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Ethnic Differences in HIV Risk Behaviors Among Methadone-Maintained Women Receiving Contingency Management for Cocaine Use Disorders

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Abstract

Objective—To identify ethnic differences in HIV risk behaviors among cocaine using women receiving methadone maintenance for opioid dependence, and to evaluate the efficacy of contingency management (CM) for cocaine use disorders in reducing HIV risk behaviors.

Methods—African American (N=47), Hispanic (N=47), and White women (N = 29) were randomized to standard methadone treatment or standard methadone treatment plus a CM intervention. They completed the HIV Risk Behavior Scale (HRBS) indicating frequency of drug use and sexual behaviors across the lifetime, in the month before baseline, and in the 3 months following clinical trial participation. Ethnic group differences and the effect of CM on change in HIV risk behaviors between baseline and follow-up were evaluated.

Results—White women reported significantly higher lifetime rates of risky drug use and sexual behaviors on the HRBS than African American women; neither group differed significantly from Hispanic women. No ethnic group differences in HIV risk behaviors were identified in the month prior to baseline. At follow-up, African American women reported fewer high-risk drug use behaviors than White or Hispanic women, and Hispanic women reported more high-risk sexual behaviors than White or African American women. CM was associated with reduction in high-risk drug use behaviors regardless of ethnicity, but did not affect high-risk sexual behaviors.

Conclusions—White women receiving methadone maintenance engage in more lifetime HIV risk behaviors than African American women. CM for cocaine use reduces risky drug use behaviors, but certain ethnic groups may benefit from additional targeted HIV prevention efforts.

Keywords

Women; Ethnicity; HIV risk behavior; Cocaine; Methadone; Contingency management

1. Introduction

An increasing proportion of individuals with HIV/AIDS are women (Hader et al., 2001), with women accounting for 27% of HIV/AIDS cases in the United States in 2005 (Centers for

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Disease Control and Prevention, 2007). The risk of contracting HIV/AIDS is elevated for women with substance use disorders, even those who do not inject (Francis, 2003), and for African American and Hispanic women (Centers for Disease Control and Prevention, 2007; Espinoza et al., 2007). Engagement in behaviors that increase HIV risk, such as anal sex, injecting drugs, sex with an injection drug user, or not using condoms, varies by ethnicity (Johnson et al., 1994; Peterson et al., 1992).

Studies of ethnic differences in HIV risk behaviors among female methadone maintenance clients yield mixed results. Among women receiving methadone maintenance treatment in the early 1990s, African American women reported less frequent condom use during sex and were less likely to report changing their sexual practices to reduce HIV risk than White or Hispanic women (Schilling et al., 1991). Other studies from the same period examining women considered to be at high-risk for HIV infection found that White women were significantly more likely than African American or Hispanic women to use intravenous drugs, to have primary sex partners with a history of injection drug use, and to use dirty needles when injecting drugs (Harrison et al., 1991; Quadagno et al., 1991). African American women were more likely than White or Hispanic women to be diagnosed with syphilis and to have primary sex partners who were HIV positive (Quadagno et al., 1991), and Hispanic women were less likely than White and African American women to use condoms (Harrison et al., 1991; Quadagno et al., 1991). Among a group of African American, Hispanic, and White women entering methadone maintenance treatment, a substantial proportion of whom were sex workers, White women were the least likely and Hispanic women the most likely to report more than two sex partners in the last 12 months, whereas African American women had intermediate rates (Grella et al., 1995a). Hispanic women in the same study were most likely to report sharing injection equipment (Grella et al., 1995b).

The studies cited above suggest that White women receiving methadone maintenance may increase their relative risk of HIV infection through injection drug use behaviors, including injecting drugs and using dirty needles. African American women have elevated risk through high-risk sexual behaviors, such as having sex without condoms and having sex with HIV positive partners. Findings are less consistent for Hispanic women, whose rates of high-risk drug use and sexual behaviors relative to African American and White women vary across studies. These studies were conducted in three different regions of the United States (New York, Florida, and California, respectively), which could contribute to some of the differing associations of risk with ethnicity. Further, all of these studies are over a decade old. We know of no studies examining ethnic differences in HIV risk among female drug users conducted since the introduction of highly active antiretroviral treatment in 1996.

Methadone maintenance treatment can be effective in reducing or eliminating use of illegal opioids and in turn reducing the frequency of HIV risk behaviors, particularly those related to injection drug use (Kwiatkowski and Booth, 2001; Sorensen and Copeland, 2000; Thiede et al., 2000; Willner-Reid et al., in press). Research on methadone maintained clients has shown that higher methadone doses are associated with decreased HIV transmission rates, most likely because adequate methadone dosing leads to decreased opioid use with an accompanying reduction in high-risk behaviors (Hartel and Schoenbaum, 1998). Even methadone maintenance clients who continue to inject drugs show reductions in risky behaviors such as sharing syringes and other injection equipment (Millson et al., 2007).

Cocaine use is a common problem among patients receiving methadone treatment for opioid use disorders (Condelli et al., 1991). Despite methadone's efficacy in reducing illegal opioid use, it has little effect on rates of cocaine use (Williamson et al., 2006). Cocaine use is associated with increased likelihood of engaging in high-risk drug use (Buchanan et al., 2006; Santibanez et al., 2005) and sexual behaviors (Buchanan et al., 2006; Lejuez et al., 2005). Many methadone

maintenance clients therefore continue to use cocaine and engage in behaviors that increase risk of exposure to the HIV virus (Condelli et al., 1991; Grella et al., 1995a).

Contingency management (CM) treatments have been effectively applied to reducing cocaine use among cocaine dependent methadone maintenance clients (Peirce et al., 2006; Petry and Martin, 2002; Petry et al., 2005b; Preston et al., 2001; Rawson et al., 2002; Silverman et al., 1999; 1996) and in other drug treatment settings (Petry et al., 2005a; 2005c). CM interventions provide tangible reinforcement for target behaviors, most often for submitting negative urine toxicology specimens. Studies conducted in methadone clinics indicate that clients assigned to receive standard treatment plus CM have longer durations of continuous cocaine abstinence and submit a higher proportion of cocaine-free urine samples than clients receiving standard treatment alone (Peirce et al., 2006; Petry and Martin, 2002; Petry et al., 2005b; 2007). There are currently no published studies specifically examining associations between ethnicity and CM treatment outcomes. A recent study examining predictors of CM outcomes included ethnicity as a covariate and showed no significant effect of ethnicity on treatment retention and drug use outcomes (Stitzer et al., 2007).

The current study examines ethnic differences in frequency of behaviors that increase risk for HIV/AIDS among women with cocaine use disorders receiving methadone maintenance treatment for opioid dependence. Lifetime and past-month behaviors were examined at the start of clinical trials evaluating CM treatment interventions for cocaine use. Based on prior research with drug dependent women, we predicted that White women would report more injection drug use related risk behaviors than African American or Hispanic women, that African American women would report the most high-risk sexual behaviors, and that Hispanic women would lie somewhere between White and African American women for both types of high-risk behaviors at baseline.

We also examined prospective effects of CM treatments on HIV risk behaviors of women of different ethnicities. Because cocaine use among methadone maintenance clients is associated with more high-risk drug use and sexual behaviors, we expect CM, which has proven to be effective in reducing cocaine use, to reduce behaviors that increase risk for contracting HIV. A recent study finds that CM treatments are associated with reductions in HIV risk behaviors, especially drug use risks, in a sample of men and women (Hanson et al., in press). We predicted that women receiving CM would show greater reductions in HIV risk behaviors than women who did not receive CM, and we examined whether this effect varied by ethnicity. No prior studies have examined the influence of ethnicity on CM's efficacy in reducing HIV risk behaviors in women. It is possible that culture-specific factors could facilitate or attenuate CM's effect on HIV risk behaviors. For instance, research suggests that White drug treatment clients have more psychiatric disorders than their African American counterparts (Kendall et al., 1995; Petry, 2003; Ziedonis et al., 1994) and that psychopathology is associated with higher engagement in risky behaviors (Abbott et al., 1994; Otto-Salaj and Stevenson, 2001; Williams and Latkin, 2005). African American women receiving methadone maintenance are more likely to use crack cocaine both at the start of treatment and 18–24 months later (Grella et al., 1995b). Such characteristics that vary by ethnicity could affect the efficacy of CM treatments for reducing cocaine use and in turn reducing HIV risk behaviors.

2. Methods

2.1. Participants

Participants were drawn from a sample of 130 women enrolled in one of three CM clinical trials conducted at a methadone maintenance clinic in Hartford, CT between 1999 and 2006 (Petry and Martin, 2002; Petry et al., 2005b; 2007). Clinical trial participants were recruited via counselor referrals or when they responded to flyers advertising the research. Counselors

were asked to refer any clients who used cocaine. Inclusion criteria for the clinical trials included a past-year diagnosis of cocaine abuse and/or dependence based on Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; American Psychiatric Association, 2000) criteria, stable methadone dose for at least one month, and ability to speak English. Only female clinical trial participants were included in the present study. Exclusion criteria were cognitive impairment identified by the Mini Mental State Examination (Folstein et al., 1975), uncontrolled psychiatric disorder, or being in recovery from pathological gambling. The latter exclusion criterion was included because the prize intervention, like gambling, involves an element of chance, although no association between prize CM and increased gambling has been observed in previous studies (Petry et al., 2006). All participants provided written informed consent, approved by the University of Connecticut Health Center's Institutional Review Board. The majority of participants belonged to one of three ethnic groups: African American, Hispanic, or White. Two women listed their ethnicity as "other" and were excluded from the current analysis, leaving 128 participants.

Of the 128 women, 123 completed both lifetime and past-month versions of the HIV Risk Behavior Scale (HRBS; Darke et al., 1991) at time of intake to the study. Figure 1 shows the ethnic group breakdown for each specific clinical trial included in this study. At follow-up interviews conducted 6 months after intake, 107 of these women (87%) completed the HRBS again, with this assessment referring to HIV risk behaviors occurring in the previous 3 months. Demographics and responses to the lifetime and past-month intake versions of the HRBS did not differ significantly between women who completed the HRBS at both intake and 6-month follow-up and those who completed it only at intake, with all *p* values greater than 0.6.

2.2. Baseline and follow-up assessments

2.2.1. Interview and drug testing—After providing informed consent, participants met with a research assistant to complete a 2-hour baseline interview consisting of several questionnaires. Diagnosis of cocaine abuse or dependence was based on the relevant modules from the Structured Clinical Interview for DSM-IV (First et al., 1997). Research staff also obtained information about demographic characteristics and substance use patterns. Participants submitted breath samples that were screened for alcohol using an Alco-sensor IV Alcometer (Intoximeters, St. Louis, MO, USA) and urine samples that were screened on-site for cocaine and opioids using OnTrak Teststiks (Varian Inc., Walnut Creek, CA, USA).

2.2.2. HIV Risk Behavior Scale—The HRBS (Darke et al., 1991) is an 11-item scale developed to assess HIV risk among intravenous drug users. The HRBS is divided into two sections. Six questions ask about drug use behaviors, and five ask about sexual behaviors associated with increased risk for HIV. It is administered as a structured interview, and takes about 10 minutes to complete. Each item is scored on a 0–5 scale; higher scores are associated with more risky behaviors. An overall summary score (0–55) can be computed by summing responses to all questions. In addition, separate subscores for Drug Use (0–30) and Sexual Behavior (0–25) can be obtained by summing the scores for these sections separately. Research by HRBS developers suggests that drug use and sexual risk-taking behaviors can occur independently (Darke et al., 1990), and principal component analysis supports the two-factor structure of the scale (Petry, 2001). Internal consistency reliability was .82 for the lifetime HRBS and .77 for the past month HRBS in a sample of 84 individuals receiving treatment for substance use disorders (Petry, 2001). Test-retest reliability was .90 for the lifetime HRBS in the same sample with a one-month interval between tests. Test-retest reliability of .86 was obtained for the past-month HRBS with a one-week interval between tests (Darke et al., 1991). Sexual partners of substance abusers asked to respond on their behalf show high agreement with the substance users themselves to questions about drug use and sexual behaviors (Darke et al., 1991).

In the current study, the HRBS was administered at intake and at the 6-month follow-up interview (3 months after end of clinical trial). At intake, two versions of the HRBS were administered. Participants were first asked to respond to the questions referring to lifetime activities. They were then asked to limit their responses to behaviors in the past month. At the 6-month follow-up, participants were asked to respond while considering behavior over the prior three months (time since end of clinical trial). The HRBS was also administered 3 months after intake (end of clinical trial), but time frames for the 3-month administration varied across the CM clinical trials. Three-month results were therefore not included in the current analysis.

Participant payment varied by study; all participants received \$10–\$15 for completing the intake interview and \$15–\$20 for completing the 6-month follow-up evaluation. Follow up rates did not differ significantly among the three ethnic groups, $\chi^2(20) = 1.25, p = .54$.

2.3. Treatment

2.3.1. Randomization—Participants were randomly assigned to treatment conditions using a computerized urn randomization program (Stout et al., 1994) that balanced groups based on gender, ethnicity, and recent cocaine use. Additional stratification variables, including age (Petry and Martin, 2002; Petry et al., 2005b), employment (Petry and Martin, 2002; Petry et al., 2007), and recent group therapy attendance (Petry et al., 2005b), were included in specific clinical trials. Treatment conditions included standard methadone treatment, or standard methadone treatment combined with a CM intervention. The active treatment phase lasted 3 months, and participants continued on standard methadone treatment after the clinical trial ended.

2.3.2. Standard treatment—Standard treatment consisted of daily methadone dosing and weekly individual and/or group counseling provided by drug and alcohol counselors with varying levels of education (high school diploma to master's degree). In addition, participants submitted urine samples on 2 to 3 days per week for 3 months. Research staff tested samples for cocaine and opioids using the on-site procedure described above.

2.3.3. CM treatment—Participants in the CM conditions received the standard treatment and submitted urine samples as described above. In addition, for 3 months they also earned reinforcement for target behaviors, including cocaine and/or opioid abstinence, and/or group counseling attendance, depending on the specific clinical trial. Reinforcements could be vouchers exchangeable for retail goods or opportunities to win prizes ranging in value from \$1 to \$100, depending on the specific clinical trial and CM treatment condition. In the voucher CM condition, participants earned vouchers with monetary value that could be accumulated and exchanged for items of equivalent value. In the prize CM conditions, participants earned draws from a bowl, with some proportion of draws resulting in prizes, again depending on the specific clinical trial and condition.

In one clinical trial (Petry and Martin, 2002), participants earned draws for each cocaine-negative and opioid-negative sample submitted, with bonus draws when all samples in a single week were negative. Number of bonus draws escalated each consecutive week that all samples were negative and were reset to the starting value when a cocaine or opioid-positive sample was submitted. Participants could earn up to 234 draws if all urine samples were negative for both drugs.

A second clinical trial (Petry et al., 2005b) provided reinforcement for submission of cocaine-negative samples and group therapy attendance. Either behavior was reinforced regardless of whether the other occurred, and participants could receive reinforcement for both behaviors if both occurred. The number of draws started at one per negative sample or group attended and increased by one for each consecutive negative sample or week of group attendance. Draws

were withheld in response to a positive sample, unexcused failure to submit a sample, or failure to attend group, and draws were reset to one for the next negative sample or group attended. Participants could earn up to 270 draws for submitting negative samples and up to 78 for attending groups.

The third clinical trial (Petry et al., 2007) had two CM conditions, one providing prize draws and one providing vouchers for cocaine-negative samples. Prize draws started at one and increased by one draw for each negative sample (up to 10 per sample). Vouchers started at \$3 per negative sample and increased by \$3 for each consecutive negative sample (up to \$30 per negative sample). Draws and vouchers were reset to one and \$3 respectively in response to a positive sample or unexcused failure to submit a sample. Participants could earn up to 195 draws with maximum average expected winnings of \$300 in prizes or \$585 in vouchers if all samples were negative for cocaine. More details on clinical trial procedures are available in the referenced articles.

Demographic characteristics, scores on the three versions of the HRBS, and treatment outcomes generally did not differ for participants assigned to the CM conditions across the three clinical trials. Similarly, participants assigned to standard care did not differ across the three trials. Prior research indicates that prize- and voucher-based CM have comparable efficacy for reducing cocaine use (Petry et al., 2007; Petry et al, 2005a). Data from the three clinical trials are therefore combined for subsequent analyses with clinical trial included as a covariate.

2.4. Data analysis

Demographic and substance use characteristics of the three ethnic groups (African American, Hispanic, White) were compared using Chi square (χ^2) tests for nominal variables and analysis of variance (ANOVA) for continuous variables. ANOVA was also used to examine differences among the three ethnic groups on the lifetime HRBS Drug Use and Sexual Behavior subscores. Because the Drug Use and Sexual Behavior subscores were not normally distributed on the past-month intake and 6-month follow-up HRBS, Kruskal-Wallis tests examined differences among the three ethnic groups on these measures. When subscores differed across ethnic groups, group differences in responses to specific HRBS items were examined using ANOVA. When the distribution of specific HRBS items did not display homogeneity of variance, Brown-Forsythe statistics were reported. Kruskal-Wallis tests compared ethnic group differences in responses to individual questions when they were not normally distributed. Given the sample sizes ($N = 123$ at baseline, $N = 107$ at 6-month follow-up), this study had adequate power (.80) to detect an effect size (f) of .28 among ethnic groups at baseline and .30 at the 6-month follow-up (Cohen, 1988; Faul et al., 2007).

Change scores (differences between 6-month follow-up and past-month intake HRBS subscores) were computed for each participant. Analysis of covariance (ANCOVA) was used to examine the effect of ethnicity (African American, Hispanic, or White), treatment group (CM vs. standard care), and the potential interaction between ethnicity and treatment group on changes in HRBS Drug Use and Sexual Behavior subscores. The specific clinical trial and any demographic characteristics that differed among the three ethnic groups at baseline were included in the analysis to control for a potential effect on changes in HIV risk behaviors. Bonferroni adjustment set p at .025 to avoid inflated Type I error as two tests were performed. Power was adequate (.80) to detect an effect size (f) of .30 when examining effects of treatment (CM vs. standard care) on changes in HRBS scores and to detect an effect size of .33 when examining interactions between treatment and ethnicity, with $\alpha = .025$ (Cohen, 1988; Faul et al., 2007).

3. Results

3.1. Demographic characteristics

Table 1 shows demographics and substance use variables for the three ethnic groups. The analysis of variance revealed a significant difference in level of education among the groups, with Hispanic women having significantly less education than either African American or White women (post-hoc mean differences significant at $p < .01$). There was a non-significant trend toward a difference in methadone dose among the groups, although opioid use at baseline did not differ. Other demographic and substance use characteristics were comparable across ethnic groups.

3.2. Ethnic group differences on HRBS

Table 2 shows mean HRBS summary scores and Drug Use and Sexual Behavior subscores assessing lifetime and past-month behavior assessed at intake, and behavior over the past 3 months assessed at 6-month follow-up. Lifetime scores differed significantly among the three ethnic groups. Post-hoc tests showed that White women had significantly higher Drug Use and Sexual Behavior subscores than African American women (mean differences significant at $p < .01$), but neither group differed significantly from Hispanic women. There were no significant differences in HIV risk behavior among the three ethnic groups in the month prior to baseline. Group differences re-emerged at the 6-month follow-up, at which time Hispanic women had higher Sexual Behavior subscores than African American or White women, and African American women had lower Drug Use subscores than White or Hispanic women.

Responses to individual items on the lifetime HRBS are in Table 3 with results of the ANOVA examining ethnic differences. Post-hoc tests indicated that significant ethnic group differences arose from discrepancies between responses by White and African American women on 7 of the 11 items, with White women reporting significantly more risk behaviors than African American women (all mean differences significant at $p < .05$). This was the case for both drug use and sexual behaviors. Hispanic women did not differ significantly from either of the other groups on any item. There were no ethnic group differences in responses to individual questions on the past-month intake HRBS with all p values greater than .05 on Kruskal-Wallis tests.

Ethnic group differences were also apparent on three questions from the 6-month follow-up HRBS. African American women reported significantly lower frequencies of injecting drugs than Hispanic or White women, Kruskal-Wallis test, $\chi^2(2) = 7.54, p < .05$. Hispanic women reported more sexual partners, $\chi^2(2) = 8.21, p < .05$, and less frequent use of condoms with regular sex partners, $\chi^2(2) = 6.78, p < .05$, at follow-up than the other two groups.

3.3. Effects of CM on HIV risk behaviors

Table 4 shows the results of the ANCOVA testing effects of ethnicity, treatment group (CM vs. Standard Care), and their interaction on change in HRBS Drug Use and Sexual Behavior subscores, controlling for level of education, methadone dose, and clinical trial. Ethnicity did not have a significant effect on changes in either subscore. Treatment group significantly influenced the change in Drug Use subscores; women assigned to a CM intervention showed significantly greater reductions in risky drug use behaviors between intake and 6-month follow-up than standard care participants. Treatment group accounted for approximately 6% of the variance in change in Drug Use subscores (partial $\eta^2 = .06$). Treatment group was not associated with changes in Sexual Behavior subscores. The interaction between treatment group and ethnicity had no significant effect on change in either HRBS subscore, nor did the covariates.

4. Discussion

4.1. Main findings

This study indicates that, across their lifetimes, White women in methadone maintenance treatment engaged in more sexual and drug use behaviors that increase risk for HIV infection than their African American or Hispanic counterparts. However, these differences were not apparent when women were asked about their more recent history of behaviors during a period when they were receiving methadone treatment for opioid dependence. Six months after beginning participation in one of three clinical trials examining effects of CM treatments on cocaine use, offered concurrent with methadone treatment, Hispanic women reported more high-risk sexual behaviors, including more sexual partners, and less condom use, than their African American or White counterparts. In contrast, African American women reported fewer high-risk drug use behaviors, particularly less injection drug use than Hispanic or White women six months after the start of the study. Women who received a CM intervention showed a significantly greater reduction in risky drug use behaviors between the start of treatment and 6-month follow up than women who received the standard methadone treatment without CM. CM was not associated with a significant reduction in high-risk sexual behaviors. Ethnicity did not appear to affect the efficacy of CM treatments on reducing high-risk drug use behaviors. However, power in this sample was only adequate to detect medium to large differences.

HRBS lifetime Drug Use subscores obtained by African American and Hispanic women in this study were comparable to those observed in other samples of clients receiving methadone maintenance (Petty, 2001). White women had substantially higher lifetime Drug Use subscores. Drug Use subscores in all ethnic groups were higher than those previously observed among clients receiving non-methadone treatment for drug use disorders or non-drug using controls (Petty, 2001). Sexual Behavior subscores of Hispanic and White women were comparable to methadone maintained and non-methadone drug use disorder clients, while African American women's lifetime Sexual Behavior subscores were comparable to scores previously obtained in a non-drug using sample (Petty, 2001).

Compared to African Americans, White drug treatment clients report more psychiatric disorders and higher levels of psychiatric distress (Petty, 2003; Ziedonis et al., 1994). Psychopathology has been associated with higher engagement in risky behaviors (Abbott et al., 1994; Otto-Salaj and Stevenson, 2001; Williams and Latkin, 2005), and a history of psychiatric distress or symptoms could have contributed to increasing lifetime engagement in self-destructive behaviors including behaviors that increase HIV risk among white women in this sample. The finding of higher rates of risky sexual behaviors among Hispanic women six months after the start of the clinical trials is somewhat puzzling, but suggests that high-risk sexual behaviors among African American and White women may be more related to drug use than they are among Hispanic women. For instance, there is some evidence that condom use is viewed negatively by many Hispanics (Marin et al., 1993), suggesting that engagement in unprotected sex may be a normative activity for some Hispanic women.

4.2. Relationship between risk behaviors and rates of infection

Although African American and Hispanic women have higher rates of HIV infection than White women (Espinoza et al., 2007; Centers for Disease Control and Prevention, 2007), prior research suggests that HIV risk behaviors are not strong predictors of infection among non-White individuals (Hallfors et al., 2007). Among White young adults, increased risk for HIV and other sexually transmitted diseases is associated with high-risk behaviors such as substance use, having multiple sexual partners, and not using condoms, but African American young adults are at increased risk even when engagement in high-risk behaviors is relatively infrequent (Hallfors et al., 2007). Young White men who have sex with men are more likely

than their African American and Hispanic counterparts to engage in risky sexual and drug use behaviors, but least likely of the three groups to be HIV positive (Harawa et al., 2004). Among adolescents, African American girls are less likely to engage in high-risk sexual behaviors than African American boys or White adolescents of either gender, but are the most likely to report having sexually transmitted diseases (Halpern et al., 2004). Our results similarly indicate that African American women receiving treatment for opioid and cocaine use disorders have relatively *low* rates of HIV risk behaviors compared to White women. High rates of HIV risk behaviors therefore do not appear to be the mechanism by which African American women's risk for HIV infection is increased. Rather, African American women may be engaging in high-risk sexual behaviors infrequently but with very high-risk partners.

If African American women report lower rates of HIV risk behaviors than their high rates of HIV infection suggest, then the general approach of providing education about risk factors and reducing drug use and other activities associated with high-risk behaviors may not be as helpful for them, and other approaches to HIV risk reduction should be explored. Because the prevalence of HIV is high among African Americans, each sexual contact with an African American individual potentially conveys a higher risk for infection than a similar interaction with a White individual. African American women are more likely to have sex with African American men than men of other ethnic backgrounds, making the level of infection risk associated with each sexual encounter higher for African American women (Laumann and Youm, 1999).

4.3. Effects of CM on HIV risk behaviors

Women in this study were interviewed at entry into CM clinical trials, but had been on a stable methadone dose for at least a month prior to interview. It is therefore likely that methadone maintenance treatment contributed to a significant reduction in high-risk behaviors among all women and reduced variability across ethnic groups in the month prior to the start of the CM clinical trials. Because cocaine use is associated with high-risk drug use behaviors (Buchanan et al., 2006; Santibanez et al., 2005), CM treatment most likely contributed to reduction in high-risk drug use behaviors through its effect on duration of cocaine abstinence. Because cocaine use is also associated with risky sexual behaviors (Buchanan et al., 2006; Lejuez et al., 2005), a reduction in high-risk sexual behaviors was expected to accompany reduction in cocaine use, but we did not observe such a reduction in this sample of women. This finding is consistent with prior research findings suggesting that drug treatment has limited impact on high-risk sexual behaviors (Herbst et al., 2007; Latka et al., 2005). There is, however, evidence that repeated exposure to drug treatment is associated with lower frequency of high-risk sexual behavior (Longshore and Hsieh, 1998).

4.4. Strengths and Limitations

The strengths of this study include the ethnically diverse sample of women examined, and the use of the HRBS, which allowed us to examine HIV risk behaviors related to both drug use and sexual behavior. Administering the HRBS at multiple time points and with reference to behaviors over the lifetime, in the month prior to the interview and in the three months following the end of the CM clinical trial provided information about patterns and changes in HIV risk behaviors related to drug use and its treatment. A significant limitation of this study is that HIV test results were not obtained. This prevents us from identifying whether HIV risk behaviors were associated with HIV infection, and whether such associations varied by ethnicity as they have in other studies. Another obvious weakness of this study is reliance on self-reported HIV risk behaviors, which prevents us from being certain that observed ethnic differences reflect actual differences in rates of behavior rather than willingness to disclose behaviors accurately. A third potential limitation is the somewhat smaller sample of White relative to African American and Hispanic participants. There are also some limits to our ability to extend these

findings to a broader population of women. For instance, ability to understand and speak English was a requirement of the clinical trials, so Hispanic women included in this study may have been relatively acculturated into English-speaking American culture compared to the general population of Hispanic women in the U.S. Because no specific measure of acculturation was administered, we cannot determine whether level of acculturation influenced the observed findings or whether they can be generalized to non-English speaking Hispanic women. Finally, because patterns of drug use and their adoption by different ethnic communities vary geographically (Agar, 2003), it is not clear whether these results are specific to the Hartford, Connecticut area or generalizable to the wider population of methadone-maintained cocaine-dependent women.

4.5. Implications for HIV prevention

The findings of this study suggest that White women with opioid and cocaine use disorders may be particularly prone to engaging in behaviors that increase their risk for contracting the HIV virus. Prevention programs aimed at reducing risk behaviors at the individual level may therefore be particularly effective in reducing HIV transmission rates among White female drug users. Hispanic women receiving drug treatment may benefit from additional interventions focused on reducing and maintaining lower frequency of high-risk sexual behaviors. Additional interventions may be necessary to reduce HIV rates among African American and Hispanic women with drug use disorders. Although some engagement in high-risk behaviors may be necessary to facilitate transmission of the virus, vulnerability to infection is not proportional to frequency of high-risk behaviors among minority women. In the Hartford area, there is anecdotal evidence that HIV infection rates are increasing among Hispanic women as a result of sexual contact with regular male partners who have engaged in high-risk behaviors (Rheannon, 2006). Effective interventions for African American and Hispanic women may require involvement of the larger social network, family, and community, rather than relying on efforts to change individual risk behaviors, and further research is needed to identify effective risk reduction interventions. For instance, it may be advisable for African American and Hispanic women to use condoms even with regular sexual partners, but encouraging this practice may require working not just with individual women but with their male partners to emphasize the benefits of condom use and reduce cultural stigmas attached to the practice. Additionally, it may be important to emphasize to Hispanic and African American women that being in a monogamous sexual relationship does not ensure protection from HIV, as there are some cultural taboos against men revealing HIV status to partners (Brooks et al., 2005) as well as beliefs that sexual contact does not spread HIV (Bogart and Thorburn, 2005). Culturally sensitive outreach efforts that address these issues may be necessary to reduce the spread of HIV/AIDS, particularly in areas like Hartford that have experienced increases in rates of HIV infection among heterosexual minority women.

It appears that providing a CM intervention concurrent with methadone maintenance treatment reduces the frequency of drug use behaviors that increase HIV risk in women, but CM is not particularly effective in reducing high-risk sexual behaviors. Providing effective treatments for drug use therefore remains an important component of HIV prevention, but additional programs focused on changing sexual behavior are also necessary, and the focus of the interventions may need to differ based on ethnicity.

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Figure 1.
Flow chart of participants in each clinical trial and assignment to treatment condition by ethnicity. CM = Contingency Management

Characteristics of methadone maintained women receiving contingency management for cocaine dependence by race/ethnicity

Table 1

Characteristic	African American (N = 47)	Hispanic (N = 47)	White (N = 29)	Significance Test	p
Age	41.1 ± 5.8	38.1 ± 7.1	40.6 ± 7.4	F (2, 120) = 2.64	.076
Education	11.6 ± 1.4	10.0 ± 2.1	12.0 ± 1.7	F (2, 120) = 14.12	<.001 ^b
% Unemployed or Disabled	68.1	74.5	82.8	$\chi^2(2) = 2.02$	.365
% Married or Cohabiting	6.4	6.4	0.0	$\chi^2(2) = 1.95$	.378
% Living with Children	23.4	31.9	10.3	$\chi^2(2) = 4.63$	.099
Yearly Legal Income	\$8034 ± 5856	\$7191 ± 5044	\$8189 ± 5342	$\chi^2(2) = .65^a$	.721
Methadone Dose	70.8 ± 28.8	75.1 ± 28.9	88.4 ± 36.4	F (2, 118) = 3.03	.052
Years of Alcohol Use	10.9 ± 10.5	12.6 ± 12.7	13.0 ± 11.1	F (2, 120) = .36	.697
Years of Cocaine Use	15.7 ± 7.9	12.7 ± 7.5	15.8 ± 9.6	F (2, 120) = 2.00	.139
Years of Heroin Use	16.7 ± 9.4	14.7 ± 9.4	15.7 ± 9.2	F (2, 120) = .57	.565
% Cocaine Positive at Study Intake	70.2	61.7	44.8	$\chi^2(2) = 4.87$	.087
% Opiate Positive at Study Intake	14.9	27.7	27.6	$\chi^2(2) = 2.68$	.262
% Receiving Contingency Management	59.6	57.4	58.6	$\chi^2(2) = .04$	.978
% In Each Clinical Trial				$\chi^2(4) = 2.33$	.675
Petry & Martin (2002)	23.4	29.8	17.2		
Petry, Martin, & Simcic (2005)	38.3	42.6	44.8		
Petry et al. (2007)	38.3	27.7	37.9		
% Completing Follow-Up	85.1	85.1	93.1	$\chi^2(2) = 1.25$	.535

^a Kruskal-Wallis Test.

^b Hispanic < African American; Hispanic < White; African American = White.

Table 2

HIV Risk Behavior Scale (HRBS) scores by ethnicity

	African American	Hispanic	White	Significance Test	P
Lifetime HRBS Score	(N = 47)	(N = 47)	(N = 29)		
Drug Use Subscore	10.8 ± 8.0	13.8 ± 8.4	17.1 ± 8.7	F (2, 120) = 5.28	.006 ^b
Sexual Behavior Subscore	8.5 ± 4.1	10.0 ± 3.7	11.4 ± 4.3	F (2, 120) = 5.06	.008 ^b
Past-Month Intake HRBS Score	(N = 47)	(N = 47)	(N = 29)		
Drug Use Subscore	1.1 ± 3.0	1.7 ± 3.7	1.7 ± 3.7	$\chi^2(2) = 4.10^a$	.129
Sexual Behavior Subscore	2.8 ± 3.7	2.9 ± 3.5	2.1 ± 3.6	$\chi^2(2) = 1.59^a$	.451
6-Month Follow-Up HRBS Score	(N = 40)	(N = 40)	(N = 27)		
Drug Use Subscore	0.5 ± 1.4	1.5 ± 3.4	1.9 ± 4.4	$\chi^2(2) = 6.15^a$	.046 ^c
Sexual Behavior Subscore	2.1 ± 2.7	3.7 ± 4.0	2.1 ± 3.6	$\chi^2(2) = 6.04^a$	.049 ^d

^a Kruskal-Wallis Test.

^b White > African American; White = Hispanic; African American = Hispanic.

^c Hispanic > African American; Hispanic > White; African American = White.

^d African American < Hispanic; African American < White; Hispanic = White.

Table 3
Mean responses to specific items on the lifetime HIV Risk Behavior Scale (HRBS) by ethnicity

Question	African American (N = 47)	Hispanic (N = 47)	White (N = 29)	Significance Test	p
Drug Use Subscore Items					
How many times have you hit up (injected drugs) in your lifetime? ^b	3.4 ± 2.1	4.2 ± 1.7	4.7 ± 1.1	F (2, 112.5) = 6.03 ^a	.003 ^j
How many times in your lifetime have you used a needle after someone else has used it? ^c	1.7 ± 1.9	2.3 ± 2.2	3.0 ± 2.2	F (2, 120) = 3.50	.033 ^j
How many different people have used a needle before you in your lifetime? ^d	1.1 ± 1.5	1.7 ± 1.9	2.3 ± 2.1	F (2, 88.6) = 3.92 ^a	.023 ^j
How many times in your lifetime has someone else used a needle after you have used it? ^e	2.0 ± 2.1	2.4 ± 2.0	2.8 ± 2.0	F (2, 120) = 1.48	.233
How often in your lifetime have you cleaned needles before re-using them? ^e	1.0 ± 1.2	1.4 ± 1.2	1.9 ± 1.5	F (2, 120) = 4.51	.013 ^j
Before using needles again, how often in your lifetime did you use bleach to clean them? ^e	1.6 ± 1.5	1.8 ± 1.4	2.4 ± 1.7	F (2, 120) = 2.47	.089
Sexual Behavior Subscore Items					
How many people have you had sex with in your lifetime? ^f	2.4 ± 0.9	3.0 ± 1.3	3.2 ± 1.3	F (2, 91.3) = 6.64 ^a	.014 ^j
How often in your lifetime have you used condoms when having sex with your regular partner(s)? ^g	3.5 ± 1.4	3.8 ± 1.3	3.9 ± 1.1	F (2, 120) = 0.78	.461
How often in your lifetime have you used condoms when you had sex with casual partners? ^h	0.8 ± 1.2	1.2 ± 1.2	1.9 ± 1.4	F (1, 120) = 7.00	.001 ^j
How often in your lifetime have you used condoms when you have been paid for sex or when you paid for sex? ⁱ	0.7 ± 1.1	1.3 ± 1.4	1.0 ± 1.2	F (2, 106.3) = 2.53 ^a	.085
How many times have you had anal sex in your lifetime? ^e	0.6 ± 1.2	0.9 ± 1.3	1.4 ± 1.7	F (2, 78.3) = 3.14 ^a	.049 ^j

^a Brown-Forsythe Test.

^b Response categories are: 0 = Never hit up; 1 = 1–2 times; 2 = 3–10 times; 3 = A few times but never more than once a month; 4 = More than once a month for any period of time; 5 = Regularly/daily for any period of time.

^c Response categories are: 0 = No times; 1 = One time; 2 = Two times; 3 = 3–5 times; 4 = 6–10 times; 5 = More than 10 times.

^d Response categories are: 0 = None; 1 = One person; 2 = Two people; 3 = 3–5 people; 4 = 6–10 people; 5 = More than 10 people.

^e Response categories are: 0 = Does not re-use; 1 = Every time; 2 = Often; 3 = Sometimes; 4 = Rarely; 5 = Never.

^f Response categories are: 0 = None; 1 = One; 2 = 2–10; 3 = 11–30 people; 4 = 31–50 people; 5 = More than 50 people.

^g Response categories are: 0 = No regular partner; 1 = Every time; 2 = Often; 3 = Sometimes; 4 = Rarely; 5 = Never.

^h Response categories are: 0 = No casual partner; 1 = Every time; 2 = Often; 3 = Sometimes; 4 = Rarely; 5 = Never.

ⁱ Response categories are: 0 = No paid sex; 1 = Every time; 2 = Often; 3 = Sometimes; 4 = Rarely; 5 = Never.

^j White > African American; White = Hispanic; African American = Hispanic.

Table 4

Results of analysis of covariance (ANCOVA) showing effects of treatment group (contingency management vs. standard care) and ethnicity on change in risk behaviors reported on the HRBS, controlling for education, methadone dose, and study

Predictor Variable	Change in HRBS Drug Use Score		Change in HRBS Sexual Behavior Score	
	F	<i>p</i>	F	<i>p</i>
Group (0 = Standard Care, 1 = Contingency Management)	6.05	.016 *	0.20	.654
Race/Ethnicity (1 = African American, 2 = Hispanic, 3 = White)	0.70	.501	0.87	.421
Group by Race/Ethnicity Interaction	0.31	.736	0.27	.764
Years of Education	0.00	.993	1.70	.195
Methadone Dose	0.02	.892	0.47	.494
Clinical Trial	0.07	.794	2.61	.109

Note. *N* = 107.

*
p<.025.