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An examination of indirect risk of exposure to HIV among wives of substance-abusing men

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Abstract

The purpose of the present investigation was to explore risk and preventive behaviors for potential HIV exposure among 362 married drug-abusing men entering outpatient treatment and their wives. During the year before entering treatment, 144 husbands (40%) reported they had engaged in sexual or drug use behaviors that placed them at high risk for HIV exposure. Nearly all of the wives of these husbands ($n = 138$, 96%) reported they had sexual intercourse with their spouses during this same time period. Among these sexually active couples, 108 of the wives (78%) reported that condoms were not regularly used when they had intercourse with their spouses, thus placing them at high risk for indirect exposure to HIV. Seventy-seven (71%) of these 108 wives reported they were not aware their husbands had engaged in high risk behaviors and thus were unknowingly placed at high risk for indirect exposure to HIV. Among those couples with husbands who had engaged in a high risk behavior, longer marriages, a diagnosis of antisocial personality disorder for husbands, and wives' lack of knowledge of husbands' high risk behaviors were uniquely associated with an increased likelihood of wives being placed at high risk for indirect exposure to HIV.

Keywords: Drug users; Risk behaviors; Marriage; HIV

1. Introduction

Women are the fastest growing group infected by HIV in the U.S.; HIV infection is now the fifth leading cause of death among all women aged 25–44 and the third leading cause of death among African–American women in this age category (Hader et al., 2001). Among women, roughly 40% of new AIDS cases and 75% of new infections are due to heterosexual transmission (Centers for Disease Control (CDC), 1999Centers for Disease Control (CDC), 2001), which represents an increase of 25% of reported AIDS cases attributable to heterosexual transmission since 1983 (CDC, 1997).

The more sexual partners with whom a person is involved, the greater the likelihood of him or her encountering a partner who is infected with and may transmit HIV. However, an individual who has only one partner can be placed at risk indirectly, through his or her partner's behaviors. For example, a sexually monogamous woman is placed at high risk for indirect exposure to HIV in circumstances in which her only partner has unprotected sexual intercourse with other partners or engages in other high risk behaviors. This type of indirect exposure leading to HIV infection is, unfortunately, a common phenomenon for women; most women who acquire HIV are infected by their primary male partners, both in the U.S. (Carpenter et al., 1991; O'Leary, 2000) and internationally (Newman et al., 2000).

In several large-scale studies that have surveyed adults (Catania et al., 1992; Kost and Forrest, 1992; Laumann et al., 1994), marital status was a significant predictor of whether or not a person had more than one sexual partner. In these surveys, unmarried and cohabiting people were more likely to have multiple sexual partnerships than were married respondents. Thus, being

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married can serve as a social protective factor against infection from HIV; yet, the strength of this factor is often less than is commonly assumed. Although belief in sexual monogamy holds considerable sway among married couples (Smith, 1990), the behavioral adherence to this ideal has been less rigid. Data from several surveys of adult sexual behavior indicated that 26–50% of married men and 21–38% of married women have had at least one lifetime occurrence of extramarital sex (Blumstein and Schwartz, 1983; Kinsey et al., 1948). Roughly 2% of married individuals engage in extramarital sex each year and, among these individuals, less than 20% use condoms consistently (Choi et al., 1994). Because condoms are used by only a small proportion of married couples as their primary method of birth control (Kwiatkowski et al., 1999; McCoy and Inciardi, 1993), it would appear that extramarital sexual relationships have the potential to be a significant public health problem. This concern is not only for the partners who engage in these unprotected extramarital sexual encounters; it also extends to their spouses, who may be exposed to HIV indirectly when they have unprotected sex with their husbands or wives who have had extramarital sexual encounters.

Because the majority of married partners who engage in extramarital relationships do not disclose this information to their spouses (Ellen et al., 1998), it is likely a significant proportion of those spouses whose partners have been sexually active outside the marriage are unknowingly placed at high risk. In an examination of HIV risk exposure among women, Finer et al. (1999) estimated roughly 17 million women in the U.S. aged 15–44 are at risk for contracting HIV through either direct contact with more than one sexual partner in the past year (5.4 million), indirect contact via one of their partners having more than one sexual partner in this period (6.3 million), or both types of exposure (5.5 million). However, a substantial proportion of these women—3.5 million—were not aware of their risk because they believed their relationships to be mutually monogamous. These findings are consistent with the results of other surveys of HIV risk among married women (Gangakhedkar et al., 1997).

It is important to emphasize that the conclusions drawn from most of the investigations reviewed thus far have been based largely on the results of general population surveys and may not generalize to clinical populations. For example, married women of drug-abusing male patients are likely placed at higher risk of indirect exposure than married women in the general population. By definition, IV drug users place themselves at comparatively high risk for contracting HIV via behaviors associated with injecting drugs, such as needle sharing, using uncleaned syringes, and so forth. Thus, women married to and having unprotected sex with IV drug-abusing husbands are very likely at increased risk for indirect exposure to HIV.

Although having multiple sexual partners is a risk factor in both the general population and among drug-abusing individuals, the magnitude of this risk factor may be different for these groups. More specifically, relative to other populations, drug users tend to inhabit communities and settings where the prevalence of HIV is more highly concentrated (e.g. shooting galleries, crack houses). Thus, the sexual partners with whom drug users engage are more likely to have HIV compared to individuals having extramarital sexual relationships in the general population. To compound this risk further, though there is evidence to suggest that drug users are more likely to use condoms in casual sexual encounters versus long-standing, committed relationships (Sherman and Latkin, 2001), surveys have found low levels of condom use among drug users in general (Booth et al., 2000).

Several investigations have identified important individual risk factors associated with behaviors that increase the likelihood of HIV exposure, including: (a) sociodemographics, particularly being younger, belonging to an ethnic or racial minority group, fewer years of formal education, and poverty (Kost and Forrest, 1992; Catania et al., 1992; Klevens et al., 2001); (b) substance use, which can have a disinhibitory effect on decision-making about compliance with safer sex practices (Rhodes et al., 1996); (c) increased severity of substance dependence (Gossop et al., 1993); and (d) a diagnosis of antisocial personality disorder (ASPD), which is associated with certain high risk behaviors, including risky needle practices (Brooner et al., 1990, 1993), increased numbers of sexual partners, and greater participation in commercial sex (Compton et al., 1995). In addition, knowledge of HIV risk behaviors, although certainly not sufficient to effect behavior change, is also a likely determinant of HIV risk reduction practices (Ralston et al., 1992).

Most of these risk factors have been examined largely from the perspective of the individual at risk. However, it is important to recognize that these and other risk factors are likely to manifest themselves in different ways, depending in part on the social context in which high risk behavior may occur (Rhodes and Quirk, 1998). For example, in the context of marital and other long-term primary relationships, particularly those involving a drug-abusing partner, other factors are often at play that can influence the occurrence of risk and preventive behaviors. For women, perception of the risk a partner presents has been found to be an important predictor of condom use (Green et al., 2000). However, women also tend not to use condoms when involved in stable, satisfying, long-term relationships, even if their partners engage in high risk behaviors (Jadack et al., 1995; Lauby et al., 2001). Additionally, in the context of

a marriage, use of condoms is not a decision that rests solely with the wife; a strong predictor of condom use is the male partner's willingness to do so (Moore et al., 2001).

Although exact figures are not available, it has been estimated that one-quarter to one-third of adult drug-abusing patients entering outpatient treatment are married (Fals-Stewart et al., 2000). Thus, marriage is an important interpersonal context from which to understand how individual and relationship HIV risk and preventive factors may influence behaviors in these partners, particularly because one of the partners in these couples (i.e. the drug-abusing spouse) is likely to be engaging in behaviors outside the marriage that increase the likelihood of exposure to HIV for the nonsubstance-abusing partners. For example, it is plausible that being married would have a strong negative influence on partners' disclosures about extra-marital sexual relationships for a variety of reasons (e.g. fears of marital dissolution, potential verbal and physical conflict), thus placing potentially unsuspecting spouses at risk unknowingly.

The purpose of the present study was to explore the HIV risk and preventive behaviors reported by married drug-abusing men entering outpatient treatment and their nonsubstance-abusing wives. Because we collected data from both partners about risk behaviors (e.g. extramarital sexual encounters), preventive behaviors (e.g. use of condoms during sexual intercourse), and knowledge of their spouses' behaviors (e.g. wives' awareness of husbands' extramarital sexual encounters), we had the opportunity to identify those couples in which wives were placed unknowingly at high indirect risk exposure. Relatedly, among those dyads in which husbands reported having participated in behaviors placing them at high risk for exposure to HIV, we explored knowledge of HIV risk, sociodemographic, diagnostic, and relationship factors identified in previous studies that might be associated with whether or not these partners engaged in intercourse without use of condoms.

2. Methods

2.1. Participants

Married male patients entering one of three substance abuse outpatient treatment programs and their wives participated in this investigation. To be admitted to these programs, applicants had to be at least 18 years of age and meet abuse or dependence criteria for at least one psychoactive substance use disorder according to the *Diagnostic and Statistical Manual of Mental Disorders* (4th edition; *DSM-IV*; American Psychiatric Association, 1994), with the primary drug of abuse not being alcohol.[1] In addition, applicants could not be psychotic or have current suicidal ideation, based on the results of a brief screening interview. Once admitted to the programs, to participate in the present investigation: (a) male and female partners had to be legally married; (b) the female partner could not meet current *DSM-IV* abuse or dependence criteria for alcohol, prescription, or illicit drugs; and (c) the partners had to agree to complete several self-report inventories and face-to-face semi-structured interviews at one of the program sites.

In addition, couples were excluded if a partner reported that he or she was HIV seropositive and the other partner was aware of their spouse's status. Such information would likely have an effect on partners' sexual behaviors that would be different than couples in which HIV status was unknown. Other investigations examining the sexual behavior of drug-abusing patients also have excluded such couples for similar reasons (Kelley and Petry, 2000).

Of the 524 married male patients who were admitted to these programs, 362 (69%) men and their female spouses agreed to participate in the study, were eligible, and completed the assessments. Of those couples who were not included ($N = 162$), 111 couples (68%) consisted of partners in which both partners met criteria for a substance use disorder. In 19 couples (12%), husbands reported they were HIV seropositive; in each of these cases, wives reported they were aware of their husbands' seropositive status. None of the wives reported that they were HIV seropositive. One or both partners in 32 couples (20%) refused to participate. It should be noted that, in the present investigation, the proportion of married drug-abusing men entering treatment who were married to women who did not have a current substance use disorder (i.e. 79%) is consistent with other studies that have included married or cohabiting drug-abusing men (Fals-Stewart, 1996).

2.2. Measures

2.2.1. HIV risk assessment

Spouses completed a modified version of the Drug-Abusing Couples HIV Risk Behaviors Inventory (DACHRBI; Fals-Stewart, 1999). The DACHRBI is a brief self-report measure designed specifically to evaluate married or cohabiting substance-abusing patients' practice of high risk behaviors for exposure to HIV among over the 12 months prior to evaluation. Partners are asked to disclose whether they have engaged in one

[1] We used a decision tree algorithm, described in Fals-Stewart (1996), to determine each female partner's primary drug of abuse, with decisions based on unweighted combinations of patient self-report data, diagnostic information, prior treatment information, and frequency of use for each drug over the 90 days and 12 months prior to evaluation.

of 10 HIV high risk sexual and drug use behaviors and whether, to the best of their knowledge, their partners have engaged in these behaviors during the same period. Thus, partners' knowledge of each others' HIV high risk exposure behaviors can be ascertained. In addition, partners are asked about occurrence of penetrative sexual intercourse (i.e. anal or vaginal sex) with their spouses in the last year and whether they always used a condom during these encounters. As part of the inventory, partners also are asked if they have ever tested HIV positive.

As noted in the original reference, the DACHRBI items were shown to have high test–retest reliablities (ranging from $r = 0.78–1.0$). In addition, among drug-abusing men whose HIV status was unknown, a greater number of positive endorsements on the DACHRBI has been shown to be significantly associated with an increased likelihood of seropositive results on subsequent HIV testing. Sample items from the DACHRBI are located in Appendix A.

For the purpose of this investigation, a husband was classified as having *high risk direct exposure to HIV* if he reported on the DACHRBI that he either had unprotected penetrative sexual intercourse (i.e. vaginal or anal sexual intercourse without use of a condom) with a person other than his spouse or engaged in risky needle practices (i.e. using syringes that others had used, using syringes that were not cleaned before use, or using the same cooker, cotton, or rinse water that others had used). A wife was classified as having *high risk indirect exposure to HIV* if her husband had engaged in at least one high risk exposure behavior *and* she reported that she had unprotected penetrative sexual intercourse with her spouse in the previous year.

Although data were collected from both partners, wives' reports about sexual intercourse with their spouse were used in the analyses. The reason we chose wives' reports of sexual behavior between spouses was that we were concerned that husbands who reported they engaged in high risk behaviors would tend to under-report engaging in unprotected sexual intercourse with their wives, suggesting less frequency of a socially undesirable activity (i.e. placing their wives at high risk indirect exposure). However, this pattern of responding did not emerge in the husbands' reports. Because of the very similar reports by both partners regarding sexual behavior between spouses, the same findings emerged whether husbands' or wives' reports of spouses' sexual behavior were used in the analyses.

2.2.2. HIV risk knowledge

The HIV Risk Knowledge Test (HIVRKT; Kelley et al., 1989) is a true-false test of knowledge about HIV transmission. A total score is based on the percentage of correctly endorsed items. As reported in the original reference, this test has high test–retest reliability and construct validity.

2.2.3. Relationship adjustment

The Dyadic Adjustment Scale (DAS; Spanier, 1976) is a widely used 32-item self-report measure of general relationship satisfaction. Scores can range from 0 to 151, with higher scores indicating higher levels of adjustment. A total score of 97 has been the traditional cutoff point for relationship distress. Previous studies have revealed the DAS to have high reliabilty, with alpha coefficents typically exceeding 0.90 and stability coefficients exceeding 0.85 (Carey et al., 1993). As reported in the original reference, the DAS also reliably discriminates between distressed and nondistressed couples.

2.2.4. Substance use

The Timeline Followback Interview (TLFB; Fals-Stewart et al., 2000a; Sobell and Sobell, 1996) was used to assess frequency of drug and alcohol use by both male and female partners. Among the most widely used measures of alcohol and drug use, the TLFB employs a calendar and other memory aids to gather retrospective estimates of an individual's daily drinking and other drug use (i.e. cannabis, cocaine, hallucinogens, inhalants, opiates, phencyclidine, sedative-hypnotics, and stimulants) over a specified time period, up to 12 months from the interview date. Percent Days Abstinent (PDA) was operationally defined as the percentage of days in the 12-month measurement period the interviewee reported no substance use and was not in jail or a hospital for reasons due to drug or alcohol use (e.g. detoxification, partial hospitalization for substance use).

2.2.5. Diagnostic information

Each partner was interviewed separately with the substance use modules of the Structured Clinical Interview for DSM-IV (SCID; First et al., 1995), administered by one of two master's-level interviewers. In addition, husbands were interviewed with the Antisocial Personality Disorder SCID module. Interviewers were trained by the first author in the administration of the SCID using mock interviews with confederates and reviews of practice interview results with substance-abusing patients.

Prior to the start of the study, interrater reliability was assessed using a paired-rater design. Videotaped interviews of 20 patients entering a drug abuse treatment center were independently observed by both primary interviewers and by the first author. Kappas between the two primary interviewers for the substance use disorders and ASPD exceeded 0.85. Kappas between the first author and the primary interviewers for the substance use disorders and ASPD exceeded 0.80. These kappas reflect good to excellent observer agreement (Landis and Koch, 1977). Randomly selected audiotapes of SCID

interviews (i.e. 10% of all interviews) were reviewed by the first author throughout the course of the study to monitor and control for interviewer drift.

2.3. Procedures

Within 2 weeks of program admission, husbands and their wives were administered the self-report inventories and semi-structured face-to-face interviews by same-gender research assistants in designated interview rooms. Husbands and wives were informed that all responses would be held in strict confidence from their partners. Each partner was paid $25.00 for completing the assessments.

Before entering the study, husbands and wives signed an informed consent document indicating their willingness to participate. As part of the consent procedures, husbands and wives were informed that they would be asked to provide sensitive information about their sexual and substance use behavior. This study received full Institutional Review Board approval from Old Dominion University, which was the first author's professional affiliation at the time the data for this investigation were collected.

2.4. Data analytic strategy

To assess agreement between partners on husband's high risk sexual behaviors and needle practices, kappas (κ) were calculated as a measure of chance-corrected agreement. Standard classifications of strong (i.e. κ of greater than or equal to 0.75), moderate (i.e. κ of greater than 0.4 but less than 0.74), and poor (i.e. κ of 0.4 or less) were used to evaluate partner's level of chance-corrected agreement (Hintze, 2001).

When exploring potential factors associated with wives' high risk indirect exposure to HIV, these variables were analyzed in a multilevel regression framework (Snijders and Bosker, 1999) to account for the inherently nested structure of the data (i.e. husbands and wives nested within couples). Because the outcome variable of interest was dichotomous (i.e. whether or not wives had high risk indirect exposure to HIV), we conducted a hierarchical generalized linear model analysis (HGLM; Raudenbush and Bryk, 2002) and used a Bernoulli sampling distribution and a logit link function. An unrestricted covariance structure was used and numerical integration was used for parameter estimation (Longford, 1994). The data were analyzed using the MIXOR data analysis package for multilevel logistic regression (Hedeker and Gibbons, 1996).

Using model building strategies and methods for logistic regression described by Hosmer and Lemeshow (1989), we initially conducted univariate analyses with each potential explanatory variable considered in separate models. All explanatory variables in the univariate analyses that had a p-value of less than 0.25 were then retained as candidates for inclusion in the multivariate HGLM (Mickey and Greenland, 1989). In addition, explanatory variables were excluded from the multivariate HGLM if they were found to be multicollinear (i.e. had variance inflation factors [VIFs] greater than 10) with other explanatory variables (Myers, 1990).

3. Results

3.1. Sample characteristics

The sociodemographic, substance use, diagnostic, and relationship characteristics of the partners are shown in

Table 1
Baseline characteristics of male substance-abusing patients and their wives ($N = 362$)

Characteristic	Statistic
Mean (*SD*)	
Male partners' age	33.2 (6.6)
Female partners' age	32.2 (6.0)
Male partners' education	12.4 (1.3)
Female partners' education	12.9 (1.3)
Years married	6.2 (5.8)
Annual family income (U.S. $)	17,349 (16,149)
Couple DAS score	76.3 (20.2)
Number (%)	
Racial-ethnic composition	
Male partners	
White	261 (72)
African American	65 (18)
Hispanic	25 (7)
Other	11 (3)
Female partners	
White	271 (75)
African American	58 (16)
Hispanic	22 (6)
Other	11 (3)
Mean (*SD*)	
Years of husbands' problematic substance use	8.9 (4.9)
Husbands' PDA	35.4 (18.2)
Wives' PDA	92.2 (11.3)
Husband's HIVRKT score	84.2 (6.1)
Wife's HIVRKT score	83.8 (5.9)
Number (%)	
Number of husbands meeting *DSM-IV* substance dependence for:	
Cocaine	250 (69)
Alcohol	297 (82)
Opiates	232 (64)
Amphetamines	127 (35)
Cannabis	22 (6)
Number (%) of husbands meeting *DSM-IV* criteria for ASPD	116 (32)

HIVRKT, HIV Risk Knowledge Test. DSM-IV, Diagnostic and Statistical Manual for Mental Disorder, 4th edition.

Table 1. Comparisons between individuals who agreed to participate and those who did not revealed no significant differences (i.e. ps > 0.25) on available sociodemographic and substance use variables.

We compared the sociodemographic, substance use, and diagnostic data from the participants drawn from the three programs and found no significant differences on any of these variables (i.e. all ps > 0.20). In addition, we explored the amount of variance explained in the analytic models by treatment programs; in all models, the amount of variance was small (i.e. less than 3% of the variance).[2] Thus, data for the different programs were pooled for the subsequent analyses.

3.2. Penetrative sexual intercourse between married partners

Using wives' reports, 345 of the 362 couples (95%) had penetrative sex during the previous year. Wives' reports revealed that 304 couples (84%) did not use condoms during all episodes of penetrative sex in the last year. Husbands' reports of sexual behaviors between partners were nearly identical to those provided by wives. Three hundred forty-six husbands (96%) reported that they had engaged in penetrative sex with their wives during the last year. In addition, among 300 couples (83%), husbands reported that partners did not use condoms during each episode of penetrative sex in the last year.

3.3. Partners' reports of high risk direct exposure and high risk indirect exposure behaviors

3.3.1. Partners' high risk direct exposure to HIV

A summary of responses to the DACHRBI for each spouse is shown in Table 2. From the complete sample of couples, 144 husbands (40%) reported they had engaged in either unprotected penetrative sexual intercourse with a partner other than their wives ($n = 58$) and/or engaged in one or more risky needle practices ($n = 124$). Among the wives, 3 (1%) reported they had engaged in unprotected vaginal or anal sexual intercourse with a partner other than their husbands; none of the wives reported any IV drug use. Thus, these husbands and wives were classified as having high risk direct exposure to HIV. Because the emphasis of the present study was on examining indirect risk exposure among wives of drug-abusing husbands and because of the very low frequency of high risk direct exposure among the wives in this sample, the remainder of the analyses focus on wives' high risk indirect exposure to HIV.

Table 2
Number (%) of partners reporting the occurrence of various drug use and sex risk behaviors during the previous 12 months ($N = 362$)

Items	Reporter	
	Husband	Wife
Husband behaviors		
Drug use risk behaviors		
Used drugs intravenously	177 (49)	160 (44)
Used a syringe after someone else	102 (28)	49 (14)
Used a syringe without cleaning	54 (15)	28 (8)
Used same cooker, cotton, and/or water used by others	59 (16)	31 (9)
Sexual risk behaviors		
Vaginal or anal intercourse with someone other than spouse	96 (27)	17 (5)
Vaginal or anal intercourse with someone other than spouse without using a condom	58 (16)	9 (2)
Wife behaviors		
Drug use risk behaviors		
Used drugs intravenously	0 (0)	0 (0)
Used a syringe after someone else	0 (0)	0 (0)
Used a syringe without cleaning	0 (0)	0 (0)
Used same cooker, cotton, and/or water used by others	0 (0)	0 (0)
Sexual risk behaviors		
Vaginal or anal intercourse with someone other than spouse	4 (1)	6 (2)
Vaginal or anal intercourse with someone other than spouse without using a condom	3 (1)	3 (1)

These numbers (%) reflect partners' reports on the DACHRBI.

3.3.2. Wives' reports of high risk indirect exposure to HIV

Among the 144 husbands who had participated in at least one high risk exposure behavior during the previous year, 138 (96%) of the wives in these couples reported the partners had engaged in penetrative intercourse with each other during the previous year. The remainder of wives ($n = 6$, 4%) reported no penetrative sexual intercourse during the time period.

Of the 138 couples in which wives reported having penetrative intercourse with their husbands, 108 wives (78%) reported that a condom was not used regularly, with most ($n = 96$, 89%) noting that condoms were 'rarely' or 'never' used. In the remaining 30 couples (22%), wives reported that the partners always used a condom when participating in vaginal or anal sex with each other. Thus, 108 wives were classified as having high risk indirect exposure to HIV.

Among the 108 wives classified as having high risk indirect exposure to HIV, 77 (71%) reported they were not aware that their husbands had engaged in either of the high risk behaviors and thus unknowingly these

[2] The formula for the intraclass correlation coefficients that was used is reported in Snijders and Bosker (1999) for binary data (p. 224). The intraclass correlation coefficients varied depending on the model being tested and explanatory variables being entered. However, the intraclass correlations never exceeded 3% of the variance explained.

wives had high risk indirect exposure. In turn, 31 wives (29%) were aware of the high risk exposure behaviors by their husbands but nonetheless engaged in unprotected sexual intercourse with them.

Among the 30 wives who reported condom use when having penetrative sexual intercourse with husbands who had been classified as having high risk direct exposure to HIV, 21 (71%) reported they had knowledge that their husbands' had engaged in one or more high risk exposure behaviors during the last year. As noted earlier, six wives of husbands who had engaged in high risk exposure behaviors reported they had not had penetrative sexual intercourse with their husbands in the last year. In each of these latter cases, all wives reported they were aware that their husbands had engaged in high risk exposure behaviors during the last year.

3.3.3. Accuracy of wives' knowledge of husbands' high risk behaviors

Interestingly, of the 58 wives who reported that they were aware that their husbands had engaged in a high risk behavior, 51 wives (88%) reported that the only risk behavior they were aware of concerned risky needle practices. Three wives (5%) reported that they were aware only of their husbands' unprotected extramarital sexual relationships; with the remaining wives (4, 7%) reporting they were aware of both types of high risk behaviors. Although the wives who reported that their spouses had unprotected extramarital sexual relationships were correct (i.e. their reports were consistent with husbands' responses), 21 of the 51 wives (41%) who reported that the only risk behavior their husbands had engaged in were risky needle practices were not correct. In these instances, husbands also reported having participated in an unprotected extramarital sexual relationship during the last year.

When examining husbands' high risk drug use behaviors in Table 2, wives were correct roughly 50% of the time when identifying risky needle practices by their husbands. The chance-corrected agreement between husbands' reports of high risk drug use behaviors (i.e. the aggregate of sharing syringes, not cleaning syringes, and using others' drug use equipment) and wives' reports of husbands' high risk drug use behaviors was moderate in size, $\kappa = 0.57$.

However, wives' knowledge was less accurate when identifying husbands' high risk sexual behaviors. For couples in which husbands had extramarital sexual intercourse (protected or unprotected) with someone other than their spouses, wives had knowledge of this in only 18% of the cases (i.e. 17 of 96 couples); chance-corrected agreement was poor, $\kappa = 0.24$. In addition, among couples in which husbands reported *unprotected* sexual intercourse with someone other than their spouse, only 16% of these wives reported being aware of this behavior; chance-corrected agreement was also poor, $\kappa = 0.23$. Thus, it appears that wives are less accurate in their assessments of husbands' high risk sexual behaviors compared to husbands' risky needle practices.

3.3.4. Factors associated with wives' high risk indirect exposure to HIV

In exploratory analyses, we examined sociodemographic, background, diagnostic, and relationship factors that might discriminate those couples in which wives had high indirect exposure to HIV via unprotected sex with husbands engaging in high risk exposure behaviors ($n = 108$) and those couples in which wives had low indirect exposure because they either abstained from sexual intercourse with their husbands ($n = 6$) or used a condom when having penetrative sexual intercourse with them ($n = 30$). The sociodemographic and background characteristics of the high and low indirect exposure groups are located in Table 3; scores on measures of relationship satisfaction, substance use, HIV risk knowledge, a current ASPD diagnosis for husbands, and wives' awareness of husbands' behaviors are located in Table 4.

The characteristics of the high indirect exposure risk and low indirect exposure risk of wives and their partners, along with the parameter estimates from the univariate HGLMs, are located in Tables 3 and 4. The variables that had parameter estimates with p values less than 0.25 were: (a) male partners' age; (b) female partners' age; (c) years married; (d) couple DAS score; (e) husbands' PDA; (f) husbands' HIVRKT score; (g) wives' HIVRKT score; (h) ASPD diagnosis for husbands; and (i) wives' awareness of their husbands' high risk behaviors. These variables were thus considered for inclusion in the multivariate model. However, as part of the screening process for selecting variables, husbands' age was not considered for the final model due to a VIF greater than 10. In the final multivariate model, as shown in Table 5, a diagnosis of ASPD for husbands, greater number of years married, and wives' lack of awareness of husbands' high risk exposure behaviors were significantly associated with increased likelihood of high indirect risk exposure for wives.

4. Discussion

The findings from the present study indicate that, during the year before entry into treatment for substance abuse, roughly 40% of the husbands in our sample had engaged in behaviors that placed them at high direct risk for exposure to HIV. Among couples in which husbands were engaging in high risk behaviors, a large majority of the wives were placed at high risk indirect exposure to HIV because they were having unprotected penetrative sex with their husbands. Most

Table 3
Parameter estimates from univariate hierarchical generalized linear models for sociodemographic and background predictors discriminating between groups of wives with high versus low indirect HIV risk exposure

Characteristic	Risk group		*B* (*SE*)	*z*	*p*	OR
	High indirect	Low indirect				
N	108	36				
M (*SD*) male partners' age	30.2 (5.2)	34.2 (4.8)	−0.06 (0.02)	3.04	0.01	0.94
M (*SD*) female partners' age	29.0 (5.3)	32.9 (5.3)	−0.05 (0.02)	2.59	0.01	0.95
M (*SD*) male partners' education	12.5 (1.2)	12.6 (1.3)	−0.01 (0.03)	0.33	0.74	0.99
M (*SD*) female partners' education	12.8 (1.4)	13.0 (1.4)	−0.02 (0.03)	0.74	0.46	0.97
M (*SD*) years married	5.5 (5.0)	6.0 (5.4)	0.05 (0.02)	2.20	0.03	1.05
M (*SD*) annual family income (U.S. $)	10,431 (11,216)	10,843 (9,644)	−0.01 (0.01)	1.10	0.27	0.99
M (*SD*) husbands' years of problematic substance use	7.8 (5.4)	7.9 (4.9)	−0.06 (0.06)	0.94	0.35	0.94
No. (%) wives from ethnic/racial minority groups	35 (32)	10 (28)	0.12 (0.44)	0.28	0.78	1.13
No. (%) husbands from ethnic/racial minority groups	32 (30)	10 (28)	0.25 (0.44)	0.56	0.57	1.28

Wives classified in the high risk group were coded '1'; wives in the low risk groups were coded '0'. Race/ethnicity was coded '1' for minority group, '0' for white.

alarmingly, the majority of these wives were placed at risk unknowingly because they were not aware of their husbands' high risk drug use and sexual behaviors. For the entire sample, 20% of the wives had unknowingly been placed at high risk of indirect exposure to HIV.

Although several factors were found to be associated with an increased likelihood of wives' high risk indirect exposure to HIV, our results suggest the most important variables were longer marriages, a diagnosis of ASPD for male partners, and a lack of awareness by wives regarding their husbands' high risk behaviors. As noted earlier, women who are in stable, long-term relationships tend not to use condoms as their primary method of protection. Even among couples in which the partners are knowingly HIV serodiscordant, condoms are often not used consistently (Buchacz et al., 2001). Thus, intimate relationships appear to exert a strong influence on condom use, even in marriages where partners are at high risk for HIV exposure.

However, the couples in which wives are placed at high indirect risk exposure to HIV appear to be marked by the feature of having a relatively high proportion of husbands with high levels of antisocial characteristics. Individuals with ASPD are typically distinguished by callousness, selfishness, and remorseless use of others. Perhaps not surprisingly, the presence of antisocial characteristics increased the likelihood of husbands engaging in risky needle practices and extramarital sexual relationships. In the context of a marital relationship, the presence of ASPD appears also to contribute to husbands putting their own sexual needs first, being more willing to disregard health concerns about themselves and their wives, and thereby placing their partners at risk. Thus, our data suggest that the presence of a husband who has high levels of antisocial characteristics in the context of a long-term, committed relationship represents a particularly dangerous combination when considering a wife's high risk indirect exposure to HIV.

Table 4
Parameter estimates from univariate hierarchical generalized linear models for assessment results as predictors discriminating between groups of wives with high versus low indirect HIV risk exposure

Characteristic	Risk group		*B* (*SE*)	*z*	*p*	OR
	High indirect	Low indirect				
N	108	36				
M (*SD*) couple DAS score	85.2 (18.3)	78.2 (20.4)	0.04 (0.02)	2.06	0.04	1.04
Partners' TLFB scores						
M (*SD*) husbands' PDA	30.3 (19.1)	35.7 (18.4)	−0.09 (0.04)	2.05	0.04	0.91
M (*SD*) wives' PDA	90.6 (12.2)	92.1 (11.8)	−0.05 (0.05)	1.04	0.29	0.95
M (*SD*) husbands' HIVRKT score	80.6 (5.5)	83.2 (4.9)	−0.02 (0.02)	1.16	0.25	0.99
M (*SD*) wives' HIVRKT score	83.9 (6.1)	84.2 (5.7)	−0.03 (0.02)	1.59	0.11	0.97
No. (%) husbands meeting DSM-IV criteria for ASPD	62 (57)	9 (25)	1.02 (0.44)	2.31	0.02	2.77
No. (%) of wives' aware of husbands' high risk behaviors	31 (29)	25 (69)	−2.01 (0.44)	4.56	0.01	0.13

DAS, Dyadic Adjustment Scale; TLFB, Timeline Followback Interview; HIVRKT, HIV Risk Knowledge Test; DSM-IV, Diagnostic and Statistical Manual for Mental Disorders (4th ed.). ASPD, Antisocial Personality Disorder. Wives classified in the high risk group were coded '1'; wives in the low risk groups were coded '0'. Race/ethnicity was coded '1' for minority group, '0' for white.

Table 5
Parameter estimates from multivariate hierarchical generalized linear model discriminating between groups of wives with high versus low indirect HIV risk exposure

Fixed effects	*B*	*SE*	*z*	*p*	OR
Sociodemographic					
Wives' age	−0.02	0.01	1.42	0.15	0.98
Husbands' substance use					
PDA	−0.01	0.01	1.16	0.14	0.99
Couple characteristics					
Years married	0.04	0.02	2.04	0.04	1.04
Couple DAS score	0.02	0.01	1.59	0.11	1.03
Wives' awareness of husbands' high risk exposure behaviors	−1.51	0.48	3.11	0.01	0.22
Diagnostic					
Diagnosis of ASPD for husbands	1.01	0.51	1.98	0.05	2.75
Knowledge of HIV risk					
Husbands' HIVRKT	−0.02	0.02	1.01	0.31	1.02
Wifes' HIVRKT	−0.01	0.02	0.68	0.49	1.03

OR, odds ratio; Partners' age, husbands' and wives' mean age; ASPD, Antisocial Personality Disorder; HIVRKT, scores on the HIV Risk Knowledge Test. Wives classified in the high risk group were coded '1'; wives in the low risk groups were coded '0'.

Wives who were aware of husbands' high risk behaviors were more likely to use condoms when having sexual intercourse with their spouses. Although risky needle practices were common among the husbands in the sample, it was quite often the case that wives were not aware of husbands' extramarital relationships, even in circumstances when they were aware of husbands' high risk drug use. In as much as partners traditionally hold monogamy as central to the survival of their marriages, men who were engaging in extramarital sexual encounters did not disclose this information to their spouses and were, to a certain extent, somewhat adept at hiding their infidelity from their wives.

The current public health recommendations to reduce the sexual transmission of HIV include dually focusing on promoting correct and consistent use of condoms and limiting one's number of sexual partners. Although as a general risk reduction strategy these recommendations are sound, each of these prevention strategies has important limitations when applied to women married to drug-abusing men. Restricting the number of sexual partners would reduce high risk direct exposure among the men in our sample; however, it was almost always the case that the wives did not have multiple sex partners. From the information we collected from our participants, the only risk factor for wives was sexual intercourse with their husbands; the problem was the wives tended to underestimate their level of risk because they assumed that their husbands engaged in safe needle practices, in monogamy, or in both.

Correct and consistent condom use certainly has the potential to be a highly effective means of HIV control, with the results of multiple studies concluding that male condoms are an effective means of reducing risk of HIV transmission (Cates and Stone, 1992). However, reliable condom use has been shown to be particularly difficult to achieve. Surveys have consistently revealed that women have great difficulty introducing and negotiating consistent and sustained condom use with their partners, particularly in the context of primary relationships (O'Leary and Wingood, 1999). Barriers to introducing condoms include women's reluctance to raise issues of trust and fidelity in the relationships and concerns about male partners' reactions to suggestions of condom use (O'Leary, 2000).

All of this begs the question, 'What might be some effective risk reduction strategies for married couples in which husbands abuse drugs?' Although we are only in the early stages of assessing the effectiveness of these interventions, our clinical experience and preliminary data suggest certain interventions can influence behavior change in these couples. As is done in our program, all married men entering treatment and their wives are assessed for the practice of high risk behaviors and regarding their general knowledge about the potential consequences of engaging in these behaviors. If patients report engaging in high risk behaviors, they are strongly encouraged to discuss these behaviors with their partners.

In the context of conjoint psychoeducational sessions for husbands and wives about HIV, a summary of the findings from this study is presented, indicating that many wives of substance-abusing partners are unaware of their husbands' high risk behaviors and are unknowingly placed at high risk for exposure to HIV. In our experience, we have found that sharing this information in the context of psychoeducational sessions has often served as an impetus for wives to discuss these issues with their husbands or for husbands to disclose their high risk behaviors. Because knowledge of HIV seros-

tatus is an important aspect of most HIV prevention and treatment programs (Coates and Collins, 2001), information is provided to partners about local testing programs and both partners are encouraged to get tested for HIV.

Additionally, partners are encouraged to participate in what we refer to as a 'negotiated safety contract' which, in many respects, is similar to safety agreements that have been described for use with gay men (Kippax, 2002). As part of this contract, both partners are asked to submit to HIV testing. If partners do not presently use condoms, they are encouraged to do so. However, if partners are unwilling or reluctant to do so, they are asked to agree to: (a) share with each other HIV-antibody status once testing is completed; (b) reach an unambiguous agreement for partners to use condoms in any sexual relationship outside the marriage; and (c) engage in safer needle practices if participating in IV drug use. We develop the negotiated safety contract in the context of our Behavioral Couples Therapy (BCT) treatment program for drug abuse (for a review, see O'Farrell and Fals-Stewart, 2000). Although many studies have found that women in long-term relationships often have difficulty negotiating safer sex practices, building this into our treatment program allows trained, master's-level BCT counselors to assist wives with this effort in the context of conjoint sessions.

As the first investigation of HIV risk and preventive factors among married drug-abusing men and their wives, this study had several important strengths. In particular, not only did we collect information about HIV risk and preventive behavior from both partners, we also asked spouses about their awareness of their partners' risk behaviors. Thus, we could compare reports of risk behaviors by one partner to his or her spouse's awareness of the occurrence of these same risk behaviors, allowing us to determine which partners were being placed at risk of HIV exposure knowingly and unknowingly. Although previous studies have explored risk and preventive behaviors among drug users involved in primary relationships, these investigations have typically collected this information from only one partner in the dyad (Sherman and Latkin, 2001). Obtaining reports from both partners, not only about their own behaviors but their perceptions of their spouses' high risk behaviors, was a unique aspect of the present study.

However, several important limitations of the study also should be highlighted. Although the general sample was comparatively large, it was reduced substantially when we isolated those couples that included husbands engaging in high risk behaviors. In turn, the analyses examining factors associated with wives being placed at high risk indirect exposure suffered from low power, a condition that precluded a adequate analyses of variable interactions. Because the study recruited men entering treatment for substance abuse, more assessment information was available for husbands than for wives. Consequently, although other studies have identified certain psychological characteristics as being related to wives' decreased likelihood of using condoms when engaging in sexual intercourse, such as levels of depression, self-esteem, and self-efficacy (O'Leary, 2000), this information was not available for the female spouses in the present study. We also recruited a particular type of drug-abusing couple, consisting of drug-abusing men and their nonsubstance-abusing spouses. It is likely that our findings would not generalize to other types of couples, such as couples in which only wives abuse drugs or those in which both partners use.

Another limitation of the study concerns the DACHRBI. Although this inventory solicits unique information from both partners about risk behaviors and their respective understanding of their spouses' behaviors, it is limited because it only allows respondents to endorse items as either occurring or not occurring. However, in reality, these behaviors occur on a continuum; as such, the measure is not very sensitive to the extent of risk and preventive behaviors. For example, partners who use condoms on nearly all occasions of sexual intercourse would be categorized the same as couples who never use condoms because the DACHRBI items query respondents as to whether condoms were used for all episodes of sexual intercourse in the last year.

In conclusion, over the last decade, HIV/AIDS research has shifted from focusing on individual risk factors to understanding risk behaviors in terms of social vulnerability (Klein et al., 2002). This perspective views risk behaviors as mediated by social and cultural contexts. Viewing risk and preventive behaviors in the context of a marital relationship provides an important vantage point from which to understand the dynamics of HIV exposure. Although some recommendations are provided to help promote risk reduction in these couples, clearly more research is needed to develop and assess the efficacy of such strategies with drug-abusing couples.

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Appendix A

Sample items from the Drug-Abusing Couples HIV Risk Behaviors Inventory (DACHRBI)

Appendix

Sample items from the Drug-Abusing Couples HIV Risk Behaviors Inventory (DACHRBI)

1. In this last 12 months, did **you** use needles or syringes that were "dirty"–that is, that someone else had used and were not sterilized or cleaned with bleach before you used them?.....____ (yes) ____ (no)
2. In the last 12 months, did **you** have vaginal or anal sex with someone other than your spouse without using a latex condom?.....____ (yes) _____ (no)
3. In this last 12 months, did **your spouse, to the best of your knowledge,** use needles or syringes that were "dirty"–that is, that someone else had used and were not sterilized or cleaned with bleach before he or she used them?.....____ (yes) ____ (no)
4. In the last 12 months, did **your spouse, to the best of your knowledge,** have vaginal or oral sex with someone other than you without using a latex condom?.....____ (yes) _____ (no)

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