 1 % (N=440)	Female participants Cycle 2 % (N=257)
Currently homeless	16.9	20.1
Never homeless	76.6	62.0
Experience with correctional facilities		
Ever been to jail, prison, or juvenile detention	35.6	46.8
Arrested by police and booked in the past 12 months	12.7	16.5
HIV testing and prevention services		
NHBS HIV Screening Test Results		
HIV-positive % prevalence	7.5	12.1
If positive, newly diagnosed positive	33.2	27.0
HIV testing experiences		
Ever tested for HIV	88.1	74.4
If yes: test within past 24 mo.	78.8	84.3
If yes: test within past 12 mo.	48.2	56.4
Receipt of prevention services, 12 mo.		
Group-level	10.5	25.0
Individual-level	12.3	15.2
Any	20.0	29.0
Sex and drug use behaviors		
Type of Partner at Last Sex		
Main	77.2	64.2
Casual	15.8	28.1
Exchange	7.0	7.7
Sexual partner concurrency		
Self-reports having a concurrent sex partnership last 12 mo.	40.0	56.6
Felt partner definitely or probably or definitely had concurrent sex partnerships last 12 mo.	48.5	65.1
Number of Sex Partners, 12 months (includes same and opposite sex)		
1	41.4	35.6
2 – 3	38.9	32.6
4+	19.6	31.8
Age at Sexual Debut (years)		
0–10	0.9	2.3
11–13	14.1	21.7
14–16	49.8	44.9
17–19	28.2	26.9
≥ 20	7.0	4.2
Behavior at Last Sex		
Had vaginal sex	98.6	87.8
If yes: unprotected vaginal sex	71.3	75.3
Had anal sex	6.8	20.6
If yes: unprotected anal sex	83.7	73.9

	Female participants Cycle 1 % (N=440)	Female participants Cycle 2 % (N=257)
Used female condom, last 12 m	–	15.0
Used alcohol	17.8	22.5
Used drugs	9.6	9.6
Used alcohol and drugs	13.5	20.5
Other Risk Factors		
Ever IDU (not in past 12 months)	10.0	19.0
Non injection drug use, past 12 mo.	59.5	54.4
Depressive Symptoms, CES-D ≥16, past week	48.8	52.9
Experienced emotional or physical abuse in the last 12 months	17.5	27.9
Last sex partner risk characteristics		
Partner ever injected drugs	4.5	15.9
Partner ever used crack	26.9	25.0
Partner ever been in prison or jail >24 hours	60.9	55.6
Partner is older	55.6	58.5
Did not know partner's HIV status	52.1	48.7

† Unless otherwise noted, all estimates are adjusted for RDS sampling strategy

RDSAT individualized weights were generated using enhanced data smoothing, 15,000 bootstraps, and adjustment for outliers at the 10% level.

NHBS-HET Cycle 1 2006–7; NHBS-HET Cycle 2 2010.

Due to changes in eligibility criteria as described in the methods section, hypothesis testing has not been performed on this table and *p*-values are not provided intentionally.

Main partner was defined as "a woman/man you have sex with and who you feel committed to above anyone else. This is a partner you would call your girl/boyfriend, wife/husband, significant other, or life partner."

Perceived concurrency was defined as responding as definitely or probably did to the following question: "As far as you know, during the past 12 months when you were having a sexual relationship with this partner, did s/he have sex with other people?"

Self-reported concurrency was defined as responding as definitely or probably did to the following question: "During the past 12 months when you were having a sexual relationship with this partner, did you have sex with other people?"

Table 2

RDS-weighted[†] unadjusted and adjusted odds ratios (OR) and 95% confidence intervals (CI) for factors associated with having an HIV positive test result in Cycle 2 (N=256) and with for combined two data collection years, Cycle 1 and Cycle 2 (N=677).

	Unadjusted OR (95% CI) Cycle 2 (N=256)	**Adjusted OR[††] (95% CI) Cycle 2 (N=256)**	**Unadjusted OR (95% CI) Cycles 1 and 2 (N=677)**	**Adjusted OR[††] (95% CI) Cycles 1 and 2 (N=677)**
Year				
Cycle 1 (2006–7)	–	–	1.00	1.00
Cycle 2 (2010)	–	–	**2.63 (1.02, 6.81)** * **p=0.046**	2.08 (0.94, 4.60) *p*=0.07
Age (years)				
<35	1.00	1.00	1.00	1.00
≥ 35	**35.4 (7.95, 158)** *** ††† **p<0.0001**	**44.7 (6.39, 312)** *** **p=0.0001**	**4.68 (1.08, 20.3)** * **p=0.04**	**9.35 (3.08, 28.4)** *** **p<0.0001**
Employment Status				
Employed	1.00	–	1.00	–
Unemployed	2.86 (0.34, 24.3) p=0.34	–	2.50 (0.31, 20.1) p=0.39	–
Homelessness				
Not currently homeless	1.00	1.00	1.00	1.00
Currently homeless	4.98 (0.76, 32.7) p=0.09	**5.90 (1.41, 24.7)** * **p=0.015**	**3.92 (1.05, 14.7)** * **p=0.04**	**2.83 (1.07, 7.46)** * **p=0.04**
Non-injection drug use past 12 months				
None	1.00	–	1.00	1.00
Any	**0.25 (0.06, 0.99)** * **p=0.048**	–	0.46 (0.16, 1.33) p=0.15	**0.42 (0.19, 0.92)** * **p=0.03**
Ever injected drugs				
No	1.00	–	1.00	–
Yes	0.83 (0.17, 4.08) p=0.82	–	2.20 (0.80, 6.00) p=0.13	–
Experience with corrections past 12 months				
None	1.00	1.00	1.00	–
Arrested and booked by police once or more	1.05 (0.22, 5.06) p=0.96	**7.70 (1.05, 56.5)** * **p=0.04**	0.93 (0.33, 2.64) p=0.89	–

	Unadjusted OR (95% CI) Cycle 2 (N=256)	Adjusted OR†† (95% CI) Cycle 2 (N=256)	Unadjusted OR (95% CI) Cycles 1 and 2 (N=677)	Adjusted OR†† (95% CI) Cycles 1 and 2 (N=677)
Depressive symptomatology (CES-D ≥ 16)				
Absent	1.00	1.00	1.00	–
Present	0.39 (0.08, 1.91) p=0.25	0.21 (0.04, 1.03) p=0.054	1.68 (0.44, 6.51) p=0.45	–
Partner number, 12 months				
1	1.00	–	1.00	–
2	0.37 (0.08, 1.78) p=0.21	–	0.84 (0.28, 2.55) p=0.75	–
Probable or definite concurrency by sex partner				
No	1.00	–	1.00	–
Yes	3.23 (0.49, 21.4) p=0.22	–	1.10 (0.33, 3.65) p=0.78	–
Concurrency by participant				
No	1.00	–	1.00	–
Yes	0.74 (0.15, 3.69) p=0.71	–	1.33 (0.41, 4.30) p=0.64	–
Condom use at last vaginal sex				
No	1.00	1.00	1.00	1.00
Yes	**7.33 (1.60, 33.7)* p=0.01**	**8.38 (2.19, 32.0)** p=0.002**	**4.72 (1.72, 13.0)** p=0.003**	**3.52 (1.65, 7.50)** p=0.001**
Ever emotionally or physically abused				
No	1.00	–	1.00	–
Yes	0.59 (0.12, 2.79) p=0.50	–	1.24 (0.36, 4.27) p=0.73	–

* p<0.05;

** p<0.01;

*** p<0.001

A chi-square goodness-of-fit test (α=0.20) was used to assess model fit.

† Weighted using RDSAT bivariable weight (gender by HIV-status).

†† Adjusted for all other variables listed in column.

[†††]Only 3 women were HIV-infected and <35, creating very wide CI for this estimate.

RDSAT individualized weights were generated using enhanced data smoothing, 15,000 bootstraps, and adjustment for outliers at the 10% level.

NHBS-HET Cycle 1 2006–7; NHBS-HET Cycle 2 2010