

High-Risk Behaviors in Women Who Use Crack: Knowledge of HIV Serostatus and Risk Behavior

TOYE H. BREWER, MD, WEI ZHAO, MD, LISA R. METSCH, PhD,
AMANDA COLTES, MPH, AND JONATHAN ZENILMAN, MD

PURPOSE: To determine whether crack cocaine-using women who are aware of their HIV serostatus have made modifications in risk behaviors, we compared known HIV-positive (HIV+) and HIV-negative (HIV-) users with respect to sexual risk behaviors, prevalence of sexually transmitted infections (STIs) and vaginitis, and correlates of unprotected sex.

METHODS: We used a cross-sectional design with street outreach, recruitment, and interviews of sexually active crack cocaine using women. Women received testing for HIV, STIs, and vaginitis.

RESULTS: Sixty-one HIV+ and 117 HIV- women were enrolled. HIV+ women were significantly more likely to be African-American. There were no significant differences in drug use, types of sexual partners, number of paying partners, attitudes regarding condoms, or STI diagnoses. HIV+ women were less likely to engage in unprotected sex compared with HIV- women (56% vs. 75%, adjusted odds ratio [AOR], 0.36; 95% confidence interval [CI], 0.13–0.99). Among HIV+ women, unprotected sex was negatively associated with stronger beliefs regarding the protective value of condoms (AOR, 0.07; 95% CI, 0.01–0.67) and concurrent injection-drug use (AOR, 0.19; 95% CI, 0.04–0.99).

CONCLUSIONS: Although the majority of crack using HIV+ crack using women in this sample continued to engage in high-risk sexual activities, they were less likely to do so than HIV- women. Interventions targeting this population are needed.

Ann Epidemiol 2007;17:533–539. © 2007 Elsevier Inc. All rights reserved.

KEY WORDS: HIV Infection, Sexual Behavior, Crack Cocaine, Risk Reduction Behavior.

INTRODUCTION

Increasing individuals' knowledge of their human immunodeficiency virus (HIV) serostatus to reduce high-risk sexual behaviors among individuals known to be HIV infected (HIV+) is an important HIV-prevention goal in the United States (1). Compared with HIV-seronegative (HIV-) women, HIV+ women report more frequently that they are abstinent or use condoms consistently (2, 3). However, subpopulations of HIV+ women, such as inner-city crack cocaine users, have been noted to engage in high-risk sexual activities, including the exchange of sex for money and drugs (4–6), as do their HIV- counterparts, who have a risk for acquiring HIV infection equal to that of men who have anal intercourse in the same population (7).

Because crack cocaine use is associated with both delayed entry into HIV primary care and reduced medication adherence (8, 9), HIV+ crack-using women are likely to have high viral loads and are at high risk of transmitting HIV to sexual partners (10). In addition, the use of crack cocaine is associated with high rates of sexually transmitted infections and vaginitis (11, 12), which increase the efficacy of HIV transmission (13). Thus, crack-using women are an important group affecting the spread of the HIV epidemic in their communities because of the high risks of becoming infected as well as transmitting to others (7, 14).

Although it is widely acknowledged that drug users engage in more high-risk behaviors than nondrug users, several studies have shown that some HIV+ drug users attempt to reduce high-risk sexual behaviors (15–17). Among HIV+ intravenous drug users who consistently use condoms to protect regular sexual partners from infection, this has been called “informed altruism” (18). However, other studies have shown HIV+ drug users to be especially resistant to reducing sexual risk behaviors (19, 20), perhaps because of social and structural constraints imposed by poverty, unemployment, low levels of education, and addiction (21).

Little attention has been devoted to examining whether knowledge of HIV+ serostatus has led to modification of risk behaviors among seropositive crack cocaine-using women compared with that of their HIV- counterparts. Knowledge

From the Department of Medicine (T.H.B.) and Department of Public Health and Epidemiology (W.Z., L.R.M., A.C.), University of Miami Miller School of Medicine, Miami, FL; and Department of Medicine, Johns Hopkins School of Medicine (J.Z.), Baltimore, MD.

Address correspondence to: Toyé H. Brewer, MD, Assistant Professor of Clinical Medicine, Division of Infectious Diseases, University of Miami Miller School of Medicine, 1400 NW 10th Avenue, Suite 813, Miami, FL 33136. Tel.: (305) 242-0051; fax: (305) 242-0774.

This work was funded by the Minority Supplement to National Institute on Drug Abuse #R01 DA09953 “Miami injecting drug users and their sexual risk for HIV.”

Received October 2, 2006; accepted January 5, 2007.

Selected Abbreviations and Acronyms

HIV = human immunodeficiency virus
HIV+ = human immunodeficiency virus positive
HIV- = human immunodeficiency virus negative
GC = *Neisseria gonorrhoeae*
CT = *Chlamydia trachomatis*
OR = odds ratio
95% CI = 95% confidence interval

of the impact, if any, of HIV seropositivity self awareness on behavior and attitudes is important for the development of interventions to decrease risk behaviors in this population. In the present study, we compared a sample of HIV+ and HIV- crack-smoking women who were aware of their HIV serostatus with respect to demographics, sexual behaviors, normative beliefs regarding condoms and condom use, and the prevalence of sexually transmitted infections and vaginitis. We also examined correlates of unprotected sex among HIV+ and HIV- crack using women. We hypothesized that, given the highly addictive nature of crack and the social disenfranchisement of these women, risk behaviors would not be significantly reduced in HIV+ users compared with HIV- users.

METHODS

Study Participants

Street outreach workers in Miami, Florida, located, screened, and recruited participants in areas known to have women with a high prevalence of drug use and HIV to participate in this cross-sectional study. Eligible participants were female, at least 18 years of age, English-speaking, self-reported having vaginal or anal sex in the past 30 days, and self-reported having smoked crack or snorted or injected cocaine or heroin in the last 30 days and having not been in drug treatment in the last 30 days. All study forms and procedures were approved by the University of Miami Institutional Review Board.

Laboratory Evaluation

After obtaining informed consent, we administered standardized risk assessment questionnaires to participants (see the section "Study Questionnaire" for details). Each woman underwent a pelvic examination with pH determination, collection of a vaginal swab for wet mount, and cervical swab for nucleic acid testing for *Neisseria gonorrhoeae* (GC) and *Chlamydia trachomatis* (CT; Gen-Probe Inc., San Diego, CA). Potassium hydroxide was applied to the vaginal fluid for the "whiff" test. The wet mount was examined for trichomonas, hyphae, and clue cells for the diagnosis of trichomonas, candidiasis, and bacterial vaginosis, respectively. Diagnosis of bacterial vaginosis was made

using Amsel criteria (22). Blood was obtained from each participant for serologic testing for syphilis (ie, VDRL test and, if positive, FTA-Abs) and HIV (enzyme-linked immunosorbent assay and, if positive, Western Blot). Women were treated as appropriate for vaginitis and cervical infections. Written referrals to the County Health Department were provided to participants for treatment of syphilis and for their sexual partners if they required treatment. Twelve women newly diagnosed with HIV were referred for medical care.

Study Questionnaire

Demographic variables included in the questionnaire were age in years, race/ethnicity, education level, marital status, employment status, income in the past 30 days, whether the participant was living on the streets at the time of interview, whether the participant had ever been in jail or prison, had ever been stabbed/shot or beaten up, or had ever received treatment for HIV. Frequency of crack use was measured as a continuous variable. Drug use variables included current alcohol use (within the last month, less than once per day, greater than once per day), injection drug use, and sharing injection syringes and other injection paraphernalia. Sexual risk variables were whether participants self-reported having main, casual, and paying sex partners and engaging in sex in a crack house. Number of paying sex partners over the last 2 months was reported as a mean. Partner type variables were main/casual/paying partners during the last 2 months.

Participants were asked the percentage of the time they used condoms when having sex during the last 60 days (range was 1 [never] to 4 [always], then dichotomized to always vs. less than always). Engaging in unprotected sex was defined as using condoms less than always or being diagnosed with GC or primary syphilis, indicating unprotected sex within the last 60 days.

Condom beliefs variables (21 items) were measured using a three-level scale according to level of agreement (1 = a little, 2 = somewhat, 3 = a lot), and three meaningful components were derived from principal components factor analysis as described by Bowen et al. (23) These components included: (1) the condoms block romance scale (three items, score range 1-3, $\alpha = 0.70$, the greater the score, the more likely one believes that condoms block romance); (2) the condoms cause problems scale (three items, score range 1-3, $\alpha = 0.70$, the greater the score, the more likely one believes that condoms cause physical problems); and (3) the condoms protect scale (three items, score range 1-3, $\alpha = 0.84$, the greater the scores, the more likely one believes that condoms can prevent diseases).

Statistical Analysis

The association between demographic variables and HIV status was examined using the chi-square test for categorical variables and two sample *t*-tests for continuous variables. Bivariate analysis was performed to determine the frequencies for each of the independent variables by HIV status and for unprotected sex by HIV+ and HIV- women, respectively. Categorical variables were expressed as proportions, and continuous variables were expressed as means with standard deviations.

Associations between independent variables and HIV status were examined in a simple logistic regression to identify association between risk behaviors and HIV status and correlates of unprotected sex by HIV status, respectively. Simultaneous multiple logistic regression was used to identify independent behavioral correlates to HIV status and to unprotected sex by serostatus respectively. In multiple logistic regression modeling, adjusted for age and race as background variables, independent variables at or less than 0.20 significance level in univariate analysis were included in the models as well as variables shown to be associated with high risk behaviors in previous studies. Covariates were assessed for collinearity and interactions; none were identified. All statistical analyses were performed using SAS v. 9.1.3 (Cary, NC).

RESULTS

Demographics

Two hundred thirty-three drug-using women were enrolled in the study between July 2000 and September 2001. Twenty-two women who had not used crack in the last 30 days, 15 women with discordant results between their answer as to whether they were HIV+ and their test results, as well as 18 women who were unsure of their HIV status, were excluded from the analysis. One hundred seventy-eight women (61 HIV+ and 117 HIV-) were included in the analysis. Although HIV+ women were significantly more likely to be African-American, there were few differences between the two groups of women (Table 1). Average age for both HIV+ crack-using women and HIV- crack-using women was approximately 40 years; the majority of both groups had less than a high school education, were single, unemployed, and lived in extreme poverty.

Although the majority had children, only a minority lived with them. Many women had grown children, but the majority had children living with relatives or in foster care (data not shown). Sources of income were similar for both groups, although HIV+ women were significantly more likely to be receiving disability benefits. Approximately half of each group relied on a sex partner for income, and the majority exchanged sex for money. A history of

TABLE 1. Demographic of participants by HIV status

Variable	Total, n = 178	HIV+, n = 61	HIV-, n = 117	χ^2
	n (%) ^a	n (%) ^a	n (%) ^a	
Age in years				
Mean (SD)	39.8 (7.7)	40.3 (7.3)	39.5 (7.8)	0.55 ^b
Range	23-77	23-64	25-77	
Race/ethnicity				
Nonblack	51 (29)	10 (16)	41 (35)	6.82 [†]
African American	127 (72)	51 (84)	76 (65)	
Education < high school	88 (54)	32 (56)	56 (53)	0.16
Marital status unmarried	149 (89)	53 (93)	96 (87)	1.27
Have children	144 (81)	52 (85)	92 (79)	1.13
Children live with you	21 (15)	8 (15)	13 (14)	0.04
Sources of income last 30 days				
Job	21 (13)	7 (12)	14 (13)	0.01
VA, disability, SSI	36 (22)	24 (42)	12 (11)	21.61 [†]
Welfare, food stamps, AFDC	38 (23)	17 (30)	21 (19)	2.46
Spouse, sex partner	86 (52)	26 (46)	60 (55)	1.20
Trading sex for money	102 (61)	33 (58)	69 (63)	0.37
Income last 30 days <\$600	109 (65)	41 (72)	68 (62)	1.31
Living with sex partner	69 (39)	23 (38)	46 (39)	0.04
Living on street now	32 (18)	8 (13)	24 (21)	1.49
Been in jail or prison at least once	163 (92)	58 (95)	105 (90)	1.48
Ever been beaten up	115 (70)	39 (68)	76 (70)	0.80
Ever been shot or stabbed	55 (33)	23 (40)	33 (31)	1.60
Received HIV treatment last year	35 (21)	35 (61)	0 (0)	NA

[†]*p* < 0.01.

^aColumn number or % may not add up to n or 100 because of missing values or rounding.

^b*T*-test.

incarceration was common among both groups. The majority of women reported that they had been beaten up in their lifetimes, and nearly one-third had been stabbed or shot at least once in their life. Two HIV+ women reported their partner/husband was HIV+ as did one HIV- woman (data not shown). The majority of the HIV+ women reported that they had received some type of medical treatment for their HIV disease in the last year.

Patterns of Drug Use

Approximately 90% of both HIV+ and HIV- women acknowledged alcohol use in the last 30 days. There were no significant differences in the proportion of HIV+ and HIV- women who reported daily drinking or in their frequency of crack use (Table 2).

More than 40% of each group smoked crack four or more times per day (data not shown). Injection-drug use, reported in smaller proportions of both HIV+ and HIV- women, was associated with decreased frequency of crack use (data not shown). The majority of both HIV+ and HIV- women

TABLE 2. Logistic regression of risk behaviors on HIV status (HIV+ vs. HIV-), n = 178

Variable ^b	HIV+, n = 61 (%) ^a	HIV-, n = 117 (%) ^a	Crude OR	95% CI	AOR	95% CI
Drug use						
Current alcohol use ≥1 time/day	25 (41)	44 (38)	1.15	0.61, 2.17	NA	
Times used crack use last 30 days: mean (SD)	46 (68)	55 (94)	0.99	0.99, 1.00	1.00	1.00-1.01
Any injection past 6 mos. (yes)	13 (21)	17 (15)	1.59	0.72, 3.55	1.01	0.29-3.55
Sex risk						
Number of paying partners last 2 mos: mean (SD)	6 (14)	14 (43)	0.99	0.97, 1.01	NA	
Had sex in a crack house in the last month (yes)	10 (16)	17 (15)	1.15	0.49, 2.70	1.06	0.35-3.26
Unprotected sex (yes)	34 (56)	88 (75)	0.42[†]	0.22, 0.80	0.36*	0.13-0.99
Easiness to discuss condom use w/partner (easy)	49 (80)	102 (87)	0.60	0.26, 1.38	NA	
Condom beliefs: mean (SD)						
Condom block romance	2.5 (0.6)	2.6 (0.5)	0.77	0.42, 1.40	NA	
Condom problems	2.4 (0.6)	2.4 (0.6)	1.03	0.58, 1.80	NA	
Condom protect	2.7 (0.4)	2.6 (0.5)	1.59	0.80, 3.15	NA	
Condom use by partner type						
Main partner (yes)	22 (56)	24 (27)	3.56[†]	1.62, 7.82	2.12	0.84-5.38
Causal partner (yes)	10 (77)	22 (56)	2.58	0.61, 10.84	NA	
Paying partner (yes)	33 (85)	72 (85)	0.99	0.34, 2.84	NA	

Adjusted odds ratio adjusting for age, race and other variables in the model.
OR = odds ratio; 95% CI = confidence interval; NA = not included in the model.

*p < 0.05, †p < 0.01.

^aColumn number or % not add up to n or 100 due to missing values or rounding.

^bLast 2 months.

stated they were unable to stop using drug when they want to and that they felt guilty about their drug use (data not shown).

Sex Practices and Partner Types

All participating women had male sex partners in the last 60 days. The majority of both HIV+ and HIV- women had at least one main partner and at least one paying partner (Table 2). Fewer women reported casual partners. Less than 20% of women in both groups had engaged in crack house sex during the last 30 days.

HIV+ women were less likely to have engaged in unprotected sex compared with HIV- women (56% vs. 75%), which was significant in univariate analysis (odds ratio [OR], 0.42; 95% confidence interval [CI], 0.22-0.80). In univariate analysis HIV+ women were also more likely to use condoms with main partners (OR, 3.6; 95% CI, 1.6-7.8) than were HIV- women.

Condom Attitudes

Attitudes toward condom use were similar among both groups (Table 2). The majority of women in both groups agreed "somewhat" to "a lot" that condom use blocks romance, causes physical problems and protects against HIV and STIs. Seventy percent of HIV- women and 63% of HIV+ women state there were times in the last 30 days they had wanted to use condoms but did not (data not shown).

Final Analysis of Risk Behaviors

In multivariate analysis (Table 2), there were no significant differences in the risk behaviors of HIV+ vs. HIV- women with regard to frequency of use of alcohol, crack or injection drugs or with regard to types of sexual partners, specific sexual behaviors, or condom-related attitudes. However, HIV+ women were significantly less likely to engage in unprotected sex or in condom use.

Vaginitis and STIs

The most frequent diagnoses were bacterial vaginosis (50% of HIV+ and 42% of HIV- women) and trichomoniasis (29% of HIV+ and 29% of HIV- women). Gonorrhea was diagnosed in 4% of HIV+ and 9% of HIV- women and chlamydia in 4% of HIV+ women and 4% of HIV- women. One woman (HIV+) was clinically diagnosed with active genital herpes. No woman was diagnosed with primary syphilis. None of these differences was significant (data not shown).

Correlates of Unprotected Sex

In univariate analysis (Table 3), unprotected sex was inversely correlated with current injection-drug use among HIV+ women (OR, 0.17; 95% CI, 0.04-0.68) and positively associated with having paying sex partners among HIV- women (OR, 2.5; 95% CI, 1.06-5.90).

In multivariate analysis of correlates associated with unprotected sex (Table 4), unprotected sex was inversely associated with concurrent injection-drug use (adjusted OR,

TABLE 3. Univariate logistic regression of behavioral correlates on unprotected sex (yes vs. no) by HIV status, n = 178

Variable ^a	HIV+, n = 61		HIV-, n = 117	
	Crude OR	95% CI	Crude OR	95% CI
Drug use				
Current alcohol use ≥1 time /day	1.02	0.36-2.85	2.28	0.88-5.90
Times used crack use last 30 days: mean (SD)	1.01	0.99-1.02	1.00	0.99-1.01
Any injection past 6 mos. (yes)	0.17*	0.04-0.68	1.08	0.32-3.63
Sex risk				
Partner type				
Main partner (yes)	1.10	0.32-3.77	2.23	0.77-6.43
Causal partner (yes)	1.08	0.32-3.59	0.47	0.20-1.14
Paying partner (yes)	2.67	0.94-7.55	2.50*	1.06-5.90
Number of paying partners: mean (SD)	1.14	0.99-1.31	1.01	0.99-1.04
Had sex in a crack house in the last month (yes)	3.85	0.74-19.9	1.64	0.44-6.17
Easiness to discuss condom use w/partner (easy)	0.35	0.08-1.44	0.19	0.02-1.50
Condom beliefs: mean (SD)				
Condom block romance	1.06	0.44-2.58	0.45	0.16-1.28
Condom problems	1.13	0.45-2.88	0.83	0.38-1.81
Condom protect	0.16	0.03-1.05	0.63	0.25-1.55

OR = odds ratio; 95% CI = confidence interval.
*p < 0.05.
^aLast 2 months.

0.19; 95% CI, 0.04-0.99) and stronger beliefs in the protective value of condoms (adjusted OR, 0.07; 95% CI, 0.01-0.67). Among HIV- women, no correlates of unprotected sex were identified.

DISCUSSION

We found that, among crack-using women aware of their HIV serostatus, there were no significant differences in illicit drug or alcohol use, exchanging sex for drugs or money, or prevalence of STIs or vaginitis between HIV- and HIV+ women in this sample. Although the majority of HIV+ women reported unprotected sex, they were significantly less likely to do so compared with HIV- women. These data suggest that knowledge of HIV+ serostatus has had some impact on the risk-taking behaviors of sexually active women who use crack cocaine in this sample.

Some studies have shown that persons who are aware of their HIV+ serostatus have decreased their risk sexual behaviors (24). In this sample, similarly, it appears that some HIV+ crack cocaine-smoking women have decreased their sexual risk sexual behavior. However the majority of HIV+ and HIV- women continue to engage in unprotected sex. The highly addictive nature of crack cocaine, the short duration of the “high,” which is followed by intense cravings for more drugs, leads to a tendency to put the acquisition of more drugs ahead of other needs (25). It is also possible that crack-using women’s dependency on their male sex partners as a source of acquiring drugs and money facilitates their continuation of high-risk sexual activities (26). Other social factors also may contribute to these women’s risk

practices because the majority of women in this sample lived in poverty, had a history of physical abuse, and reported an inability to control their drug use, and limited control of their use of condoms.

Notably, HIV+ women who reported stronger beliefs that condoms protect from HIV infection were less likely to have unprotected sex (adjusted OR, 0.07; 95% CI, 0.01-0.67), suggesting that this subset of HIV+ crack using women may take personal responsibility for their behavior and engage in “informed altruism.” Interestingly in univariate analysis HIV+ women were more likely to use condoms

TABLE 4. Multiple logistic regression of behavioral correlates on unprotected sex (yes vs. no) by HIV status

Variable ^a	HIV+, n = 56		HIV-, n = 107	
	AOR	95% CI	AOR	95% CI
Drug use				
Times used crack use last 30 days	1.00	0.99-1.01	1.00	1.00-1.52
Active injection drug use (yes)	0.19*	0.04-0.99	0.87	0.19-4.01
Sex risk				
Partner type				
Main partner (yes)	NA		2.74	0.82-9.13
Causal partner (yes)	NA		0.40	0.14-1.17
Paying partner (yes)	NA		2.40	0.85-6.73
Condom beliefs (mean)				
Condom block romance	1.58	0.40-6.22	0.36	0.09-1.50
Condom problems	1.81	0.46-7.07	1.20	0.43-3.34
Condom protect	0.07*	0.01-0.67	1.04	0.30-3.55

AOR = adjusted odds ratio; 95% CI = confidence interval; NA = not included in the model.
*p < 0.05.
^aLast 2 months.

with main partners than were HIV– women, but this did not hold true for casual or paying partners. Among HIV– women, stronger beliefs in the protective value of condoms were not associated with lower levels of unprotected sex, indicating little attempt to protect oneself from potential HIV transmission.

The prevalence of unprotected sex among HIV+ crack-using women was lower among those who also injected drugs in univariate (OR, 0.17; 95% CI, 0.04–0.68) and multivariate analysis (adjusted OR, 0.19; 95% CI, 0.04–0.99). Because these women smoked crack less frequently, it is possible they were marginally integrated into the culture of crack cocaine and more involved in injection-drug user social networks, where the association between sex and drugs is not as pervasive (27). However, it has been previously reported that women injectors who also smoke crack are more likely to engage in high-risk sexual behaviors than those who only inject drugs (27).

The high rates of bacterial vaginosis and trichomonas reported here are consistent with published reports from similar populations (11). These conditions have been shown to enhance HIV transmission (28, 29). Genital herpes, a chronic STI that is only intermittently clinically detectable, would be underdetected given the cross-sectional study design and the fact that screening for HSV-2 genital shedding was not performed. However, unlike the diagnosis of GC, an STI with a short duration of infectiousness, these other conditions are not indicative of recent unprotected sex. The low prevalence of GC and CT (which has a considerably longer duration of infectiousness than GC) in this population is not surprising, given the older age of the participants. The strong association between active drug use and failure to access HAART or achieve virologic suppression (9, 30) makes it very likely that many HIV+ women had uncontrolled viremia, further increasing the risk of sexual transmission (10).

This study has limitations. First, the sample was not randomly selected and selection bias cannot be ruled out. However, standard methods to recruit and enroll high-risk drug users were used (31) and the high-risk sex behaviors reported here are consistent with other reports in the literature (4–6). Second, because this is a cross-sectional study, we cannot make causal associations or examine the effect of knowing one's HIV status on behaviors over time; furthermore we do not know how long HIV+ women were aware of their serostatus, and behaviors might have changed over time. Third, although few persons in the sample acknowledged an HIV+ main sexual partner, we did not capture data on the serostatus of casual and paying partners. Therefore, not all unprotected sex among HIV+ women may have put others at risk of a new HIV infection, although unprotected sex represents risky behaviors for all participating women, regardless of their HIV status.

Despite these limitations, these findings reiterate the need for urgent interventions for women who use crack as part of HIV prevention efforts targeting both HIV+ and HIV– individuals. Women crack users are a difficult group in which to effect behavioral change (17, 26, 32). Avants et al. (32) found high levels of knowledge of sexual risks that were unrelated to risk behavior in this population. Instead, sexual risk behaviors were associated with low levels of motivation and poor behavioral skills, as appears the case in this sample. In addition to addressing individual behavioral determinants, structural interventions are needed as well.

Addressing poverty, lack of education, and other social conditions as well as drug treatment should be key components of an intervention among crack cocaine users. Specific interventions for those who are HIV infected, which may be accompanied by case management for HIV primary care, and for those who are still uninfected are required to impact this epidemic. More than a decade after the recognition of the association of crack cocaine use and HIV infection, the urgent need to address this epidemic as part of a strategy to decrease the incidence of HIV has still been largely ignored.

Thanks to Clyde McCoy for facilitating this research project, to Thomas Hooton for helpful comments in reviewing this manuscript, and to Sam Comerford for coordinating outreach and recruitment.

REFERENCES

1. Centers for Disease Control and Prevention. Incorporating HIV prevention into the medical care of persons living with HIV: Recommendations of CDC, the Health Resources and Services Administration, the National Institutes of Health, and the HIV Medical Association of the Infectious Disease Society of America. *MMWR*. 2003;52:121:1–24.
2. Greenblatt RM, Bacchetti P, Barkan S, Augenbraun M, Silver S, Delapenha R, et al. Lower genital tract infections among HIV-infected and high-risk uninfected women: findings of the Women's Interagency HIV Study (WIHS). *Sex Trans Dis*. 1999;26:143–151.
3. Wilson TE, Massad SL, Riester KA, Barkan S, Richardson J, Young M, et al. Sexual, contraceptive, and drug use behaviors of women with HIV and those at high-risk for infection: Results from the Women's Interagency HIV Study. *AIDS*. 1999;13:591–598.
4. Campsmith ML, Nakashima AK, Jones JL. Association between crack cocaine use and high-risk sexual behaviors after HIV diagnosis. *J Acquir Immune Defic Syndr*. 2002;25:192–198.
5. Wilson TE, Minkoff H, Dehovitz J, Feldman J, Landesman S. The relationship of cocaine use and human immunodeficiency virus serostatus to incident sexually transmitted diseases among women. *Sex Trans Dis*. 1998; 25:70–75.
6. Novotna L, Wilson TE, Minkoff HL, McNutt LA, DeHovitz JA, Ehrlich I, et al. Predictors and risk taking consequences of drug use among HIV-infected women. *J Acquir Immune Defic Syndr*. 1999;20:502–507.
7. Edlin BR, Irwin KL, Faruque S, McCoy CB, Word C, Serrano Y, et al. Intersecting epidemics—crack cocaine use and HIV infection among inner-city young adults. Multicenter crack cocaine and HIV infection study team. *N Engl J Med*. 1994;331:1422–1427.
8. Sharpe TT, Lee LM, Nakashima AK, Elam-Evans LD, Fleming PL. Crack cocaine use and adherence to antiretroviral therapy among HIV-infected black women. *J Community Health*. 2000;29:117–127.

9. Wilson TE, Barron Y, Cohen M, Richardson J, Greenblatt R, Sacks HS, et al. Adherence to antiretroviral therapy and its association with sexual behavior in a national sample of women with human immunodeficiency. *Clin Infect Dis*. 2002;34:529-534.
10. Quinn TC, Wawer MJ, Sewankambo N, Serwadda D, Li C, Wabwire-Mangen F, et al. Viral load and heterosexual transmission of human immunodeficiency virus type 1. *N Engl J Med*. 2000;342:921-929.
11. Cu-Uvin S, Hogan JW, Warren D, Klein RS, Peipert J, Schuman P, et al. Prevalence of lower genital tract infections among human immunodeficiency virus (HIV)-seropositive and high-risk HIV-seronegative women. HIV Epidemiology Research Study Group. *Clin Infect Dis*. 1999;29:1145-1150.
12. Dehovitz JA, Kelly P, Feldman J, Sierra M, Clarke L, Bromberg J, et al. Sexually transmitted diseases, sexual behavior, and cocaine use in inner-city women. *Am J Epidemiol*. 1994;140:1125-1134.
13. Fleming DT, Wasserheit JN. From epidemiological synergy to public health policy and practice: The contribution of other sexually transmitted diseases to sexual transmission of HIV infection. *Sex Transm Infect*. 1999;75:3-17.
14. Adimora AA, Schoenbach VJ, Martinson FE, Coyne-Beasley T, Doherty I, Stancil TR, et al. Heterosexually transmitted HIV infection among African Americans in North Carolina. *J Acquir Immune Defic Syndr*. 2006;41:616-623.
15. Rhodes TJ, Donoghoe MC, Hunter GM, Stimson GV. Continued risk behavior among HIV positive drug injectors in London: Implications for intervention. *Addiction*. 1993;88:1553-1560.
16. Colon HM, Rivera Robles R, Marrero CA, Reyes JC, Sahai H. Behavioral effects of receiving HIV test results among injection-drug users in Puerto Rico. *AIDS*. 1996;10:1163-1168.
17. Metsch LR, McCoy CB, Lai S, Miles C. Continuing risk behaviors among HIV seropositive chronic drug users in Miami, Florida. *AIDS Behav*. 1998;2:161-169.
18. Des Jarlais DC, Perlis T, Arasteh K, Hagan H, Milliken J, et al. Informed altruism" and "partner restriction" in the reduction of HIV infection in injecting drug users entering detoxification treatment in New York City, 1990-2001. *J Acquir Immune Defic Syndr*. 2004;35:158-166.
19. Timpson SC, Williams ML, Bowen AM, Keel KB. Condom use behaviors in HIV-infected African American crack cocaine users. *Subst Abus*. 2003;24:211-220.
20. Latka MH, Metsch LR, Mizuno Y, Tobin K, Mackenzie S, Arnsten JH, et al. Unprotected sex among HIV-positive injection-drug-using women and their serodiscordant male partners: role of personal and partnership influences. *J Acquir Immune Defic Syndr*. 2006;42:222-228.
21. Zierler S, Krieger N. Reframing women's risk: Social inequalities and HIV infection. *Annu Rev Public Health*. 1997;18:401-436.
22. Amsel R, Tottten PA, Spiegel CA, Chen KC, Eschenbach D, Holmes KK. Nonspecific vaginitis: Diagnostic criteria and microbial and epidemiological considerations. *Am J Med*. 1983;74:14.
23. Bowen AM, Williams M, McCoy HV, McCoy CB. Crack smokers' intention to use condoms with loved partners: intervention development using the theory of reasoned action, condom beliefs, and processes of change. *AIDS Care*. 2001;13:579-594.
24. Weinhardt LS. The effects of HIV diagnosis on sexual risk behavior. In: Seth C, Kalichman, eds. *Positive Prevention: Reducing Risk Among People Living With HIV*. New York: Kluwer; 2005:29-63.
25. Sherman SG and Steckler A "What the 'caine was tellin' me to do." Crack users' risk for HIV: An exploratory study of female inmates. *Womens Health*. 1998;4:117-134.
26. Sterk CE, Theall KP, Elifson KW. Who's getting the message? Intervention response rates among women who inject drugs and/or smoke crack cocaine. *Prev Med*. 2003;37:119-128.
27. Booth RE, Kwiatkowski CF, Chitwood DD. Sex related HIV risk behaviors differential risks among injection-drug users, crack smokers, and injection-drug users who smoke crack. *Drug Alcohol Depend*. 2000;58:219-226.
28. Guenther PC, Secor WE, Dezzutti CS. *Trichomonas vaginalis*-induced epithelial monolayer disruption and human immunodeficiency virus type 1 (HIV-1) replication: Implications for the sexual transmission of HIV-1. *Infect Immun*. 2005;73:4155-4160.
29. Sha BE, Zariffard MR, Wang QJ, Chen HY, Bremer J, Cohen MH, et al. Female genital-tract HIV load correlates inversely with *Lactobacillus* species but positively with bacterial vaginosis and *Mycoplasma hominis*. *J Infect Dis*. 2005;191:25-32.
30. Lucas GM, Cheever LW, Chaisson RE, Moore RD. Detrimental effects of continued illicit drug use on the treatment of HIV infections. *J Acquir Immune Defic Syndr*. 2001;27:252-259.
31. Watters JK, Biernacki P. Targeted sampling: options for the study of hidden populations. *Social Prob*. 1989;36:416-430.
32. Avants SK, Warburton LA, Hawkins KA, Margolin A. Continuation of high-risk behavior by HIV-positive drug users. Treatment implications. *J Subst Abuse Treat*. 2000;19:15-22.