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ORIGINAL PAPER

HIV Prevalence, Substance Use, and Sexual Risk Behaviors Among Transgender Women Recruited Through Outreach

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Abstract Transgender women ("transwomen") face a disproportionate HIV disease burden; the odds of being HIV-positive are estimated to be 34.2 times higher for transwomen than the United States adult population. From January 1, 2005 through December 31, 2011, HIV prevention outreach encounters were conducted with 2,136 unique transwomen on the streets and at high-risk venues in Los Angeles County. The outreach encounters were comprised of a low-intensity health education and risk reduction intervention, which included referrals to needed services. The goal of the encounters was to assess the participant's level of substance use and sexual risk behaviors to provide appropriate risk reduction strategies and supplies. The sample evidenced high rates of recent alcohol (57.7 %), marijuana (25.6 %), and methamphetamine (21.5 %) use, lifetime injection drug or illegal hormone use (66.3 %), and recent engagement in sex work (73.3 %). Multivariate logistic regression analysis revealed that recent methamphetamine (AOR = 2.09; $p \leq 0.001$) and/or crack cocaine (AOR = 2.19; $p = 0.010$) use, injection drug/hormone use (AOR = 1.65; $p \leq 0.001$), unprotected anal intercourse during sex work (AOR = 2.24; $p = 0.029$), and any non-Hispanic minority racial status were all associated with increased odds of reporting a HIV-positive status. The transwomen encountered via outreach exhibited many risk co-factors for HIV infection and transmission.

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Introduction

The Centers for Disease Control and Prevention estimate the prevalence of HIV infection in the United States to be between 0.3 and 0.4 % [1]; the odds of being HIV-positive are estimated to be 34.2 times higher for male-to-female transgender women (hereafter "transwomen") compared to other adults in the United States [2]. Meta-analysis of data from studies conducted in the United States estimates the national HIV prevalence among transwomen to be 27.7 %, with rates further elevated among African American/black transwomen [3]. This HIV prevalence rate is higher even than what is found among men who have sex with men (19 %) [4], a behavioral category that accounts for more than half of all new HIV infections in the United States each year [5], and a term which is often (erroneously) applied to transwomen. This disproportionate HIV disease burden facing transwomen may be a result of numerous, syndemic HIV risk factors [6–8], including elevated rates of unstable housing [9], sex work [10], and poverty [7]. Substance use may result from [11], and/or may reciprocally reinforce [9, 12], the presence of one or more of these HIV risk factors.

Substance Use and HIV Among Transwomen

Transwomen report substance use as a means of coping with the stigma, discrimination and other hardships associated with their gender presentation [11–14]. Weighted averages from United States samples of transwomen reveal elevated rates of alcohol (43.7 %), marijuana (20.2 %), and illicit drug use (26.7 %) [3]. A sample of transwomen enrolled in a

prevention case management study in Los Angeles self-reported high rates of lifetime engagement in substance abuse treatment programs (41.7 %) [15], with elevated rates also seen in a sample from San Francisco (31 %) [9]. Data from transgender-specific studies consisting primarily of transwomen (rather than transmen) demonstrated that the percentage who met the diagnostic criteria for substance abuse or dependence was high and varied between 11.2 and 16.3 % (95 % CI) [3], a significantly higher rate than found in the United States non-transgender populace [16]. Unsafe needle protocols during injection drug use (and/or hormone misuse, an avenue of HIV risk specific to transgender persons) represent additional substance use-related HIV risk factors in this population [12, 17]. Additionally, substance use during sex or sex work may increase risk for HIV infection in transwomen by decreasing consistent condom use [9, 18].

Sex Work and HIV Among Transwomen

Studies have shown that transwomen engage in high rates of sex work [3, 19, 20], as sex work can provide a means of basic economic survival for transwomen in the face of pervasive economic discrimination [21–24]. Unfortunately, transwomen sex workers are more at risk for HIV infection than non-transgender sex workers [10], and sex work has been associated with stimulant use and unmonitored hormone injections, additional pathways of HIV risk among this population [9, 14]. In addition, transwomen of color may be particularly vulnerable to the mental and physical health consequences of engagement in sex work [14], revealing the intersecting influence of behavioral and demographic co-factors on HIV risk among transwomen.

This study provides a description of the demographics, substance use patterns, sexual risk behaviors, and self-reported HIV prevalence of a large, urban sample of high-risk transwomen encountered on the streets and in the high-risk venues of Los Angeles County (LAC) from 2005 to 2011. The study sought to explore how these co-factors are associated with HIV infection among high-risk transwomen by estimating the associations between transwomen's demographic characteristics, substance use, sexual risk behavior(s), and self-reported HIV-positive status. Large-sample studies are extremely rare among this high-risk population, yet such efforts are crucial for understanding the broad range of characteristics and co-factors associated with HIV infection among high-risk transwomen.

Methods

Participants

Participants were self-identified transwomen contacted via HIV prevention outreach encounters on the streets and high-risk venues of the Hollywood, West Hollywood, and Downtown areas of LAC. Any participant that self-identified as a transgender woman (i.e., any person who believed her male biological sex assigned at birth was in conflict with her female gender identity), regardless of her stage of gender transition, was eligible for participation.

Procedure

The street outreach HIV prevention program provided low-intensity health education and risk reduction interventions using teams of two-to-three ethnically diverse, bilingual (English and Spanish), indigenous street outreach workers. Prior to entering the field, all outreach workers received 6–8 weeks of intensive training (from first author) and demonstrated proficiency in how to identify (i.e., "mapping") high-risk venues, to establish trust and rapport, to approach transwomen in sexually charged and/or drug intense settings, to administer a brief assessment, and to provide culturally appropriate referrals. Staff training, outreach sites, and many of the individual staff members remained constant over the reported period. Over 85 % of all encounters were conducted by five outreach workers who were employed on the program for an average of 4.2 years. Furthermore, the majority of the outreach encounters (88 %) were conducted by transwomen outreach workers. All materials were approved by the Los Angeles County, Department of Public Health, Division of HIV and STD Programs.

Data collection occurred over a 7-year period from January 1, 2005 through December 31, 2011. The outreach teams canvassed areas known to be frequented by transwomen including bars, clubs, boutiques, parks, street corners, cruising boulevards, hotels, and hair and nail shops. Outreach activities were conducted during rotating hours, between 11:00 A.M. and 1:00 A.M. Transwomen were approached by outreach workers who then conducted "encounters," i.e., low intensity HIV risk reduction interventions, that lasted from 16 to 60 min. Although encounters were often conducted in public venues, outreach workers were trained to protect the privacy and confidentiality of the participant. The goal of the outreach encounter was to assess the participant's level of substance use and sexual risk behaviors, provide low-intensity risk reduction strategies, provide the participants with risk reduction supplies (e.g., condoms and bleach) and incentive gifts (e.g., earrings, nail polish, lipstick, toothbrushes, toothpaste, and hair brushes), and provide referrals to needed services, if appropriate. Participants were not compensated for their participation. Staff recorded participant responses first on a paper assessment that was subsequently scanned into an electronic database. Unique identifiers derived from durable sociodemographic

information (e.g., birth date, first and last initials, race/ethnicity) [25] were used to safely and anonymously identify participants and link data from the same participant in case they were encountered by the outreach team more than once over the seven-year period. Electronic versions of the completed assessments were ordered by date and repeat encounters of the same unique identifier were excluded, implying that only the first encounter with each individual should be included in the analytical sample.

Measures

The assessment was designed by the first author to garner information on HIV risk behaviors during a brief encounter in a public or semi-public setting. The encounter form gathered data on participants' self-reported HIV status, demographic characteristics, substance use, and sexual risk behavior(s). HIV-status was self-reported, and included the response categories "HIV-positive," "HIV-negative," and "Don't know." Participants that responded "Don't know" (n = 45; 2 %) were excluded from the final analysis. Participant race/ethnicity and sexual identity were assessed through close-ended categorical items, while age was an open-ended response field asking for years of age. Use of specific substances (e.g., alcohol, methamphetamine) in the previous 30 days was assessed by listing each substance one-at-a-time and asking participants to indicate use of each in the previous 30 days. Injection drug/hormone use was assessed by the question "In your lifetime, have you ever injected any substance (including steroids or hormones)?" Sexual risk behaviors were assessed by asking participants to recall whether they had engaged in any receptive/insertive oral and/or anal sex with non-exchange male partners in the previous 30 days, as well as whether they had engaged in these same behaviors with any exchange (i.e., sex work) partners in the previous 30 days. Exchange partners were defined as those partners with whom participants exchanged sex for money and/or drugs, and sex work was defined as sex with these exchange partners. Unprotected receptive/insertive anal intercourse (UAI) with non-exchange male and/or exchange partners were assessed with the question "Was a condom or latex barrier used [during anal sex]?" This question was only asked if the participant indicated they had engaged in anal intercourse with that partner type in the previous 30 days, was asked individually for both non-exchange male and exchange partners, and included the ordinal response categories Never/Sometimes/Always. Any response other than "Always" was coded as engagement in UAI in the previous 30 days.

Statistical Analyses

Means and standard deviations were provided for continuous variables, while counts and their corresponding percentages were supplied for nominal variables; bivariate contrasts were tested for significance using student's *t* tests for continuous variables, and Chi square tests of association for nominal variables. Multivariate logistic regression analysis was carried out to explore the associations between self-reported HIV serostatus and participants' demographics, recent substance use, and sexual risk behaviors. Given the particularly long data collection phase (i.e., 7 years), time is included as a statistical control in all multivariate models (coded in 6-month intervals), to account for potential shifts in HIV risk/prevalence in the local community of transwomen that may have occurred during the data collection phase. Coefficient estimates for the logistic regression are presented as adjusted odds ratios (AOR), which in this instance describe the factor change in the estimated odds of self-reporting a HIV-positive status for each unit increase in the predictor variable, when controlling for all covariates. All significance tests were two-tailed, and all analyses were carried out using Stata SE v13 (StataCorp, College Station, TX; 2013).

Results

Demographic Characteristics and HIV Status

The total sample included 2,136 transwomen. The overall self-reported HIV-prevalence rate was 13.6 %. Most participants (72.1 %) self-identified as Hispanic/Latina, with African American/black (12.6 %) being the next most common racial/ethnic category. There were significant differences in HIV prevalence across racial/ethnic categories, with African American/black transwomen and multiracial/other race transwomen being overrepresented in the HIV-positive category, while Hispanic/Latina transwomen were underrepresented. The mean age for the entire sample was 31.1 years (SD = 8.8), though HIV-positive transwomen were significantly older than HIV-negative transwomen (36.4 vs. 30.2; $p \leq 0.001$). Most of the participants self-reported a heterosexual sexual identity (83.4 %), with bisexual being the next most common category (8.3 %). Sexual identity was not associated with self-reported HIV-positive status (Table 1).

Substance Use and HIV Status

Alcohol was the most frequently reported substance, though use differed significantly by HIV status (HIV− = 59.1 %; HIV+ = 48.8 %; $p \leq 0.001$), with HIV-negative

transwomen being more likely to report recent alcohol use. Marijuana use was common in the sample as a whole (25.6 %) and did not differ by HIV status. Methamphetamine use was reported by slightly over one-fifth of the sample (21.5 %), and HIV-positive transwomen were significantly more likely to report methamphetamine use in the previous 30 days (HIV− = 20.3 %; HIV+ = 29.2 %; $p \leq 0.001$). Recent cocaine use was reported by 5.4 % of the sample and did not differ by HIV status, while crack use was reported by 3.3 % of the sample and was more common among HIV-positive transwomen (HIV− = 2.8 %; HIV+ = 6.5 %; $p \leq 0.001$). Lifetime injection drug use or non-medically prescribed hormone misuse was reported by two-thirds of the sample as a whole, but was significantly more likely among HIV-positive transwomen (HIV− = 65.4 %; HIV+ = 71.8 %; $p = 0.032$).

Sexual Risk Behavior and HIV Status

Transwomen who self-reported being HIV-negative were more likely to report recent oral (HIV− = 58.4 %; HIV+ = 51.6 %; $p = 0.029$) and anal (HIV− = 54.0 %; HIV+ = 47.4 %; $p = 0.037$) sex with non-exchange male partner(s). Rates of engagement in UAI with these non-exchange partners was moderate (11.9 %), and did not differ by HIV status. HIV-negative transwomen were also significantly more likely to report oral (HIV− = 75.7 %; HIV+ = 57.7 %; $p \leq 0.001$) and anal (HIV− = 70.1 %; HIV+ = 49.8 %; $p \leq 0.001$) sex with exchange partner(s) than their HIV-positive counterparts, though HIV-positive transwomen were more likely to report UAI with these exchange partners (HIV− = 2.0 %; HIV+ = 4.5 %; $p = 0.010$).

Demographics, Substance Use, Sexual Risk and HIV Status

African American/black transwomen (AOR = 2.97; 95 % CI 1.65–5.38) and multiracial/other race transwomen (AOR = 1.97; 95 % CI 1.04–3.75) were each significantly more likely to self-report a HIV-positive status than Caucasian/white transwomen (the reference category); Hispanic/Latina transwomen's odds of self-reporting a HIV-positive status were not significantly different from Caucasian/white transwomen's. Odds of self-reporting a HIV-positive status were associated with participant age, increasing an estimated 6–9 % with each additional year ($p \leq 0.001$). Sexual identity was unassociated with self-reported HIV-positive status.

When controlling for demographic variables, use of other substances, and sexual risk behaviors, recent methamphetamine (AOR = 2.09; 95 % CI 1.52–2.88) and/or crack (AOR = 2.19; 95 % CI 1.21–3.97) use were each uniquely associated with a more than doubling in the estimated odds of a self-reported HIV-positive status. Self-reported injection drug use or hormone misuse at any point in the participant's lifetime was associated with a 21–125 % increase in the odds of reporting a HIV-positive status ($p \leq 0.001$). Recent oral or anal sex with a non-exchange male partner were both unassociated with self-reported HIV status, as was UAI with a non-exchange male partner.

Oral sex with exchange partners (i.e., sex work) was unassociated with participant HIV status, though anal sex with these same partners was more common among HIV-negative transwomen. HIV-positive transwomen were estimated to be more than twice as likely to report UAI with an exchange partner (AOR = 2.24; 95 % CI 1.09–4.60) than their HIV-negative counterparts. The model demonstrated a significantly good fit to the data ($\chi^2 = 212.2$; $p \leq 0.0001$), and explained approximately 13 % of the variance in self-reported HIV status (Table 2).

Discussion

Although rates of self-reported HIV infection among transwomen in the United States vary widely across samples and over time [3], among this sample of high-risk transwomen, the HIV prevalence was commensurate with the estimated national weighted average of self-reported HIV prevalence among transwomen (13.6 vs. 11.8 %) [3]. Alcohol, marijuana and methamphetamine use were all common and consistent with prevalence estimates from prior studies [3]; cocaine and crack use, while relatively less common, still displayed rates of use five to ten times greater than estimated prevalence rates for the United States general population [26]. The self-reported rate of injection substance use was high relative to previously published prevalence estimates [3]; this is mostly likely due to the inclusion of both illicit injection drug use as well as injection hormone misuse, as well as the "lifetime" recall period, all of which most likely inflated this observed rate.

Recent use of methamphetamine and/or crack was associated with increased odds of self-reporting a HIV-positive status at both the bivariate and multivariate level, as was injection drug use/hormone misuse at any point in the lifetime. The association between substance use, particularly stimulant and injection use, and HIV risk has been demonstrated [9, 27]; qualitative evidence has shown that transwomen often use drugs, particularly stimulants, to help overcome the emotional pain and physical demands associated with sex work [11, 28].

Findings also demonstrated a significant bivariate, and marginally significant multivariate, negative association between alcohol use and HIV-positive status. Though caution should be taken when interpreting coefficients only reaching marginal significance after applying statistical control, we suggest that different substances of abuse have contrasting roles in the sexual risk-taking of high-risk transwomen. As qualitative evidence has shown, many transwomen believe that stimulants perform a functional purpose to help engage in high-risk sexual behaviors, as well as to overcome (even temporarily) the stress, anxiety, and trauma of engaging in such high-risk sexual behaviors [29]. Evidence also suggests that drug use, but not alcohol use, acts as a mediator in the pathway from life stress to sexual risk-taking among transwomen [30]. Compared to the physiological effects achieved through the use of stimulants such as methamphetamine or crack (e.g., prolonged and uninhibited sexual functioning, heightened sense of euphoria, increased energy) [31, 32], alcohol may be a substandard option for use before or during high-risk sexual encounters. Thus, many transwomen engaged in the highest levels of sexual risk-taking may have eschewed alcohol use in favor of methamphetamine, crack or other stimulants. Further research should attend to differences in HIV risk behaviors and prevalence rates among transwomen reporting recent use of alcohol, illicit drugs, and/or both.

Recent engagement in sex work was common in the sample, with rates similar to those found in prior studies of transwomen [3, 12, 33]. Rates of recent oral and anal sex with an exchange partner exceeded rates of these same behaviors with non-exchange partners for both HIV-positive and HIV-negative transwomen. These results continue to demonstrate the extremely high rates of sex work exhibited by high-risk, urban transwomen, regardless of HIV status.

Bivariate and multivariate analysis of recent sexual risk behaviors indicated that in general, HIV-positive transwomen engaged in less sexual activity than their HIV-negative counterparts. Observed rates of oral and anal sex were significantly reduced among the HIV-positive transwomen compared to the HIV-negative transwomen regardless of partner type, though reductions were particularly sharp with exchange partners. On the one hand, this may imply that infection with HIV prompted some transwomen to reduce (or even abandon) engagement in sexual behaviors, particularly with exchange partners. On the other hand, it may be that the HIV-positive transwomen began to seek out sexual partners that were also HIV-positive (or that were unconcerned about HIV infection), a self-imposed constraint which may have reduced the number of available partners and thus the observed rate of engagement in sexual behavior.

The rate of engagement in UAI with non-exchange male partners was moderate ($\sim$12 % overall) and was uncorrelated with participant HIV status. In contrast, though a smaller percentage of transwomen reported UAI with an exchange partner in the previous 30 days (2.3 % overall), transwomen self-reporting a HIV-positive status were estimated to be more than twice as likely to engage in UAI with an exchange partner when compared to their HIV-negative counterparts. Thus, while HIV-infected transwomen were less likely to report recent sex work than uninfected transwomen, they were more likely to eschew protection during anal sex with their exchange partners. This suggests that HIV-positive transwomen sex workers could serve as a bridge in the diffusion of HIV and other STIs. As such, HIV prevention programs and service providers working with transwomen that are engaged in sex work should focus on reducing sexual risk behaviors with exchange partners through the adoption of safer sex work practices.

After controlling for covariates, a self-reported African American/black racial identification was the strongest nominal predictor in the multivariate logistic regression model, producing an estimated 200 % increase in the odds of reporting a HIV-positive status compared to Caucasian/white participants. Multiracial/other race participants were also more likely than Caucasian/white participants to report a HIV-positive status, with an effect similar in magnitude to that of methamphetamine or crack use. Hispanic/Latina transwomen were not significantly different from Caucasian/white participants, and were in fact underrepresented in the HIV-positive category at the bivariate level. These results corroborate meta-analytic findings that African American/black and multiracial transwomen report higher rates of HIV prevalence and incidence than Caucasian/white or Hispanic/Latina transwomen [3]. These and other recent findings from studies of transwomen [34], men who have sex with men [35], and surveys of the United States general population [36] reveal continued racial disparities in HIV-prevalence rates that cut across sexual and gender identities and confirm the need for continued efforts to reduce the disease burden within communities of racial/ethnic minority individuals.

Age was significantly associated with HIV, as viral disease prevalence accrues in populations over time. Given the elevated risk factors facing this population (e.g., substance use, sex work, UAI) it is perhaps unsurprising that the odds of a transwoman reporting a HIV-positive status increased significantly with each year of life. Unknown HIV infections are also more likely to be identified over time, either through testing or the onset of symptoms, implying that some of the association between age and HIV prevalence may have been caused by newly identified previously unknown infections. Such late

diagnosis of HIV is especially true within marginalized populations (such as transwomen), and may have numerous detrimental effects on the expected health outcomes of such individuals [37]. In LAC, it is estimated that 21 % of transwomen infected with HIV are unaware of their serostatus [38], and transwomen have been explicitly noted as one of the primary groups in LAC who systematically fail to be properly linked into care after diagnosis with HIV [39]. In order to counteract these findings, testing efforts should be increased for transwomen through the hiring of other transwomen as outreach workers, recruiters, and HIV testing counselors in communities with a high density of transwomen, particularly minority transwomen. Sexual identity, which was self-reported and may not be interpretable in any traditional sense, had no effect on the likelihood of reporting a HIV-positive status at either the bivariate or multivariate level.

Limitations and Conclusions

This study was limited by the self-reported nature of the data. Meta-analytic examinations, as well as epidemiologic data specific to LAC, suggest transwomen underreport rates of HIV infection [3, 38], implying that actual HIV prevalence may be higher than reported here. Though sampling sites, assessments, methods, and many of the staff remained consistent throughout the 7-year observation period, the non-representative sampling methodology and often unpredictable nature of the target population leave open the possibility that the estimates provided here may be biased, and ungeneralizable. The generalizability of the results may also be limited by the highly specialized population: high-risk transwomen recruited through outreach in LAC. Given that the participants were recruited via outreach on the streets and in the high-risk venues, the assessment tool was necessarily concise and focused

Table 1 Participant demographic characteristics, substance use, and sexual risk behaviors by HIV status

	HIV-negative (n = 1,845) Mean (SD) or n (%)	HIV-positive (n = 291) Mean (SD) or n (%)	Total (N = 2,136) Mean (SD) or n (%)	Sig.[a]
Race/ethnicity				
Caucasian/white	139 (7.5 %)	25 (8.6 %)	164 (7.7 %)	$p \leq 0.001$
African American/black	206 (11.2 %)	62 (21.3 %)	268 (12.6 %)	
Hispanic/Latina	1,367 (74.1 %)	173 (59.5 %)	1,540 (72.1 %)	
Multiracial/other	133 (7.2 %)	31 (10.7 %)	164 (7.7 %)	
Age (years)	30.21 (8.3)	36.42 (9.5)	31.05 (8.8)	$p \leq 0.001$
Sexual identity				
Heterosexual	1,542 (83.6 %)	240 (82.5 %)	1,782 (83.4 %)	$p = 0.804$
Gay	119 (6.5 %)	20 (6.9 %)	139 (6.5 %)	
Bisexual	154 (8.4 %)	24 (8.3 %)	178 (8.3 %)	
Lesbian	30 (1.6 %)	7 (2.4 %)	37 (1.7 %)	
Substance use (previous 30 days)				
Alcohol	1,090 (59.1 %)	142 (48.8 %)	1,232 (57.7 %)	$p \leq 0.001$
Marijuana	481 (26.1 %)	66 (22.7 %)	547 (25.6 %)	$p = 0.218$
Methamphetamine	375 (20.3 %)	85 (29.2 %)	460 (21.5 %)	$p \leq 0.001$
Cocaine (powder)	98 (5.3 %)	18 (6.2 %)	116 (5.4 %)	$p = 0.541$
Crack (rock cocaine)	51 (2.8 %)	19 (6.5 %)	70 (3.3 %)	$p \leq 0.001$
Injection drug/hormone use (lifetime)	1,207 (65.4 %)	209 (71.8 %)	1,416 (66.3 %)	$p = 0.032$
Sex (previous 30 days)				
Oral sex with non-exchange male	1,077 (58.4 %)	150 (51.6 %)	1,227 (57.4 %)	$p = 0.029$
Anal sex with non-exchange male	996 (54.0 %)	138 (47.4 %)	1,134 (53.1 %)	$p = 0.037$
UAI[b] with non-exchange male	219 (11.9 %)	35 (12.0 %)	254 (11.9 %)	$p = 0.938$
Sex work (previous 30 days)				
Oral sex with exchange partner	1,397 (75.7 %)	168 (57.7 %)	1,565 (73.3 %)	$p \leq 0.001$
Anal sex with exchange partner	1,293 (70.1 %)	145 (49.8 %)	1,438 (67.3 %)	$p \leq 0.001$
UAI[b] with exchange partner	37 (2.0 %)	13 (4.5 %)	50 (2.3 %)	$p = 0.010$

[a] Associations were tested using Chi square analyses for nominal variables (e.g., race/ethnicity by HIV status, substance use by HIV status) and with a t test for differences in mean age by HIV status. All significance tests were 2-tailed

[b] *UAI* unprotected (receptive or insertive) anal intercourse

Table 2 Multivariate logistic regression of self-reported HIV-positive status on participant demographics, substance use, and sexual risk behaviors ($N = 2{,}136$)

	AOR[a] (95 % CI)	Sig.[b]
Race/ethnicity[c]		
African American/black	2.97 (1.65–5.38)	$p \leq 0.001$
Hispanic/Latina	1.49 (0.85–2.59)	$p = 0.160$
Multiracial/other	1.97 (1.04–3.75)	$p = 0.039$
Age (years)	1.07 (1.06–1.09)	$p \leq 0.001$
Heterosexual identity	1.07 (0.73–1.57)	$p = 0.736$
Substance use (previous 30 days)		
Alcohol	0.79 (0.59–1.04)	$p = 0.091$
Marijuana	0.83 (0.59–1.17)	$p = 0.292$
Methamphetamine	2.09 (1.52–2.88)	$p \leq 0.001$
Cocaine (powder)	1.27 (0.72–2.25)	$p = 0.405$
Crack (rock cocaine)	2.19 (1.21–3.97)	$p = 0.010$
Injection drug/hormone use (lifetime)	1.65 (1.21–2.25)	$p \leq 0.001$
Sex (previous 30 days)		
Oral sex with non-exchange male	0.72 (0.45–1.16)	$p = 0.178$
Anal sex with non-exchange male	1.15 (0.70–1.88)	$p = 0.580$
UAI[d] during sex with non-exchange male	0.95 (0.61–1.49)	$p = 0.823$
Sex work (previous 30 days)		
Oral sex with exchange partner	0.87 (0.53–1.44)	$p = 0.589$
Anal sex with exchange partner	0.51 (0.31–0.84)	$p = 0.008$
UAI[d] during sex with exchange partner	2.24 (1.09–4.60)	$p = 0.029$

Statistical control: time (6-month intervals)

[a] Adjusted odds ratio

[b] All significance tests 2-tailed

[c] Reference category: Caucasian/white

[d] *UAI* unprotected (receptive or insertive) anal intercourse

specifically on HIV transmission routes, i.e., unsafe injection protocols or UAI. Therefore, it is also a limitation that data presented here cannot differentiate between illicit injection drug use and illegal non-medically prescribed hormone injection misuse, as they represent unique pathways to HIV risk for transwomen, and should not be conflated wherever possible.

Analytically, use of inferential analyses such as multivariate logistic regression is often intended to imply causation; no such implication is intended here: participant-known HIV-positive status would have been established prior to the recent engagement in substance use and sexual risk behavior included as nominal predictors. Inferential analyses were used in this context simply to provide adjusted estimates of the associations between HIV status and the demographics, substance use, and sexual risk behaviors presented in Table 1. Without such adjustment, shared variance between factors like racial/ethnic category and substance use or sexual risk behavior may render apparent bivariate associations spurious. It is a limitation of this study that the causal link between HIV and the co-factors examined here cannot be established. Finally, the assessment dichotomized sexual partner types by either male non-exchange or male exchange partners and, therefore, it is unknown whether the male non-exchange sexual partners were main, casual, or anonymous partners (an important distinction when assessing a transwoman's sexual risk behavior) [3, 40]. Thus, the findings regarding non-exchange sexual partners must be interpreted within the constraints of this limitation. Nevertheless, this study provides important information on the characteristics and co-factors associated with HIV infection and transmission among high-risk transwomen in LAC.

This study was unique as it included what we believe is the largest sample of high-risk transwomen ever assembled, revealing details of not only their sociodemographics and substance use/sexual risk behaviors, but also of the associations between those factors and self-reported HIV infection. These findings provide important insights about how HIV infection is associated with the demographics, recent substance use patterns, and sexual risk behaviors of high-risk transwomen. Though small, exploratory studies can provide important insights as to the challenges and concerns facing members of marginalized and understudied populations, it is also crucial that large sample research be carried out with such vulnerable groups. This is especially true when a population suffers from numerous, syndemic HIV risk factors, as do populations of high-risk transwomen. Reducing the inequitable health burden high-risk transwomen experience would result in improved individual and public health outcomes. Additional research is needed to develop social service programs and research strategies that are most effective at reducing these health burdens.

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