Appendix A
Papers in Press & DEBI Criteria

1. Published Papers (5)
2. Logic Model
3. Comparison of EBAN I with DEBI Criteria

1. Published Papers (5)

1) NIMH Multisite Eban HIV/STD Prevention Intervention for African American HIV Serodiscordant Couples: A Cluster Randomized Trial

2) Risky Sexual Behavior and Correlates of STD Prevalence Among African American HIV Serodiscordant Couples

3) Prevalence of Child and Adult Sexual Abuse and Risk Taking Practices Among HIV Serodiscordant African-American Couples

4) The Contribution of Male and Female Partners' Substance Use to Sexual Risks and STDs Among African American HIV Serodiscordant Couples

5) Concordant and Discordant Reports on Shared Sexual Behaviorsand Condom Use Among African American Serodiscordant Couples in Four Cities

ONLINE FIRST

National Institute of Mental Health Multisite Eban HIV/STD Prevention Intervention for African American HIV Serodiscordant Couples

A Cluster Randomized Trial

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Background: Human immunodeficiency virus (HIV) has disproportionately affected African Americans. Couple-level interventions may be a promising intervention strategy.

Methods: To determine if a behavioral intervention can reduce HIV/sexually transmitted disease (STD) risk behaviors among African American HIV serodiscordant couples, a cluster randomized controlled trial (Eban) was conducted in Atlanta, Georgia; Los Angeles, California; New York, New York; and Philadelphia, Pennsylvania; with African American HIV serodiscordant heterosexual couples who were eligible if both partners were at least 18 years old and reported unprotected intercourse in the previous 90 days and awareness of each other's serostatus. One thousand seventy participants were enrolled (mean age, 43 years; 40% of male participants were HIV positive). Couples were randomized to 1 of 2 interventions: couple-focused Eban HIV/STD risk-reduction intervention or attention-matched individual-focused health promotion comparison. The primary outcomes were the proportion of condom-protected intercourse acts and cumulative incidence of STDs (chlamydia, gonorrhea, or trichomonas). Data were collected preintervention and postintervention, and at 6- and 12-month follow-ups.

Results: Data were analyzed for 535 randomized couples: 260 in the intervention group and 275 in the comparison group; 81.9% were retained at the 12-month follow-up. Generalized estimating equation analyses revealed that the proportion of condom-protected intercourse acts was larger among couples in the intervention group (0.77) than in the comparison group (0.47; risk ratio, 1.24; 95% confidence interval [CI], 1.09 to 1.41; $P=.006$) when adjusted for the baseline criterion measure. The adjusted percentage of couples using condoms consistently was higher in the intervention group (63%) than in the comparison group (48%; risk ratio, 1.45; 95% CI, 1.24 to 1.70; $P<.001$). The adjusted mean number of (log)unprotected intercourse acts was lower in the intervention group than in the comparison group (mean difference, –1.52; 95% CI, –2.07 to –0.98; $P<.001$). The cumulative STD incidence over the 12-month follow-up did not differ between couples in the intervention and comparison groups. The overall HIV seroconversion at the 12-month follow-up was 5 (2 in the intervention group, 3 in the comparison group) of 535 individuals, which translates to 935 per 100 000 population.

Conclusion: To our knowledge, this is the first randomized controlled intervention trial to report significant reductions in HIV/STD risk behaviors among African American HIV serodiscordant couples.

Trial Registration: clinicaltrials.gov Identifier: NCT00644163

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Group Information: A list of members of the NIMH Multisite HIV/STD Prevention Trial for African American Couples Group was published in *J Acquir Immune Defic Syndr*. 2008;49(suppl 1):S3-S14. Group members are listed on page 1600.

THE HUMAN IMMUNODEFICIENCY virus (HIV)/AIDS epidemic continues to have a severe impact on African Americans living in urban areas of the United States.[1] Although African Americans represented only 12% of the US population in 2006, 45% of new HIV infections occurred among African Americans.[1] Rates of new infections were 7 times higher among African Americans than among white individuals.[2] Heterosexual exposure was the most common HIV transmission category for African American women and the second most common category for African American men.

Studies have documented low condom use among African Americans with steady partners.[3-5] This low prevalence of condom use among couples and high rate of heterosexual transmission suggest a need for couple-based HIV/sexually transmitted disease (STD) prevention interventions for African Americans. Several studies found that couple-based HIV counseling and testing increased condom use[6-8] and reduced HIV/

Table 1. Random Allocation to HIV/STD Risk Reduction (RR) and Health Promotion (HP) Interventions, Overall and by Clinical Site

Site	Total Participants, No. (%)	Total No. of Cohort Groups (%)	Total No. of Couples (RR-HP)	HIV-Positive Partner, No. (%)	
				Male	Female
All sites	1070 (100)	110 (147)	535 (260-275)	212 (40)	323 (60)
Columbia University, New York, New York	442 (41.31)	40 (58)	221 (104-117)	79 (36)	142 (64)
Emory University, Atlanta, Georgia	234 (21.87)	27 (33)	117 (57-60)	49 (42)	68 (58)
University of California, Los Angeles	200 (18.69)	24 (30)	100 (52-48)	42 (42)	58 (58)
University of Pennsylvania, Philadelphia	194 (18.13)	19 (26)	97 (47-50)	42 (43)	55 (57)

Abbreviation: HIV, human immunodeficiency virus.

STD transmission in international settings[9-17] among heterosexual couples, including HIV serodiscordant heterosexual couples.[7,8,12] Although these studies had encouraging findings, they had 1 or more methodologic limitations, including small samples and a lack of an attention-control group, a randomized control design, assessment of both biological and behavioral outcomes, generalizability across geographic areas, and culturally congruent values and beliefs, which can enhance interventions' efficacy.

A meta-analysis[18] found that most HIV prevention interventions were less effective for African Americans, highlighting the need for culturally congruent approaches. A few recent randomized controlled trials (RCTs) demonstrated the efficacy of culturally congruent, individual- or group-based HIV prevention interventions for African Americans in increasing condom use and reducing unprotected intercourse and STD rates.[19-21] These studies identified several effective components of culturally congruent HIV prevention interventions with African Americans,[22] including emphasizing African American familial norms of cooperation and unity, using African American facilitators to communicate reality-based and credible information,[23,24] and using Afrocentric videos, songs, and poetry to inspire African Americans to protect themselves.[24]

We report an RCT focusing exclusively on African American HIV serodiscordant heterosexual couples. Building on HIV prevention research with couples[4,5,25] and high-risk African Americans,[20,21,26,27] a culturally congruent couple-focused HIV/STD risk-reduction intervention was designed. In a cluster RCT, African American HIV serodiscordant couples in 4 cities (Atlanta, Georgia; Los Angeles, California; New York, New York; and Philadelphia, Pennsylvania) were allocated to 1 of 2 interventions, the Eban HIV/STD risk reduction or the health promotion comparison (**Table 1**). We hypothesized that couples in the Eban HIV/STD risk-reduction intervention group would report a higher proportion of condom-protected intercourse acts, more consistent condom use, and fewer unprotected intercourse acts, and would be less likely to test positive for an STD (ie, chlamydia, gonorrhea, or trichomonas) over the 12-month follow-up period compared with those in the comparison intervention group. Characteristics of the participants are presented in **Table 2**.

METHODS

Couples were enrolled at 4 sites, using a common recruitment protocol, from November 2003 through June 2007. The appropriate institutional review boards at each site approved the trial, and an independent National Institutes of Health–appointed data safety and monitoring board (DSMB) monitored it. Couples were eligible to participate if (1) each partner was at least 18 years old; (2) their relationship had existed for at least 6 months; (3) each partner intended to remain together for at least 12 months; (4) at least 1 partner reported having unprotected intercourse with the other in the previous 90 days; (5) each partner did not plan to relocate beyond a reasonable distance from the study site; (6) at least 1 partner self-identified as African American or black; (7) at least 1 partner reported that the couple was not planning a pregnancy within 18 months; (8) each partner was aware of the other's HIV serostatus; and (9) only 1 was HIV seropositive and had known that status for at least 3 months. To confirm the couples' HIV serodiscordant status, we collected from both partners an oral specimen using OraSure test procedures (OraSure Technologies Inc, Bethlehem, Pennsylvania). Following an initial screening with an enzyme-linked immunosorbent assay, reactive specimens were confirmed using a Western blot assay. Using these same procedures, HIV-negative partners were tested for HIV at 12-month follow-up to determine the HIV seroconversion rate.

Couples were excluded if either partner (1) did not have a mailing address; (2) evidenced clinically significant psychiatric, physical, or neurological impairment that would limit effective participation as confirmed on a Mini-Mental State Examination; (3) reported victimization by severe violence perpetrated by the other in the past year, as assessed by the severe physical and sexual intimate partner violence subscales of the Revised Conflict Tactics Scale; (4) was unwilling or unable to commit to completing the study; or (5) was not fluent in English as determined by the consent process. Couples were also excluded if they had participated in a couple-based HIV/STD risk-reduction intervention in the past year.

To meet the sample size requirements and ensure a representative sample, we recruited participants from several sources, including HIV care clinics, AIDS service organizations, community-based organizations, targeted street outreach, word-of-mouth, and the media, including radio, magazine, and newspaper advertisements. Recruiters informed potential participants about the study, obtained consent to be screened, and screened them for eligibility. People who seemed to be eligible were asked to invite their main sexual partner to participate. A letter to their partner that introduced the study was given to potential participants or mailed to their partner if the potential participants gave permission. Partners interested in participating were screened. If eligible, the recruiter scheduled the couple for baseline data collection. To permit comparisons between participants and eligible nonparticipants, the recruiter collected sociodemographic information and reasons for declining participation. Each participant was compensated.

Table 2. Selected Characteristics at Baseline: All Randomized Participants and by Intervention Arm[a]

Characteristic	RR Group (n=520)	HP Group (n=550)	Overall (n=1070)
Age, mean (SD), y	43.25 (8.17)	43.49 (8.16)	43.41 (8.08)
Education, No. (%)			
<HS graduate	162 (31.52)	164 (29.87)	326 (30.67)
HS graduate/GED	209 (40.66)	228 (41.53)	437 (41.11)
Some college	143 (27.82)	157 (28.60)	300 (28.22)
Employed	144 (28.07)	158 (28.83)	302 (28.46)
Monthly income, No. (%), $			
<400	156 (30.41)	151 (27.61)	307 (28.96)
400-850	202 (39.38)	244 (44.61)	446 (42.08)
851-1650	106 (20.66)	99 (18.10)	205 (19.34)
>1651	49 (9.55)	53 (9.69)	102 (9.62)
Insured, No. (%)	377 (73.35)	423 (77.33)	800 (75.40)
Years lived in United States, mean (SD)	41.91 (10.34)	42.63 (9.45)	42.29 (9.89)
Living arrangement, No. (%)			
Live in own home/own apartment	430 (83.66)	468 (85.25)	898 (84.48)
Live with nonrelative	22 (4.28)	27 (4.92)	49 (4.61)
Rooming/welfare resident	60 (11.67)	51 (9.29)	111 (10.44)
Homeless	2 (0.39)	3 (0.55)	5 (0.47)
Living with study partner	368 (71.88)	438 (79.78)	806 (75.97)
Time with study partner, mean (SD), y	6.72 (7.31)	7.45 (7.40)	6.91 (6.56)
Married to study partner	168 (32.68)	177 (32.30)	345 (32.49)
Previously incarcerated	311 (60.86)	350 (64.10)	661 (62.54)
Alcohol dependence (CAGE questionnaire)	80 (15.59)	91 (16.58)	171 (16.10)
Drug dependence (TCUDS)	82 (15.98)	100 (18.35)	182 (17.20)
Outcomes			
Proportion condom-protected sex, mean (SD)	0.44 (0.43)	0.44 (0.43)	0.44 (0.43)
Unprotected sex, mean (SD)	16.36 (28.93)	14.83 (32.30)	15.57 (30.71)
Consistent condom use, No. (%)	111 (22.52)	122 (23.28)	233 (22.91)
Concurrent partner, No. (%)	98 (19.14)	98 (18.01)	196 (18.56)
Any STD, No. (%)	79 (15.25)	69 (12.64)	148 (13.91)
HIV-positive participants only			
Female, No. (%)	158 (60.77)	165 (60.00)	323 (60.37)
Length of HIV diagnosis, mean (SD), mo	9.62 (6.66)	9.83 (7.84)	9.73 (7.29)
CD4 lymphocyte count, mean (SD), cells/μL	543.78 (325.42)	510.74 (344.14)	526.75 (335.14)
Don't know, No. (%)	76 (29.23)	87 (31.64)	163 (31.47)
Viral load, No. (%), copies/mL			
0-50	61 (25.00)	70 (25.93)	131 (25.49)
>50	76 (31.15)	73 (27.04)	149 (28.99)
Don't know	107 (43.85)	127 (47.04)	234 (45.53)

Abbreviations: GED, General Educational Development test; HIV, human immunodeficiency virus; HP, health promotion; HS, high school; RR, risk reduction; STD, sexually transmitted disease; TCUDS, Texas Christian University Drug Screen.

SI conversion factor: To convert lymphocytes to cells $\times 10^9$ L, multiply by 0.001.

[a]Percentages do not sum to total because of missing data.

Using a modified block randomization algorithm,[28] we randomized groups of 3 to 5 couples to 1 of 2 interventions: couple-focused Eban HIV/STD risk reduction or individual-focused health promotion comparison. The sex of the HIV-positive partner was used as a blocking factor to ensure that couples with HIV-positive women were equally balanced across intervention arms. Randomized intervention assignments, generated and maintained by one of us (S.L.B, codirector of the Data Coordinating Center) were sent in sealed, confidential envelopes directly to the project director at each site, who executed the assignments.

The Eban HIV/STD risk-reduction intervention, described in detail elsewhere,[29] incorporates *Eban*, a traditional African concept meaning "fence," a symbol of safety, security, and love within one's family and relationship space. It was developed drawing on components from a previous couple-based HIV prevention intervention[6,25] and group-based HIV prevention interventions[14,21] that were found to be efficacious. It integrated components of social cognitive theory, historical and cultural beliefs about family and community preservation, and an Afrocentric paradigm into a relationship-oriented ecological framework, described elsewhere.[30] The focus was on multilevel risk and protective factors associated with HIV/STD risk reduction among African American HIV serodiscordant couples. (eAppendix, http://www.archinternmed.com).

Eban consisted of 8 weekly structured 2-hour sessions delivered by male and female African American cofacilitators who had at least a bachelor's degree and 2 years of clinical experience in HIV prevention or related fields. They received 40 hours of centralized facilitator training. The intervention included 4 sessions with individual couples and 4 with groups of couples. In the first half of session 1, a group of couples met with their cofacilitators; in the second half, participants met in single-sex groups with the same-sex facilitator. In sessions 2, 3, 4, and 8, each couple met separately with their cofacilitators. In sessions 5 to 7, group sessions were held.

Skills taught in individual couple sessions were reinforced in group sessions. Individual couple sessions were designed to address interpersonal factors associated with sexual risk reduction, including communication, problem solving, monogamy, and negotiation skills. Group sessions were designed

to address community-level factors, including (1) increasing positive peer norms for condom use by emphasizing the threat of HIV to African American communities; (2) reducing the stigma associated with being African American couples affected by HIV; and (3) increasing social support for HIV risk reduction. The principles of *Nguzu Saba* (ie, unity, self-determination, collective work and responsibility, purpose, creativity, cooperative economics) were woven into the theme and content of the sessions and used to motivate couples to use condoms consistently to protect each other and their community.

The health promotion comparison intervention, described elsewhere,[31] was designed to control for Hawthorne effects, to reduce the likelihood that effects of the Eban HIV/STD risk-reduction intervention could be attributed to nonspecific features, including group interaction and special attention. Guided by social cognitive theory, this intervention was structurally similar to the Eban HIV/STD risk-reduction intervention, containing the same number, type, duration, and sequencing of sessions implemented by African American male and female cofacilitators. It focused not on risk of STD, but on behaviors linked to risk of heart disease, hypertension, stroke, and certain cancers. It was designed to increase fruit and vegetable consumption, physical activity, and medical adherence, including HIV medication adherence. Unlike the Eban HIV/STD risk-reduction intervention, it focused on the participants as individuals, not as couples.

To ensure the fidelity of implementation for both interventions, as described elsewhere,[29,31] facilitators used structured manuals with detailed implementation protocols, completed fidelity assessment forms after each session, met weekly with supervisors, and received reviews of audio-taped sessions and feedback from their supervisor. An independent quality assurance monitor also rated the fidelity of a random sample of 10% of sessions from each intervention.

Self-reported sexual behavior and biological specimens for STD assessments were collected independently from each partner at baseline, immediately postintervention, and 6 and 12 months postintervention. Facilitators were not involved in the data collection, and data collectors were blind to participants' intervention. Individual-level responses were combined to form couple-level outcomes. Audio computer-assisted self-interviewing (ACASI) was used to collect self-reported sexual behaviors, including number of condom-protected vaginal and anal intercourse acts, number of unprotected vaginal or anal intercourse acts, and consistent condom use with study partner and incidence of concurrent partners in the past 90 days at baseline and follow-ups, and in the past 60 days at immediate postintervention. The timeline follow-back method was used to enhance recall of sexual behaviors.[32]

The primary behavioral outcome was the couple's reported proportion of condom-protected intercourse acts in the past 90 days, calculated as a weighted average of the partners' responses. The denominator was the sum of vaginal and anal intercourse acts in the past 90 days reported by each partner (ie, 4 items); the numerator was the sum of male condom– and female condom–protected vaginal and anal intercourse acts in the past 90 days reported by each partner (ie, 8 items).

Consistent condom use, defined as condom use during every vaginal and anal intercourse act, was constructed by dichotomizing the proportion of condom-protected intercourse into 2 categories at unity. Specifically, couples in which both partners independently reported 100% condom use were considered consistent condom users, and all others were considered inconsistent condom users.

The total number of unprotected vaginal and anal intercourse acts was first constructed for each partner by subtracting the sum of the male condom– and female condom–protected vaginal and anal intercourse acts from the total number of intercourse acts with study partners in the past 90 days. Individuals reporting no sexual activity in the past 90 days were assigned a value equal to zero for this outcome. Couple-level outcomes were then constructed by averaging the partners' responses. Consistency of male and female partners' reports for each of the shared behaviors was relatively high.[33] The Spearman correlation coefficient ranged from 0.42 to 0.65 ($P < .001$).

Concurrent partnerships were defined by individuals' reports of intercourse with someone other than their study partner in the past 90 days. Couples were defined as having concurrent partners if at least 1 partner reported having a concurrent partner.

The couple-level cumulative incidence of STD was the primary biological outcome. We first constructed incidence measures for each partner at each postintervention visit. Women provided 2 self-collected vaginal swab specimens and men provided a urine specimen after completing the ACASI. Specimens were delivered to the Emory University pathology laboratory and assayed for *Chlamydia trachomatis* and *Neisseria gonorrhoeae* using the Becton Dickinson Probe ET Amplified DNA Assay (Becton, Dickinson and Co, Sparks, Maryland) and for *Trichomonas vaginalis* using a noncommercial real-time polymerase chain reaction assay.[34] Participants with positive STD test results received directly observable single-dose antimicrobial treatment and risk-reduction counseling per Centers for Disease Control and Prevention recommendations. If a participant tested positive for an STD at baseline, the couple was treated within 7 to 14 days postbaseline; thus, both the participant and his or her partner were treated for the STD before collection of postintervention specimens. Participants were considered an incident STD case if at any of the 3 postintervention assessments they tested positive for any of the 3 STDs. Couples were incident cases if either partner was an incident case.

Participants also completed measures of sociodemographic and relationship characteristics, including age, education, marital status, employment status, income, type of health insurance, incarceration history, length of relationship, quality of relationship, and cohabitation with the study partner. Partners who were HIV positive reported their length of diagnosis, CD4 lymphocyte count, and viral load. The CAGE questionnaire[35] was used to assess lifetime alcohol dependence and the Texas Christian University Drug Screen (TCUDS)[36] to identify individuals with a history of heavy drug use and dependence. Alcohol and drug problems were denoted by CAGE scores ($\alpha = 0.73$) greater than or equal to 2 and TCUDS scores ($\alpha = 0.89$) greater than or equal to 3, respectively.

This study was originally powered to detect an 8-percentage-point difference in STD incidence between the HIV/STD risk-reduction and health promotion interventions. Power was computed for a 2-sided, $\alpha = .05$ level test, assuming a binomial model with the couple as the unit of analysis, controlling for the intraclass correlation coefficient (ICC) among responses of the 3 to 5 couples per group. Assuming 20% incidence in the health promotion group, compared with a 12% incidence in the Eban HIV/STD risk-reduction intervention group, it was determined that a sample of 800 couples (400 per arm) would yield a statistical power of 81%, accounting for an attrition rate of 20% at 12 months and an ICC of 0.01. On the basis of an interim analysis presented to the DSMB, a reduced target sample size was selected that would yield an estimated 80% power to detect the specified effect size for the primary behavioral end point. Site principal investigators, the National Institute of Mental Health (NIMH) staff collaborator, and site staff were blinded to the results of the interim analysis. Sample size calculations using the observed effect size for the biological end point suggested that even with 800 couples we would still have much lower power than originally anticipated. Considering time and funding constraints, the DSMB advised continuation of the final recruitment phase targeting the reduced sample size.

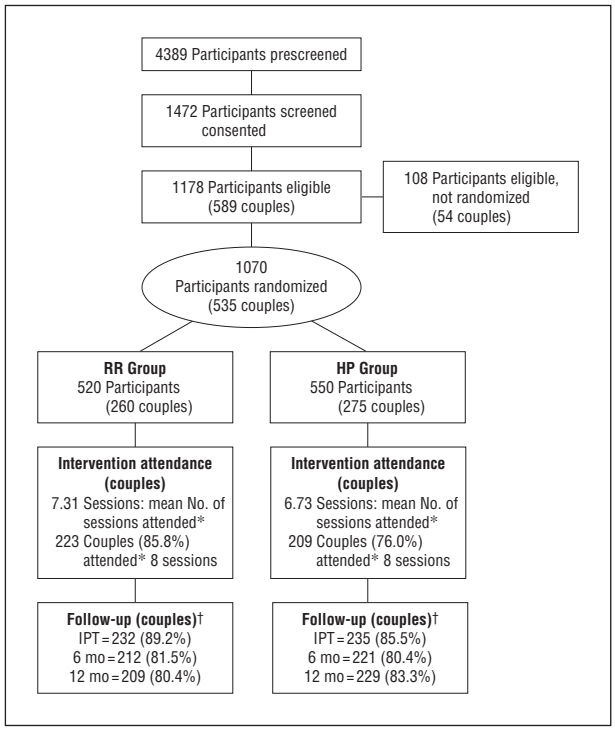

Figure. Eban participant couple CONSORT diagram. HP indicates health promotion; IPT, immediate posttest; RR, risk reduction. *Attendance (full, partial, or make-up session completed by both partners of each couple). †Participants lost to follow-up: 18 in the RR group (7 deaths, 6 incarcerations, 2 no longer interested in participation, and 3 for other reasons) and 17 in the HP group (5 deaths, 5 incarcerations, 2 no longer interested, and 5 for other reasons).

The primary analyses used standard intent-to-treat methods in which all available data on all randomized participants were included. To assess intervention effects, generalized estimating equation models were constructed, controlling for the correlations among repeated measures for couples over time and among responses of couples treated together as a group. Models for behavioral outcomes were adjusted for baseline response. Models for STD incidence were adjusted for baseline STD status, sex of the HIV-positive partner, and length of HIV diagnosis. We report unadjusted and adjusted data for baseline responses, estimated risk ratios for binary outcomes, and estimated mean differences for continuous outcomes at the immediate postintervention assessment, at 6-month and 12-month assessments, and over the postintervention period as a whole, corresponding 95% confidence intervals (CIs), and significance probabilities.

RESULTS

The **Figure** presents the flow of participants in the trial. Of the 589 couples that were eligible, 535 (90.8%) were randomized and included in primary analyses. A total of 72 groups with 260 couples were allocated to the Eban HIV/STD risk-reduction intervention; 75 groups with 275 couples were allocated to the health promotion intervention. The HIV-positive partner was female in most of the couples, and the percentage of couples with seropositive female participants was comparable at the 4 sites, ranging from 57% to 64%. Attendance at the sessions of both interventions was very high. On average, couples in the Eban HIV/STD risk-reduction intervention attended 7.31 (SD, 1.88), or 91.4% of the sessions, and couples in the health promotion intervention attended 6.73 (SD, 2.49), or 84.1% of the sessions ($P = .003$). The retention rate at immediate postintervention and 6- and 12-month postintervention assessments was 87.3% (467 couples), 80.9% (433 couples), and 81.9% (432 couples), respectively, and did not differ significantly between arms.

Table 3 presents the descriptive statistics for outcomes by intervention condition and time. **Table 4** presents effect size estimates and significance tests for the intervention effect at each postintervention assessment and over the postintervention period. In the unadjusted analyses, over the postintervention period, and at the immediate postintervention and 6- and 12-month assessments, the proportion of condom-protected acts of intercourse and the percentage reporting consistent condom use were greater and the number of unprotected intercourse acts was smaller among couples in the Eban HIV/STD risk-reduction intervention group than among couples in the health promotion intervention group. The adjusted analyses revealed similar results, with 1 exception. Couples in the Eban HIV/STD risk-reduction intervention group reported a similar proportion of condom-protected sex compared with couples in the health promotion intervention group at the 12-month assessment. There were no significant differences in incidence of concurrent partners between the 2 interventions in either analysis (unadjusted $P = .81$; adjusted $P = .95$).

In the unadjusted analyses and adjusted analyses, the cumulative STD incidence did not significantly differ in the Eban HIV/STD risk-reduction intervention group compared with the health promotion intervention group over the postintervention period (risk ratio, 0.98; 95% CI, 0.62-1.56; $P = .93$) or at any postintervention assessment ($P > .35$).

The overall HIV seroconversion at 12-month follow-up was 5 (2 in the risk-reduction intervention group, 3 in the health promotion group) of 535 individuals, which translates to 935 per 100 000 population.

COMMENT

This trial demonstrated that a theory-based culturally congruent intervention can reduce self-reported sexual risk behavior among African American HIV serodiscordant couples. The intervention had significant effects, averaged over the 1-year follow-up period, on the primary behavioral outcome, the proportion of condom-protected sex, and the percentage of couples practicing consistent condom use, and the number of unprotected sex acts in which couples engaged. The overall magnitude and consistency of findings across the sexual behavior outcomes strengthen confidence in the intervention's efficacy.

Public health scientists have urged a shift beyond individual-level HIV interventions to prevention strategies that have an impact on social structures and context to curb the epidemic among African Americans.[37,38] The intervention used here, in structure and content, was relationship based and redirected the focus to changing the relationship factors that influence sexual decision making and increasing the likelihood that risk reduction will be stable over time. Individual, couple, and group for-

Table 3. Summary of Sexual Behavior Outcomes at Baseline, Immediate Postintervention Test (IPT), and 6- and 12-Month Follow-ups

Outcome	Baseline	Follow-up		
		IPT	6 mo	12 mo
Proportion of condom-protected sex, mean (SD)				
HIV/STD RR group	0.44 (0.38)	0.82 (0.28)	0.75 (0.36)	0.72 (0.38)
HP group	0.44 (0.40)	0.55 (0.43)	0.56 (0.43)	0.56 (0.43)
Consistent (100%) condom use, No. (%)				
HIV/STD RR group	29 (11.15)	110 (42.31)	94 (36.15)	95 (36.54)
HP group	38 (13.82)	75 (27.27)	72 (26.18)	73 (26.55)
Unprotected sex, mean (SD)				
HIV/STD RR group	16.38 (23.66)	2.80 (6.82)	5.05 (20.75)	5.92 (20.10)
HP group	14.82 (25.24)	8.52 (24.59)	8.03 (17.42)	7.25 (15.22)
Concurrent partners, No. (%)				
HIV/STD RR group	49 (18.85)	39 (15.00)	48 (18.46)	67 (25.77)
HP group	49 (17.82)	42 (15.27)	47 (17.09)	64 (23.27)

Abbreviations: HIV/STD, human immunodeficiency virus/sexually transmitted disease; HP, health promotion; RR, risk reduction.

Table 4. Longitudinal Analysis of HIV/STD Risk Behaviors, Adjusting for Clustering Within Randomized Group (Unadjusted and Adjusted for Baseline Response)[a]

Treatment Effects	Proportion of Condom-Protected Sex		Consistent (100%) Condom Use		(log)Unprotected Sex		Concurrent Partners	
	RR (95% CI)[b]	*P* Value	RR (95% CI)[b]	*P* Value	Difference (95% CI)[c]	*P* Value	RR (95% CI)[b]	*P* Value
Unadjusted for Baseline Response								
Baseline	0.98 (0.77 to 1.24)	.84	0.81 (0.52 to 1.27)	.36	0.35 (–0.21 to 0.90)	.22	1.06 (0.74 to 1.52)	.74
Over entire FU	1.36 (1.16 to 1.59)	<.001	1.23 (1.02 to 1.50)	.03	–0.93 (–1.46 to –0.41)	<.001	1.04 (0.80 to 1.34)	.81
IPT	1.89 (1.49 to 2.40)	<.001	1.47 (1.17 to 1.85)	.003	–1.44 (–2.18 to –0.70)	<.001	0.95 (0.64 to 1.42)	.81
6 mo	1.37 (1.10 to 1.72)	.008	1.44 (1.13 to 1.83)	.006	–1.65 (–2.41 to –0.90)	<.001	1.05 (0.73 to 1.49)	.81
12 mo	1.34 (1.04 to 1.72)	.02	1.35 (1.07 to 1.71)	.02	–0.99 (–1.76 to –0.22)	.01	1.09 (0.82 to 1.46)	.81
ICC	0.48		0.31		0.42		0.42	
Adjusted for Baseline Response								
Over entire FU	1.24 (1.09 to 1.41)	.006	1.45 (1.24 to 1.70)	<.001	–1.52 (–2.07 to –0.98)	<.001	1.01 (0.81 to 1.25)	.95
IPT	1.49 (1.13 to 1.95)	.009	1.39 (1.13 to 1.71)	.002	–1.63 (–2.30 to –0.95)	<.001	1.06 (0.76 to 1.49)	.95
6 mo	1.22 (1.05 to 1.41)	.01	1.57 (1.27 to 1.94)	<.001	–1.79 (–2.50 to –1.08)	<.001	0.96 (0.71 to 1.29)	.95
12 mo	1.05 (0.85 to 1.30)	.64	1.40 (1.13 to 1.75)	.003	–1.15 (–1.88 to –0.42)	.002	1.01 (0.78 to 1.30)	.95
ICC	0.34		0.37		0.41		0.31	

Abbreviations: CI, confidence interval; ICC, estimated intraclass correlation coefficient from exchangeable working correlation matrix; FU, follow-up; HIV/STD, human immunodeficiency virus/sexually transmitted disease; IPT, immediate posttest; RR, risk ratio.

[a] All *P* values were adjusted.

[b] Empirical RR (risk reduction vs health promotion) estimates examining treatment effects for behavioral outcomes of interest with "independence" working correlation specified.

[c] Difference (risk reduction minus health promotion) estimates examining treatment effects for behavioral outcomes of interest with "independence" working correlation specified.

mats were used to maximize discussions of relationships and communication about risk reduction. Male and female cofacilitators led the intervention and modeled the communication and transparency needed when 2 individuals need to share responsibility for safer sex practices along with relationship maintenance. Cultural congruence was achieved by integrating concepts of *Nguzu Saba*[39] into each session. The findings strengthen the accumulating evidence on the efficacy of couple-based HIV/STD prevention strategies[5,15,25] and expand the repertoire of efficacious interventions for couples.

In contrast to the significant effects on the primary and secondary sexual behavior outcomes, the intervention did not influence the incidence of STDs. This may have occurred because the intervention did not affect concurrency. Recall that if a participant tested positive for an STD, both partners were treated. Thus, participants had to have unprotected intercourse with a concurrent partner who had an STD to contract an STD after the intervention. The Eban HIV/STD risk-reduction intervention did not reduce rates of concurrency. Future research should examine strategies to reduce concurrent partnerships in HIV serodiscordant couples.

To our knowledge, this is the first study designed for African American HIV serodiscordant couples to publish HIV seroconversion rates. The observed HIV seroconversion rate, 935 per 100 000, was substantially larger than the annual HIV incidence estimate overall for African Americans[2] of 83.8 per 100 000. Thus, HIV-negative African Americans in HIV serodiscordant rela-

tionships, even relatively stable relationships, are at substantially high risk for HIV acquisition.

This study has a number of strengths. It used a randomized controlled design and a dose and modality equivalent comparison group, controlling for group interaction and special attention. Sampling couples in 4 geographical areas of the United States increased generalizability. The study also had limitations. The sample may not be representative of all African American HIV serodiscordant couples. The participating couples knew they were in an HIV serodiscordant relationship, whereas many people in such relationships do not realize it. The findings may not generalize to such people. The primary behavioral outcome was measured with self-reports, which can be influenced by socially desirable responding. However, the use of ACASI, testing participants for STDs, and collection of data on shared behaviors from partners may have mitigated potential problems with self-report validity.

In conclusion, to our knowledge, this is the first study to demonstrate the efficacy of an HIV/STD intervention in reducing sexual risk behavior among African American HIV serodiscordant couples. It shows that couples at high risk of transmitting HIV can be recruited for such interventions, are willing to attend multiple intervention sessions, and can be retained for follow-up efficacy assessments. The findings draw attention to an effective intervention strategy that may be scaled up to curb the magnitude and continued spread of HIV and other STDs. Future studies must explore the generalizability of the findings to couples irrespective of serostatus and in settings where individuals and couples are not aware of their risks for HIV transmission[2,40,41] but whose relationships can be supported as they learn to minimize risks for themselves and each other. Moreover, the approach of engaging couples should be tested elsewhere in the United States and in other parts of the world, including sub-Saharan Africa, where sex-based power imbalances make it especially difficult for women in couples to reduce their risk of heterosexual exposure to HIV and other STDs.

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Online-Only Material: An eAppendix is available at http://www.archinternmed.com.

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Correction

Omission of Final Page Number of Article Citation. In the Original Investigation titled "An Intensive Behavioral Weight Loss Intervention and Hot Flushes in Women" by Huang et al, published in the July 12 issue of the *Archives* (2010;170[13]:1161-1167), an error occurred in the citation of the final page number of the article, located at the end of the Abstract section. On page 1161, the full citation should have read "*Arch Intern Med*. 2010;170(13):1161-1167."

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ORIGINAL PAPER

Risky Sexual Behavior and Correlates of STD Prevalence Among African American HIV Serodiscordant Couples

The NIMH Multisite HIV/STD Prevention Trial for African American Couples Group

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Abstract This paper reports baseline behavioral and biological data collected from a cohort of 535 African American HIV serodiscordant couples enrolled in the Eban study across four urban metro areas. Data were collected on (1) the prevalence of risky sexual behaviors that occur within a couple and with concurrent sexual partners, (2) the STD prevalence for each member of the couple and (3) the correlates of STDs in the male partner as well as in the female partner. Presentation of the sociodemographic characterization and HIV risk behavior profiles of African American HIV serodiscordant couples represents an important initial description of a hidden, vulnerable population. Future research should be conducted with diverse samples of African American couples (i.e., younger couples, non-stable couples) to explore other potential correlates of STD prevalence.

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Keywords HIV · Serodiscordant · African-American couples

Introduction

Although the HIV/AIDS epidemic in the African American community continues to be a public health crisis, perhaps one subgroup that deserves special attention is African American HIV serodiscordant couples. In the US, HIV transmission risk reduction efforts for this population have been minimal. Although data indicate that condoms reduce the annual HIV transmission among HIV serodiscordant couples by 95% when used consistently [1], studies report 20–25% of serodiscordant couples engage in unprotected intercourse [2, 3]. Research also indicates that overall rates of unprotected intercourse are greater with regular partners than with non-regular partners. The rationale for these practices is unclear, but one study conducted by Wyatt et al. [4], with African American and Caucasian HIV serodiscordant couples reported that couples in this study perceived being at a low risk for HIV transmission and avoided discussing safer sex so as not to remind the infected partner of their HIV status [5]. The findings from these studies suggest significant risks for transmission of HIV in HIV serodiscordant couples. Furthermore, HIV acquisition and transmission in serodiscordant couples may be facilitated by sexually transmitted infections [6]. While several articles have examined the prevalence of STDs in HIV-infected women [7, 8] and men who have sex with men [9, 10], the prevalence of STDs and sexual risk behaviors is incompletely characterized among African American HIV serodiscordant couples. The present manuscript aims to address this gap by describing: (1) the prevalence of risky sexual behaviors that occur within a couple and that occur with concurrent sexual partners, (2) the STD prevalence for each member of the couple and (3) the correlates of STDs in the male partner as well as in the female partner. The provision of couples-based data, the opportunity to examine sexual behaviors from both the male and female partners' perspective is a unique scientific contribution of this manuscript.

Methods

Study Recruitment

A total of 4,389 individuals were pre-screened for possible inclusion into the study. The following are the top five reasons individuals were ineligible: 1,006 (23%) reported no incidents of unprotected intercourse in the past 90 days; 623 (14%) were sero-concordant couples; 543 (12%) could not be contacted for further screening; 328 (8%) did not have a partner; and 296 (7%) reported violence in their

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relationship in the past year. Of the 4,389 that were pre-screened, 1,472 individuals were further screened and provided consent for study participation, and 93% (1,374) met the study eligibility criteria. Baseline ACASI data, including demographic characteristics, were collected for 1,178 participants (85% of all eligible individuals); 1,070 (78% of those who were eligible) of these participants were subsequently randomized and 108 were not.

Study Design

The Eban study is a two-arm, couples-based randomized controlled trial of high-risk HIV serodiscordant African American couples currently underway in four cities in the US. The present article examines the baseline behavioral and biological data collected from this cohort of eligible couples. Study enrollment opened in November 2003 and closed in June 2007. Participants were 535 couples enrolled across four urban metro areas, where high-risk serodiscordant African American couples could be recruited (Atlanta = 117 couples; Los Angeles = 100 couples; New York = 221 couples; Philadelphia = 97 couples). Bellamy [11] contains a complete description of the randomization procedure implemented in this trial.

Data Collection

At baseline, data were obtained from three sources. First, participants completed a 90-min Audio Computer-Assisted Survey Interview (ACASI), which assessed sociodemographic characteristics, HIV/STD-associated sexual behaviors, and psychosocial mediators that had sound psychometric properties and had previously been implemented with adult African American populations. Although both male and female partner participants completed the same ACASI assessments, the sexual behavior items were written to be appropriate for each gender. Subsequently, a trained African American interviewer administered validated and reliable assessments on sexual and physical abuse and a brief index assessing study participants' commitment to the African American community. Finally, males provided a urine specimen and women provided two self-obtained vaginal swab specimens that were assayed for three STDs.

Assessment of STDs

STD prevalence was defined as a laboratory-confirmed test for chlamydia, gonorrhea, or trichomonas infection at the baseline assessment. Participants were considered STD positive if they tested positive for any one of these three STDs. One swab was evaluated for *Neisseria gonorrhoeae* (GC) and *Chlamydia trachomatis* (CT) using the Becton–Dickinson ProbeTec ET *Chlamydia trachomatis* and *Neisseria gonorrhoeae* Amplified DNA Assay (Sparks, MD). A second vaginal swab was tested for *Trichomonas vaginalis* (TV) using Taq-Man PCR [12]. All assays were conducted at the Emory University Department of Pathology Research Laboratory. Participants testing positive for an STD were provided directly observable single-dose treatment and received appropriate counseling per CDC recommendations.

Assessment of Self-Report Measures

Sociodemographic Characteristics

Sociodemographic characteristics assessed included participant's age, education, employment status, income, health insurance, marital status and number of years with study partner.

Medical History

Participants reported their last CD4 count, last viral load, length of time since their HIV diagnosis (months), whether they had a history of hepatitis C, and whether they had ever received drug treatment.

Sexual Behaviors

Participants provided data on types of sexual behaviors engaged in (vaginal, anal and oral), frequency of male or female condom use during sex, whether behaviors were practiced with their study partners, with partners outside this primary relationship or with both, and data were reported across three different time periods (at last sex, past 30 days and past 90 days). Shorter time frames were selected to facilitate the collection of more reliable reports of episodes of sexual behavior [13] while longer time frames allowed capturing a greater number of episodes of sexual behavior. The primary HIV sexual risk behaviors assessed have been used in prior multisite studies involving African Americans and individuals living with HIV, and this study used similar measures for consistency of assessment [14, 15].

The primary HIV sexual risk behavior assessed was the proportion of the participants' vaginal and anal intercourse episodes with their study partner in the past 90 days that were protected using a male or female condom. This variable was calculated by dividing the total number of episodes of vaginal and anal intercourse with the study partner in the past 90 days into the total number of times a male or female condom was used on those occasions. Similar variables were created to assess proportion of oral and anal sexual episodes protected by a condom in the past 90 days

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with the study partner. Additionally, similar variables were computed to assess proportion of protected vaginal, anal or oral episodes with partners other than the study partner in the past 90 days that were protected using a condom.

A second important HIV sexual risk behavior assessed was the number of unprotected vaginal intercourse episodes with the study partner in the past 90 days. This variable was calculated by subtracting the total number of vaginal intercourse episodes with the study partner with whom a condom was used in the past 90 days from the total number of episodes of vaginal intercourse with the study partner in the past 90 days. Similar variables were created to assess number of oral and anal sexual episodes not protected by a condom in the past 90 days with the study partner. Additionally, similar variables were computed to assess number of unprotected vaginal, anal or oral episodes with partners other than the study partner in the past 90 days.

Sexual behaviors with concurrent partners was assessed by asking each member of the couple if he or she had sex with someone other than his or her study partner in the past 90 days and whether condoms were used on those occasions. The assessment also measured history of trading sex for drugs, shelter, money or food in the past 90 days and reported condom use (male and female condoms) at last sexual episode (vaginal, anal, and oral sex) with study partners.

Psychosocial Variables

Psychological distress was measured using the Center for Epidemiologic Studies—Depression (CESD) Scale (Brief version) [16]. Adult sexual abuse (ASA) was assessed using the Wyatt Sex History Questionnaire (Adult Sexual Abuse section only) [17] and intimate partner violence (IPV) was assessed using the Revised Conflict Tactics Scale (CTS2), modified version [18] which measures the history of physical abuse by an intimate partner in adulthood. The Cutting down, Annoyance by criticism, Guilty feeling and Eye-openers (CAGE) brief screener was used to measure lifetime alcohol dependence [19] and history of heavy drug use and dependence was measured using the Texas Christian Drug Screen II (TCUDS) [20]. Alcohol and drug problems were characterized by CAGE scores greater than or equal to 2 and by TCUDS scores greater than or equal to 3, respectively. History of spending time in a drug treatment program was assessed by the following item: "Have you ever spent time in an impatient drug treatment program?" and douching (females only) was assessed by the following question: "In the past 90 days, have you douched?"

Statistical Analysis Methods

Descriptive summaries were calculated for sociodemographic characteristics and sexual behaviors, and appropriate independent two-sample methods were employed to compare couples in which the female partner was HIV positive with couples in which the male partner was HIV positive. Gender-specific comparisons for select variables were also computed (e.g., comparing females in couples where the HIV positive partner was female to males in couples where the HIV positive partner was male). Means and standard deviations were computed for continuous measures, and *t*-tests were calculated with corresponding *P*-values of the null hypothesis that population means were identical in the two groups (couples in which the female was the positive partner compared with couples in which the male was the positive partner). Similarly, frequency and percents were calculated for categorical measures, and corresponding chi-squared (χ^2) tests were computed to test the null hypothesis of no association in the distribution of those frequencies in couples in which the female was the positive partner compared with couples in which the male was the positive partner. All analyses were completed using SAS V9 [21]. Univariate analyses of categorical and continuous variables were performed using the FREQ, MEANS or UNIVARIATE procedures, as appropriate, and all hypotheses tests were two-sided and conducted at the alpha = 0.05 level.

Couple-Level Measures

A couple-level STD measure was created as the cross-classification (similarity of the partners' STD status versus dissimilarity of the partners' STD status) of each partner's dichotomous STD outcome noting whether both partners tested positive, one partner tested positive, or both partners tested negative for any one of the three STDs. Similarly, dichotomous couple-level sexual behavior measures (e.g., condom use at last sex, history of trading sex) were also cross-classified as similarity of partners' responses versus dissimilarity of partners' responses. Finally, continuous couple-level sexual behavior measures were also computed. For example, the proportion of vaginal intercourse episodes using a male condom in the past 90 days reported by the couple was calculated for each study partner as described above. Subsequently, the couple-level variable was derived by adding the individual-level data and averaging partner-specific individual-level data.

Results

Sociodemographic Characteristics of the Sample

Table 1 compares the sociodemographic characteristics of participants and those who were eligible but not randomized. Participants were more likely to be married (33 vs. 20%; $\chi^2 = 6.96$ (df = 2), $P = 0.0084$), than eligible non-participants, however, there were no observed age,

education, income, insurance status, or employment status differences between participants and those who were eligible but not randomized.

The CD4 counts and viral load of HIV positive individuals were also assessed. Thirty-six percent of HIV positive males ($n = 74$) and 28% of HIV positive females ($n = 89$) reported not knowing their CD4 count and 48% of HIV positive males ($n = 98$) and 44% of HIV positive females ($n = 136$) reported not knowing their viral loads. Of the reported values, there were no differences in the distribution of viral loads for HIV positive males and females ($\chi^2 = 1.60$ (df = 3), $P = 0.6601$), however, the reported distribution of CD4 counts were significantly different. Specifically, the distribution of CD4 counts (copies/mL) for HIV positive women was 7% reported 0–200; 31% reported 201–500 and 33% reported >500 compared to HIV positive men: 12% reported 0–200; 24% reported 201–500 and 28% reported >500 ($\chi^2 = 8.15$ (df = 3), $P = 0.0430$).

Prevalence of Sexual Risk Behaviors

Table 2 compares the baseline prevalence of the study couples' sexual risk behaviors. Couples in which the HIV positive partner is female were compared to couples in which the HIV positive partner is male with respect to each outcome and sexual risk behavior. However, couples with HIV positive male partners reported a significantly higher proportion of condom-protected sex than couples with HIV positive female partners (mean = 0.54, SD = 0.39 versus mean = 0.38, SD = 0.38; $t = -4.60$ (df = 530), $P < 0.0001$). All couples reported similar frequencies of unprotected sexual activity (vaginal, anal and oral) with their study partners in the past 90 days. Couples with HIV positive female partners reported a significantly higher ($t = 4.68$ (df = 478), $P < 0.0001$) proportion of male condom-unprotected vaginal sex (mean = 0.64; SD = 0.36) compared with couples with HIV positive male partners (mean = 0.48; SD = 0.38). Few couples reported using the female condom during sex.

The prevalence of sexual risk behaviors with partners outside of the couple's relationship (e.g., concurrent partners) were similar among couples with HIV positive female and couples with HIV positive male partners. Specifically, significant differences were not reported in the prevalence of the couples' prior history of trading sex for drugs, money, shelter or food ($\chi^2 = 2.24$ (df = 2), $P = 0.3261$); the number of concurrent opposite sexual partners ($\chi^2 = 0.14$ (df = 2), $P = 0.9329$); the proportion of male-condom unprotected vaginal sex episodes in the past 90 days ($t = 0.54$ (df = 6), $P = 0.6102$); or the frequency of unprotected vaginal sex episodes with opposite sex partners in the past 90 days ($t = -2.04$ (df = 6), $P = 0.1269$).

STD Prevalence

The prevalence of STDs was also assessed at the couple level. Twenty-three percent ($n = 74$) of couples with HIV positive female partners and 26% ($n = 56$) of couples with HIV positive male partners ($\chi^2 = 0.33$ (df = 1), $P = 0.5680$) tested positive for at least one STD at baseline (e.g., at least one partner tested positive for at least one STD). Further analyses assessed STD prevalence at the individual-level. Bivariate analyses by gender indicated

Table 1 Demographic comparison of participants meeting eligibility requirements

	Eligible and randomized ($n = 1070$)	Eligible and not randomized ($n = 108$)	$\chi 2$ statistic
Age			
<30	60 (5.69)	4 (3.96)	2.23, df = 2
30–39	229 (21.71)	28 (27.72)	
40+	766 (72.61)	69 (68.32)	
Married to study partner[a]	344 (32. 54)	20 (19.80)	6.95, df = 1
Education			
<HS	325 (30.72)	33 (32.67)	0.47, df = 2
HS/GED	435 (41.12)	38 (37.62)	
Some college	298 (28.17)	30 (29.70)	
Employed[b]	300 (28.41)	37 (36.63)	3.02, df = 1
Income			
<$400 per month	307 (29.10)	32 (32.00)	1.02, df = 3
$400–850 per month	443 (41.99)	37 (37.00)	
$851–1650 per month	204 (19.34)	20 (20.00)	
>$1650 per month	101 (9.57)	11 (11.00)	
Insured	796 (75.38)	81 (80.20)	1.17, df = 1

All values represent *N* (%). *P*-values were determined using χ^2 tests

df degrees of freedom

[a] *P*-value <0.01, [b] *P*-value <0.10

Table 2 Baseline prevalence of couple-level HIV transmission sexual risk behaviors, by gender of HIV sero-positive partner (within the relationship in the past 90 days)

	HIV + female couples ($n = 323$)	HIV + male couples ($n = 212$)	Statistic, df
Proportion condom protected sex[a]	0.38 ± 0.38	0.54 ± 0.39	−4.60, df = 530
MC at last vaginal sex[b]			
Both no	36 (11.25)	33 (15.79)	9.68, df = 2
One no	262 (81.88)	148 (70.81)	
Both yes	22 (6.88)	28 (13.40)	
MC at last anal sex			
Both no	17 (27.87)	8 (22.22)	0.38, df = 2
One no	38 (62.30)	24 (66.67)	
Both yes	6 (9.84)	4 (11.11)	
FC at last vaginal sex			
Both no	19 (5.94)	19 (9.05)	2.77, df = 2
One no	284 (88.75)	176 (83.81)	
Both yes	17 (5.31)	15(7.14)	
# Unprotected vaginal sex (w/ study partner)			
MC unprotected	16.69 ± 22.68	14.69 ± 27.16	0.83, df = 329
FC unprotected	25.20 ± 29.28	25.41 ± 29.36	0.18, df = 504
Neither MC or FC	17.32 ± 23.14	14.89 ± 24.00	1.03, df = 425
# Unprotected anal sex (w/ study partner)			
MC unprotected	3.09 ± 3.87	2.90 ± 4.36	0.17, df = 59
FC unprotected	5.21 ± 6.80	4.10 ± 5.05	−0.45, df = 504
Neither MC or FC	3.50 ± 4.32	2.50 ± 3.80	0.84, df = 46
# Unprotected oral sex (receptive, w/ study partner)			
DD or MC unprotected	13.86 ± 30.37	13.39 ± 16.44	0.16, df = 240
# Unprotected oral sex (non-receptive, w/ study partner)			
DD or MC unprotected	12.18 ± 18.63	12.03 ± 14.03	0.06, df = 204
Proportion unprotected vaginal sex (w/ study partner)			
MC unprotected[a]	0.64 ± 0.36	0.48 ± 0.38	4.68, df = 478
FC unprotected[c]	0.96 ± 0.12	0.94 ± 0.16	1.74, df = 312
Neither MC or FC[d]	0.66 ± 0.36	0.51 ± 0.38	3.92, df = 425
Proportion unprotected anal sex (w/ study partner)			
MC unprotected	0.57 ± 0.36	0.63 ± 0.36	−0.72, df = 59
FC unprotected	0.88 ± 0.19	0.95 ± 0.15	−1.36, df = 59
Neither MC or FC	0.63 ± 0.36	0.66 ± 0.39	−0.28, df = 46

Values shown are *N* (%) or mean ± standard deviation. *P*-values for continuous variables were determined using two-sample *t*-tests; *P*-values for categorical variables were determined using χ^2 tests

STD sexually transmitted disease, *MC* male condom, *FC* female condom, *DD* dental dam

[a] *P*-value <0.0001; [b] *P*-value <0.01; [c] *P*-value <0.10; [d] *P*-value <0.001

that STDs, were significantly more prevalent in women than in men ($\chi^2 = 74.60$ (df = 1), $P < .0001$). This difference in STD prevalence by gender was accounted for by Trichomoniasis. The prevalence of gonorrhea, Trichomoniasis and chlamydia was similar for HIV positive and HIV negative females. However, when comparing the prevalence of each STD for the HIV positive and HIV negative males, HIV negative males had a higher STD prevalence (7.19 vs. 2.37%; $\chi^2 = 5.91$ (df = 1), $P = 0.0150$) (Tables 3, 4).

Bivariate and Multivariate Associations for STD Prevalence in Women

Bivariate associations were assessed between sociodemographic characteristics, sexual behaviors, psychosocial factors, and the variable "any STD," defined as testing positive for at least one STD at baseline. In bivariate analyses conducted among women ($n = 535$) who were either HIV positive or HIV negative, being uninsured ($\chi^2 = 1.97$ (df = 1), $P = 0.1608$), having a lengthier

Table 3 STD prevalence by gender

	Males ($n = 535$)	Females ($n = 535$)	All ($n = 1070$)
Chlamydia	4 (0.75)	4 (0.75)	8 (0.75)
Gonorrhea	0 (0.00)	1 (0.19)	1 (0.09)
Trichomoniasis	24 (4.52)	116 (21.80)	140 (13.17)
Any STD[a]	28 (5.27)	120 (22.51)	148 (13.91)

Values shown are *N* (%) [a]Generalized Cochran Mantel Haensel (CMH) test statistic; $\chi^2 = 74.60$, df = 1, $P < 0.0001$

relationship with one's study partner ($t = -1.48$ (df = 527), $P = 0.1396$), and having a history of douching ($\chi^2 = 13.11$ (df = 1), $P = 0.0003$), inpatient drug treatment ($\chi^2 = 1.89$ (df = 1), $P = 0.1692$) or abuse ($\chi^2 = 1.65$ (df = 1), $P = 0.1996$), were associated with testing positive for at least one STD at baseline. In multivariate analyses, women who douched were 2.28 times as likely to have a prevalent STD (odds ratio [OR] = 2.28; 95% confidence interval [CI], 1.40–3.74; $\chi^2 = 10.85$ (df = 1), $P = 0.0010$). No other variables were significant in this multivariate model.

Bivariate and Multivariate Associations for STD Prevalence in Men

Bivariate associations were assessed between sociodemographic characteristics, sexual behaviors, psychosocial factors, and the variable "any STD," defined as testing positive for at least one STD at baseline. In bivariate analyses conducted among men ($n = 535$) who were either HIV positive or HIV negative, being uninsured ($\chi^2 = 6.33$ (df = 1), $P = 0.0119$) and having a history of PTSD ($\chi^2 = 2.61$ (df = 1), $P = 0.1061$) were associated with testing positive for at least one STD at baseline. In multivariate analyses, men who were uninsured were approximately 2.6 times as likely to have a prevalent STD (OR = 2.62; 95% CI, 1.22–5.65; $\chi^2 = 6.03$ (df = 1), $P = 0.0140$). Insurance status was the only variable significant in this multivariate model.

Discussion

This study is among the first to examine HIV serodiscordant African American couples. Serodiscordant couples who engage in unprotected sexual activity are an important research focus because they are in relationships where the risk of transmission is very high. This study makes significant contributions to public health research because it highlights a population that has received scant empirical attention. HIV has permeated our society and remains a significant public health problem. It affects not only individuals, but also families.

Besides being affected by HIV, these couples are affected by other sexual risks. Overall, couples reported using condoms only about 44% of the time when they had anal or vaginal sex. Furthermore, the proportion of condom protected sexual episodes were significantly less frequent when the female partner was positive compared to when the male partner was HIV positive. This pattern was observed among females in sexual relationships with their study partner as well as with their nonstudy partners, suggesting that if the female partner is the positive partner in a serodiscordant couple negotiating safer sex may be a challenge. Strategies for reducing HIV transmission risk in HIV serodiscordant couples need to take into account the gender of the HIV positive partner, given greater potential for transmission when the female partner is positive. Additional HIV transmission behaviors, including high levels of non-condom use, were reported by at least one member of many study couples. Nearly 18% of couples reported that one partner had a concurrent sexual partner, and about 8% of couples reported that at least one partner had traded sex for money, drugs, or food. Clearly, given the breadth of HIV transmission risk behaviors reported by couples in this study, prevention efforts tailored to this subpopulation are warranted.

About 26% of the couples tested positive for an STD. The prevalence of STDs reported among this sample is comparable to the prevalence reported in other studies of HIV positive individuals [22]. By far the most prevalent STD in females and in males was Trichomonas. Prevalence

Table 4 STD prevalence among females and males by HIV serostatus

	Females			Males		
	HIV− ($n = 212$)	HIV+ ($n = 323$)	All ($n = 535$)	HIV− ($n = 323$)	HIV+ ($n = 212$)	All ($n = 535$)
Chlamydia	2 (0.94)	2 (0.62)	4 (0.75)	4 (1.25)	0 (0.00)	4 (0.75)
Gonorrhea	0 (0.00)	1 (0.31)	1 (0.19)	0 (0.00)	0 (0.00)	0 (0.00)
Trichomoniasis	53 (25.00)	63 (19.69)	116 (21.80)	19 (5.94)	5 (2.37)	24 (4.52)
Any STD	55 (25.94)	65 (20.25)	120 (22.51)	23 (7.19)	5 (2.37)	28 (5.27)

Values shown are *N* (%)

rates for Trichomonas were comparable for HIV negative and for HIV positive females. The comparable prevalence of STDs in HIV negative and HIV positive women has been documented in prior research [7]. However, significantly more HIV negative males had a prevalent *Trichomonas* infection compared with HIV positive males.

Trichomonas is a protozoan parasite transmitted principally through vaginal intercourse and is highly prevalent in African Americans. Empirical research suggests that *Trichomonas* may play an important role in HIV transmission dynamics [23]. *Trichomonas* typically elicits an aggressive local cellular immune response with inflammation of the vaginal epithelium and exocervix in women and the urethra in men [24]. This inflammatory response induces a large infiltration of leukocytes, including HIV target cells such as CD4+ bearing lymphocytes and macrophages to which HIV can bind and gain access [25]. In addition, *Trichomonas* can frequently punctuate mucosal hemorrhages [26]. Among persons living with HIV, the pathology induced by *Trichomonas* can increase HIV shedding. *Trichomonas* infection may also act to expand the portal of entry for HIV in an HIV negative person [27].

In multivariate analyses, the only significant correlate of having a prevalent STD in women was douching. Historically, vaginal douching has been used as a hygienic practice [28], and several studies have reported that douching is more common among African American women compared with women of other ethnic groups [29–31]. African American women may douche more frequently as a result of cultural beliefs reinforcing douching as a hygienic practice as well as possibly an effective contraceptive practice [32, 33]. Douching has been found to reduce the normal vaginal flora, specifically, the Lactobacilli bacteria that protect against genital pathogens. This may result in an overgrowth of pathogenic organisms in the lower genital tract [34]. A study conducted by McClelland et al. among Kenyan women demonstrated that vaginal washing with water or soap increased women's risk for acquiring HIV-1 [35]. This study concluded that intervention strategies aimed at modifying intravaginal practices should be evaluated as a possible female-controlled HIV-1 prevention strategy.

In multivariate analyses with males, being uninsured was the only significant correlate of having a prevalent STD. Socioeconomic forces such as having limited health insurance are well-known risk markers for HIV and other STIs [36, 37]. This finding contributes to the accumulating evidence which emphasizes the importance of social and economic context in promoting the spread and perpetuation of the HIV epidemic among African Americans. Changing the social context of life for African Americans may be effective in decreasing the burden of the HIV epidemic in this community [38].

Strengths and Limitations

This study has a number of limitations. The sample in this study may not be representative of all African American serodiscordant couples. To be eligible to participate, a couple had to have been together for 6 months, be planning to be together another year, and have no plans to have a child. The results may not generalize to couples that do not meet these criteria. Moreover, these eligibility criteria may have hampered our ability to identify other known correlates of STD prevalence in African Americans. Additionally, we did not recruit people who were unaware that they were in a serodiscordant relationship, which restricts the generalizability of the findings.

The data from this study represent a significant extension in the examination of couple-level HIV sexual risk behavior. The findings are original and contribute significantly to HIV/STD research with couples, particularly African American couples. Additionally, presentation of the sociodemographic characterization and HIV risk behavior profiles of African American HIV serodiscordant couples represents an important initial description of a hidden, vulnerable population.

In conclusion, because of HIV infection, individuals in serodiscordant couples need to learn to have sex in a way that is safe and healthful for both themselves and their partners. Programs that provide information and skills to promote sexual health in the context of couples' lives and the fullness of their relationships have the potential to be successful in reducing the risks that HIV serodiscordant couples face. Future research should be conducted with diverse samples of African American couples (i.e., younger couples, non-stable couples) to explore other potential correlates of STD prevalence.

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ORIGINAL PAPER

Prevalence of Child and Adult Sexual Abuse and Risk Taking Practices Among HIV Serodiscordant African-American Couples

The NIMH Multisite HIV/STD Prevention Trial for African American Couples Group

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Abstract This study reports the prevalence of child (CSA) and adult (ASA) sexual abuse among 535 African American HIV serodiscordant couples from four major United State cities, and its relationship to personal and couple related vulnerabilities and HIV risk factors. As part of a randomized, clinical trial, CSA and ASA histories were obtained through face-to-face interviews. Results indicate that HIV positive women were significantly more likely to report one kind of abuse (32.32%), either before or since age 18 or both (32.6%). HIV-positive men (34.9%) were significantly more likely to report CSA than HIV-negative men (22.0%). Overall, 72% of couples reported that one or both had CSA histories. These findings underscore the heightened emotional vulnerability, and STI and HIV transmission risk taking practices, associated with sexual abuse. Sexual abuse histories among couples should be assessed to better understand how these histories may contribute to couples dynamics and risk-taking practices.

The NIMH Multisite HIV/STD Prevention Trial for African American Couples Study Group

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Introduction

In the United States, African American women and men continue to be significantly impacted by HIV/AIDS [1]. The rate of AIDS among African American women is nearly 23 times that of white women, while the rate among African American men is eight times the rate for white men [2]. Although African Americans only account for 12.4% of the U.S. population [3], they constitute almost half of all new HIV infections [2].

Heterosexual contact is the primary mode of HIV infection for African American women and the third most common mode of transmission for African-American men [2]. Attention is being directed to heterosexual African-American couples who are serodiscordant, where one member of the couple is HIV-positive and the other is HIV-negative. Although HIV-related behaviors are often better understood within the context of sexual partnerships [4], little is known about factors affecting the sexual histories of couples. One partner's personal history or contribution to interpersonal dynamics may impact the overall risk and health of the couple [5–8]. Most HIV couples studies focus on marital or sexual satisfaction, the impact of extra-marital problems on relationships [9, 10], or the traumatic effects of marital disruption [11]. Identifying additional factors that may also heighten the risks that couples encounter in HIV serodiscordant relationships have yet to be adequately studied [5].

Sexual abuse across the life course is a factor that can affect HIV-related risks for couples. Child sexual abuse (CSA), defined as unwanted or coerced sexual contact before age 18, is a common experience among women of all ethnicities [12]. The prevalence of child sexual abuse for HIV-negative women is approximately one in three, but for HIV-positive women it is one in two in the United States [13–16]. However, these findings were reported for women who were not necessarily in relationships. There are few studies describing the prevalence of sexual abuse among self-identified heterosexual men. Estimates of sexual abuse among mostly men who have sex with men vary widely, from 4 to 76% [13]. Discrepancies in these rates may be due to differences in what constitutes abuse, how questions were asked, the samples studied [17, 18], and more importantly, to the reluctance of males to disclose these incidents [19]. Boys at highest risk tend to be younger than 13, non-white and poor [20]. Problems with prevalence rates notwithstanding, incidents of child sexual abuse before age 18 tend to form the template for long-term effects that extend beyond the personal difficulties of the survivor and influence future relationship dynamics [21]. As child sexual abuse is a form of interpersonal violence,

often by someone with whom the child has a close relationship, survivors are likely to experience intimate relationship problems as adults [22]. In fact, women with CSA histories report less intimate relationship satisfaction, less trust of their partners, and poorer communication than women without CSA histories [23].

Child sexual abuse survivors are also more likely to report being victims of adult sexual abuse (ASA) or rape [4, 17, 24–26]. African American women with CSA are more likely to be raped as adults compared to women of other ethnic backgrounds, due primarily to the effects of poverty and living in highly dense, urban areas [27]. One study showed African American and Latino men at risk for HIV with CSA histories were 6.8 times more likely to report unwanted sexual activity after age 13 than those without CSA histories [28].

Although past studies have incorporated couples into their designs, most studies treat each person's data independently and focus on reducing individual risk taking practices [29]. The present study focused on couples, so that one person would not have to explain the need to change behaviors that two individuals may engage in. Addressing individuals in a couple requires that both persons assume responsibility for themselves and for each other. Given that gender and culture bound traditions endorse women's compliance with their partner's sexual advances [30–32], women with histories of early sexual abuse may have difficulties in self advocacy, and may not communicate concerns about condom use or sexual behaviors that may increase risks for HIV/STD transmission to the uninfected partner [21, 33], However, since we do not have adequate information on couples [34], the present study attempts to address this limitation.

While the relationship between early abusive sexual experiences and HIV-related sexual practices has been included in HIV prevention interventions [32, 35, 36], most of this research focuses on individuals and primarily women [11, 37]. Other studies that report histories of child or adult sexual abuse with couples have included ethnic groups other than African Americans [38, 39] or report findings from large international research with results that are difficult to generalize to U.S. populations [40–45].

Individuals with CSA histories may also be more likely to use maladaptive coping strategies (e.g., substance use) [46, 47], and report an inability to protect themselves from future abuse within their relationships [48]. Women with early and chronic sexual abuse have a seven-fold increase in HIV risk behavior, including intravenous drug use, sexually transmitted infections (STI's) [14, 49], and anal sex without condoms [24]. Lower condom self-efficacy has also been reported [50]. Women with histories of CSA may also be likely to have more sexual partners [49, 51, 52] and report higher rates of sexual revictimization [27, 32, 53]. Conversely, once women with CSA histories become infected with HIV, they may be less likely to engage in regular sexual activity with partners [36].

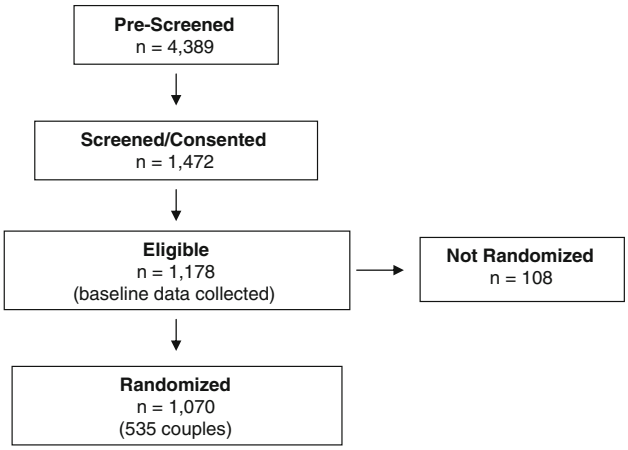

Fig. 1 AAC participant flow; pre-screening to randomization, *Note*: there were no observed statistical differences between participants who were eligible and not randomized compared to those who were eligible and randomized for a number of key demographic characteristics, including age, education, employment status, income and insurance status. Randomized participants were, however, more likely to be married compared to those eligible couples who were not randomized (340 (32.35%) versus (19.80%); $P < 0.01$)

Young male CSA survivors report engaging in a range of self-destructive behaviors including unprotected anal intercourse while intoxicated, hypersexual behavior, and unprotected sex with multiple partners [54]. These behaviors are associated with significant distress from past abuse, possibly contributing to sexual identity confusion and sexually-related problems [13, 55–58]. It may be useful to consider the gender of the HIV-infected partner as a predictor of the pattern of HIV-related risk-taking behaviors, to better understand what couples may need to address in clinical treatment and interventions.

The purpose of this study was to report the prevalence of child and adult sexual abuse histories among HIV-serodiscordant African-American couples in four U.S. cities by the gender of the infected partner. Second, we examined the relationship between histories of sexual abuse in childhood, adulthood, or both, in individual- and couple-related outcomes that increase HIV and STI transmission risks. We expect higher sexual abuse and sexual re-victimization rates among HIV-positive African American women compared to their HIV-negative counterparts and increased risk taking practices among HIV positive women whose partners are HIV negative.

The NIMH Multisite HIV/STD Prevention Trial for African American Couples Group
Bethesda, MD, USA

Methods

Study Design

This paper used baseline data from the Eban study, a two-arm, couples-based randomized controlled intervention trial of HIV serodiscordant African-American couples from four U.S. cities (Atlanta, GA, Los Angeles, CA, New York, NY, and Philadelphia, PA). The study tested the efficacy of a couple-focused HIV/STD risk reduction intervention vs. an individual-focused health promotion intervention in reducing sexual risk behaviors and STD incidence (For more details on the study design see Bellamy [59], NIMH Multisite HIV/STD Prevention Trial for African-American Couples Group [60–62], and "Risky Sexual Behavior and Correlates of STD Prevalence…" (in this paper) [63]).

The Study Sample and Recruitment of the Couples

The study includes 535 couples (1070 individuals) recruited from HIV care clinics, HIV testing and counseling sites, primary care clinics, substance abuse treatment programs, churches and HIV/AIDS ministries, HIV/AIDS services providers and community-based coalitions of advocacy organizations. Participants met specific study criteria (see NIMH Multisite HIV/STD Prevention Trial for African-American Couples Group [64] for greater detail on study recruitment and criteria). Study recruitment procedures and eligibility criteria are described in "Risky Sexual Behavior and Correlates of STD Prevalence among African American HIV Serodiscordant Couples" in this issue [63].

Staff Training

There were 15 interviewers trained to administer the ACASI and the face-to-face version of the modified Wyatt Sex History Questionnaire [12] that was used to assess child and adult sexual abuse. While research indicates that social desirability of responses may be facilitated by the ACASI, there is significant variance in an individual's perception of sexual experiences that meet criteria as sexual abuse [65]. Face-to-face administration of the sexual abuse questions allowed for the participants to clarify and discuss: (1) incidents that may or may not meet criteria (such as before or since age 18); (2) the meaning of terms like 'anal sex (for women) is where the perpetrator puts his penis in your bottom or behind' that may be unclear or confusing; and (3) incidents that may not have been reported or disclosed prior to the interview. The training protocol included a discussion of skills needed for face-to-face interviews and the importance of interviewers avoiding body language or posturing that might influence participant responses; how to avoid 'burn out' which may lead to the inability to separate the interviewer's personal history from the participant's experiences; how to report incidents of sexual and physical abuse, if needed; and how to handle emotional responses to questions about trauma. The training also included the importance of supervisors discussing all aspects of data collection with interviewers to ensure their consistency throughout the study. Mock interviews of sexual abuse were demonstrated and scored by interviewers with high inter-rater reliability ($\alpha = 0.95$). A clinical psychologist with expertise in coding sexual abuse reviewed and corrected any coding errors of each incident across four sites prior to analyses of these data (Fig. 1).

Measures

At baseline, data were obtained from three sources. First, participants completed a 90-minute Audio Computer-Assisted Survey Interview (ACASI), which assessed sociodemographic and relationship characteristics, sexual behaviors and condom use, and psychosocial mediators that had sound psychometric properties and had previously been implemented with adult African-American populations. Although both participating male and female partners completed the same ACASI assessments, the sexual behavior items were written to be appropriate for each specific gender. Subsequently, a trained African-American interviewer administered validated and reliable assessments on sexual and physical abuse and a brief index assessing study participants' commitment to the African-American community. Finally, males provided a urine specimen and women provided two vaginal swab specimens that were assayed for three STDs and HIV testing. For more detail see NIMH Multisite HIV/STD Prevention Trial for African-American Couples Group [64].

Sociodemographic Characteristics

Characteristics of the sample were reported and included items such as participant's age, education, employment status, income, living arrangement, marital status, and length of their relationship. Participants who responded "excellent" or "very good" to the following question were considered to have excellent or very good general health: "In general, how would you rate your overall quality of life?" Hepatitis C status was determined by summarizing participant responses to the following item: "Has your doctor or nurse ever told you that you have Hepatitis C?" Participants who responded "yes" to this item were denoted as Hepatitis C positive. Insurance status was determined by responses to the following item: "Do you currently have health care insurance, including government-sponsored insurance such as Medicaid or Medical?"

To assess quality of life, two responses were summed related to feelings about life now and life one year from now; scores ranged from 2 (worst possible life now and 1 year from now) to 20 (best possible life now and 1 year from now). Participants were asked to recall the number of children that depend on them for the majority of their food and shelter.

Definitions of Child and Adult Sexual Abuse

Child sexual abuse (CSA) is a multidimensional construct that is defined as sexual incidents before age 18 (the age of legal consent) [66], which involved: (1) involuntary or coerced sexual experiences of a male or female (regardless of the age of the perpetrator), (2) a male or female of the same age that were against their will, (3) a male or female with a perpetrator who was 5 years or older, or (4) a male or female with a perpetrator who was older than 18 years. Components of this definition also highlight the power imbalance and cognitive inability of survivors younger than 18 years to understand the behavior or consequences of the sexual context (statutory rape) [67, 68], and often involves multiple incidents over time [69, 70]. Adult sexual abuse (ASA) is defined as attempted or completed sexual acts of rape since age 18. Research has shown that there is a link between child sexual abuse and adult re-victimization, with ASA being almost five times more likely among those with histories of CSA [51].

Assessment of CSA and ASA

Men and women were asked about their child and adult sexual experiences using a modified version of the Wyatt Sex History Questionnaire [12]. This instrument had a combination of forced-choice and open-ended response options which allowed participants to clarify what incidents met the definition of abuse and facilitated memory recall by using calendars, as well as bounding and framing techniques to describe important events [12]. To assess CSA, participants were asked seven questions (yes/no items), regarding attempted or completed vaginal or anal intercourse, oral copulation to either victim or perpetrator, and digital penetration of victim or perpetrator. If participants responded "yes" to any of the questions, they were classified as having experienced CSA. To assess severity, they were asked questions about their age at the time of the incident, the age of the perpetrator, the relationship of the perpetrator to the victim (e.g., parent, relative, stranger, etc.), if the incident was consensual, and whether it had occurred with someone else before the age of 18.

To assess ASA, men and women were asked whether or not someone forced their penis or an object in their bottom (or vagina for women) since age 18. If participants answered "yes" they were classified as having experienced ASA.

Couple-Level Abuse Measure

Couple-level abuse scores (e.g., whether neither, one, or both partners reported abuse histories) included the total number of abuse experiences of both male and female partners.

Relationship Characteristics

Study participants were asked questions that addressed relationship characteristics including length of relationship, whether or not participants were married to or separated from their study partner, and quality of relationship. A general scale developed by Hendrick [71] to measure the quality of satisfaction in intimate relationships was used to assess the quality of the relationship. The scale consists of seven items and summary scores range from 7 (low satisfaction) to 35 (high satisfaction). Questions on this scale include: (1) "How well does your study partner meet your needs?" and (2) "In general, how satisfied are you with your relationship?" This measure has been used by a range of populations including urban African-American and Latino women [72].

Past Experiences that Increase Vulnerability and Drug Related, Housing, and Psychological Problems

Prior incarceration, drug treatment program and residential treatment program histories were determined by the following three items: "Have you ever spent time in jail or prison?", "Have you ever spent time in an impatient drug treatment program?" and "Have you ever spent time in other residential programs?", respectively. The Cutting down, Annoyance by criticism, Guilty feeling and Eye-openers (CAGE) brief screener was used to measure lifetime alcohol dependence [73] and history of heavy drug use and dependence was measured using the Texas Christian Drug Screen II (TCUDS) [74]. Alcohol and drug problems were characterized by CAGE scores greater than or equal to two and by TCUDS scores greater than or equal to three, respectively.

Relationship-Based Risks

Participants provided data on the use of male and female condoms during sex and different types of sexual behaviors they had engaged in with study partners (vaginal, anal and oral intercourse) over the past 90 days. We selected the 90 day time period in order to allow sufficient time for

Table 1 Demographics of participants meeting eligibility requirements, N = 535 couples

	All Participants ($N = 1070$)	Males ($N = 535$)	Females ($N = 535$)	Statistic[a]
Age, mean ± SD	43.41 ± 8.07	45.09 ± 8.13	41.73 ± 7.68	9.98***
Married, n (%) yes	345 (32.49)	175 (32.96)	170 (32.02)	0.95
Living with study partner, mean ± SD	806 ± 75.97	405 ± 76.42	401 ± 75.52	0.71
Years with study partner, mean ± SD	6.91 ± 6.56	7.09 ± 6.68	6.74 ± 6.44	2.71**
Education, n (%)				
<HS	326 (30.67)	141 (26.55)	185 (34.77)	
HS/GED	437 (41.11)	249 (46.89)	188 (35.34)	
Some college	300 (28.22)	141 (26.55)	159 (29.89)	4.04*
Employed, n (%) yes	302 (28.46)	181 (34.09)	121 (22.83)	19.89***
Income, n (%)				
<$400 per month	307 (28.96)	158 (29.81)	149 (28.11)	
$400–850 per month	446 (42.08)	212 (40.00)	234 (44.15)	
$851–1650 per month	205 (19.34)	103 (19.43)	102 (19.25)	0.40
>$1650 per month	102 (9.62)	57 (10.75)	45 (8.49)	
Insured, n (%) yes	800 (75.40)	365 (68.87)	435 (81.92)	25.98***
Previously incarcerated, n (%) yes	661 (62.54)	405 (76.42)	256 (48.58)	90.24***
Spent time in inpatient drug treatment program, n (%) yes	554 (52.17)	288 (54.24)	266 (50.09)	2.06
Spent time in other residential programs, n (%) yes	267 (25.16)	129 (24.29)	138 (26.04)	0.69
Hepatitis C, n (%) positive	231 (21.73)	134 (25.24)	97 (18.23)	7.48**
HIV clinical characteristics (HIV-positive partners only; n = 535)				
CD4 count, n (%)				
<200	47 (9.07)	24 (11.71)	23 (7.35)	8.15*
200–500	147 (28.38)	49 (23.90)	98 (31.31)	
501–3000	161 (31.08)	58 (28.29)	103 (32.91)	
Unknown (9999)	163 (31.47)	74 (36.10)	89 (28.43)	
Viral load, n (%)				
0–50	131 (25.49)	53 (25.98)	78 (25.16)	1.60
51–400	38 (7.39)	13 (6.37)	25 (8.06)	
>400	111 (21.60)	40 (19.61)	71 (22.90)	
Unknown (9999)	234 (45.53)	98 (48.04)	136 (43.87)	

[a] Statistic = Z from GEE model, adjusted for within couple correlation, for continuous variables (age and years with study partner); *Statistic* = Mantel Hansel χ^2 for categorical variables (married (df = 1), living with study partner (df = 1), education, insured, previously incarcerated, spent time in residential drug treatment program, spent time in other residential treatment program, Hepatitis C (df = 2), employed (df = 1), and income (df = 3)). Statistic = unadjusted χ^2 (df = 3) for the HIV Clinical Characteristics (CD4 count and viral load)

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.0001$

sexual practices to occur among couples. For example, to assess vaginal sex, female participants were asked: "In the past 90 days, about how many times did your study partner put his penis into your vagina?", and "In the past 90 days, when your study partner put his penis into your vagina, about how many of these times was a male condom used?" Similar items were used to assess anal and oral sexual episodes with study partners in the past 90 days. The primary HIV sexual risk behavior assessed was the proportion of the participants' sexual intercourse episodes with their study partner in the past 90 days that were protected using male or female condoms. This variable was calculated by dividing the total number of sexual intercourse episodes with the study partner in the past 90 days into the total number of times a male or female condom was used on those occasions.

A second important HIV sexual risk behavior assessed was the number of unprotected sexual intercourse episodes with the study partner in the past 90 days. This variable was calculated by subtracting the total number of sexual intercourse episodes with the study partner with whom a male or female condom was used in the past 90 days from the total number of episodes of sexual intercourse with the study partner in the past 90 days. The number of protected sexual episodes with study partners in the past 90 days was the complement of this variable.

Table 2 Prevalence of gender-specific child and adult sexual abuse, by HIV serostatus, N = 535 couples

Women only				
	HIV positive (n = 323)	HIV negative (n = 212)	χ^2 statistic	OR [95% CI]
CSA: yes (%)	214 (67.94)	126 (60.00)	3.48^{+}	1.41 [0.98–2.03]
ASA: yes (%)	173 (54.23)	85 (40.48)	9.59**	1.74 [1.22–2.48]
CSA and ASA				
Neither	71 (22.54)	67 (32.21)	9.50**	Reference
Either	102 (32.38)	73 (35.10)		1.31 [0.84–2.07]
Both	142 (45.08)	68 (32.69)		1.97 [1.27–3.06]
Men only				
	HIV positive (n = 212)	HIV negative (n = 323)	χ^2 statistic	OR [95%CI]
CSA: yes (%)	73 (34.93%)	69 (22.04)	10.50**	1.90 [1.28–2.80]
ASA: yes (%)	11 (5.19)	5 (1.55)	5.81*	3.47 [1.19–10.13]
CSA and ASA				
Neither	134 (64.11)	242 (77.56)	13.09**	Reference
Either	66 (31.58)	66 (21.15)		1.81 [1.23–2.74]
Both	9 (4.31)	4 (1.28)		4.06 [1.23–13.44]

$^{+}$ $P < 0.10$; * $P < 0.05$; ** $P < 0.01$

Table 3 Prevalence of couple-level child and adult sexual abuse, N = 535 couples

	All couples (n = 535)	HIV positive partner		χ^2 statistic	OR [95% CI]
	N (%)	Female (n = 323) N (%)	Male (n = 212) N (%)		
Childhood Sexual Abuse (CSA)					
Neither partner	142 (27.73)	77 (25.25)	65 (31.40)	17.24***	Reference
One partner	269 (52.54)	182 (59.67)	87 (42.03)		1.77 [1.16–2.68]
Both partners	101 (19.73)	46 (15.08)	55 (26.57)		0.71 [0.42–1.18]
CSA (males only)	142 (27.20)	69 (22.04)	73 (34.93)	10.50**	1.90 [1.28–2.80]
CSA (females only)	340 (64.76)	214 (67.94)	126 (60.00)	3.48^{+}	1.41 [0.98–2.03]
Adult Sexual Abuse (ASA)					
Neither partner	261 (49.43)	142 (44.65)	119 (56.67)	10.02**	Reference
One partner	261 (49.43)	174 (54.72)	87 (41.43)		1.68 [1.18–2.39]
Both partners	6 (1.14)	2 (0.63)	4 (1.90)		0.42 [0.07–2.33]
ASA (males only)	16 (3.00)	5 (1.55)	11 (5.19)	5.81*	3.47 [1.19–10.13]
ASA (females only)	258 (48.77)	173 (54.23)	85 (40.48)	9.59**	1.74 [1.22–2.48]

$^{+}$ $P < 0.10$; * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$

Statistical Analysis

The methods of statistical analysis are presented separately for each respective summary table. Table 1 presents a demographic summary of study participants, overall and stratified by gender, controlling for the within-couple correlation. Analysis of responses for continuous variables (age and years with study partner) was performed by fitting generalized estimating equations (GEE) as a function of gender, specifying couple as the clustering variable. Mantel–Haenszel χ^2 statistics were reported for categorical variables (marital status, living with study partner, education, and income), controlling for the correlations within each couple and listing degrees of freedom, and p-values. Table 2 presents gender-specific rates of CSA and ASA comparing HIV-positive participants to HIV-negative participants. Within gender, responses from HIV-positive and HIV-negative participants were analyzed using χ^2 test

Table 4 Correlates of child and adult sexual abuse, N = 1070 participants

Exposures	CSA Estimate (95% CI)	ASA Estimate (95% CI)	Both CSA and ASA Estimate (95% CI)
Demographics			
[a]Female	4.92 (3.78, 6.40)****	30.82 (18.22, 52.15)****	26.22 (14.71, 46.71)****
[a]HIV positive	2.04 (1.59, 2.61)****	2.60 (1.95, 3.48)****	2.52 (1.84, 3.44)****
[a]Excellent or very good general health	0.80 (0.68, 1.03)$^{+}$	0.76 (0.57, 1.01)$^{+}$	0.70 (0.51, 0.95)*
[a]Hepatitis C positive	0.99 (0.74, 1.33)	1.20 (0.87, 1.67)	1.24 (0.88, 1.76)
[a]Insured	1.63 (1.22, 2.18)***	1.99 (1.39, 2.85)***	1.89 (1.29, 2.78)**
[b]Quality of Life	−0.14 (−0.53, 0.24)	0.04 (−0.39, 0.48)	−0.01 (−0.48, 0.46)
[b]Dependent children	0.10 (−0.09, 0.29)	−0.06 (−0.27, 0.15)	−0.03 (−0.25, 0.20)
Relationship characteristics			
[a]Married	1.35 (1.05, 1.73)*	1.11 (0.84, 1.47)	1.25 (0.93, 1.69)
[a]Separated	1.26 (0.79, 2.02)	1.06 (0.62, 1.80)	1.01 (0.57, 1.80)
[a]Married to study partner	1.27 (0.98, 1.65)$^{+}$	1.09 (0.81, 1.45)	1.28 (0.94, 1.75)
[b]Relationship assessment	−0.14 (−0.71, 0.43)	0.24 (−0.41, 0.89)	−0.00 (−0.70, 0.69)
[b]Years with study partner	0.33 (−0.47, 1.14)	0.55 (−0.35, 1.46)	0.43 (−0.54, 1.41)
Past experiences that increase vulnerability-and drug related, housing and psychological problems			
[a]Previously in drug treatment program	1.67 (1.31, 2.14)****	2.05 (1.54, 2.73)****	2.27 (1.66, 3.10)****
[a]Previously in residential treatment program	1.69 (1.27, 2.23)***	2.04 (1.51, 2.76)****	2.06 (1.50, 2.84)****
[a]TCUDS $\geq$ 3	1.54 (1.11, 2.14)**	1.36 (0.96, 1.94)$^{+}$	1.67 (1.16, 2.42)**
[a]CAGE $\geq$ 2	1.13 (0.81, 1.57)	0.84 (0.57, 1.24)	0.93 (0.62, 1.40)
[a]Previously incarcerated	0.99 (0.77, 1.28)	1.09 (0.82, 1.45)	1.06 (0.78, 1.44)
Risk behaviors			
[a]STD positive	1.48 (1.04, 2.10)*	1.96 (1.36, 2.83)***	2.03 (1.38, 2.98)***
[a]Traded sex for drugs, money, food	2.51 (1.31, 4.81)**	3.68 (2.00, 6.78)****	3.38 (1.82, 6.28)***
[a]Concurrent opposite sex partners	1.78 (1.19, 2.67)**	1.30 (0.84, 2.01)	1.56 (1.00, 2.45)*
Relationship based risks			
[b]Protected sex (90d)	−7.06 (−11.32, −2.80)**	−2.60 (−7.41, 2.21)	−4.28 (−9.48, 0.93)
[b]Unprotected sex (90d)	−2.59 (−6.49, 1.30)	−0.23 (−4.59, 4.13)	−1.26 (−5.98, 3.45)
[b]Proportion protected sex (90d)	0.02 (−0.03, 0.08)	0.07 (0.01, 0.13)*	0.05 (−0.01, 0.12)
[b]Vaginal sex (90d)	−4.99 (−9.48, −0.49)*	1.00 (−4.05, 6.04)	−0.32 (−5.77, 5.13)
[b]Anal sex (90d)	0.06 (−2.57, 2.68)	−0.69 (−3.47, 2.10)	−0.89 (−3.88, 2.10)

[a] Estimate = odds ratio of abuse comparing 'exposed to non-exposed' and corresponding p-value from 1 df $\chi 2$ test statistic

[b] Estimate = mean difference and corresponding p-value from two-sample *t*-test comparing mean 'exposure' for participants who reported abuse to those who did not report abuse

CAGE = alcohol abuse scale; CAGE $\geq$ 2 identifies alcohol problems

TCUDS = drug abuse scale; TCUDS $\geq$ 3 identifies drug problems

Relationship assessment scale—measures relationship satisfaction in intimate relationships; scores range from 7 (low satisfaction) to 35 (high satisfaction)

Quality of life = sum of two responses related to feelings about life now and about life one year from now; scores may range from 2 (worst possible life now and one year from now) to 20 (best possible life now and one year from now)

$^{+}$ $P < 0.10$; * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$; **** $P < 0.0001$

statistics. Corresponding odds ratios (OR) and 95% confidence intervals (CIs) compare rates of abuse for HIV-positive and HIV-negative participants. In Table 3, χ^2 test statistics (df = 2) and corresponding *P*-values are presented testing for any statistical association between the distribution of each three level couple outcome (neither, one, or both partners reporting abuse) and gender of the HIV-positive partner. Corresponding odds ratios are also presented comparing the couples where the HIV-positive partner is female to couples where the HIV-positive partner is male. We fit multinomial regression models for the three level couple CSA response in order to examine whether the gender of the HIV positive partner was associated with couple CSA scores via a cumulative logit model. All

results from the regression model are summarized in the text below. Table 4 presents the estimated associations of individual-level correlates of abuse for each abuse outcome of interest (CSA, ASA and both CSA and ASA). This analysis focuses on individual outcomes and correlates because an abuse history as an individual outcome may have occurred outside the context of the current relationship. We considered a number of correlates from the following broad categories: demographics, relationship characteristics, past experiences that increase vulnerability, risk behaviors, and relationship based risks. Odds ratios, 95% confidence intervals and *P*-values from 1 df Chi-square tests are presented for binary correlates while mean differences, corresponding 95% confidence intervals and *P*-values from two-sample *t*-tests comparing the mean values of each potential correlate among participants who reported abuse to those who did not report abuse are presented for continuous correlates. These analyses are presented for the entire study sample, however we did examine whether or not observed associations differed for men and women by fitting a model with the main effects of each potential correlate and gender, as well as the 'correlate X gender' interaction term. Any outcome, correlate combination with significant 'correlate X gender' terms were further highlighted to illustrate gender as a modifier of the effect of the correlate on the abuse outcome. All analyses were completed using SAS V9 (SAS Institute, Cary NC) and all hypotheses tests were two-sided and conducted at the alpha = 0.05 level.

Results

The prevalence of CSA (age 17 and younger) and ASA (age 18 and older) was reported as 482 (45.0%) and 274 (25.6%), respectively, of the 1070 participants in the study.

Women

The majority of the women (63.6%) in the study reported histories of CSA (67.94% of HIV positive and 60% of HIV-negative women, (χ^2 (df = 1) = 3.48; $P = .0622$). Nearly half, or 48.2%, of women in the sample reported adult sexual abuse. HIV-positive women were significantly more likely to have a history of ASA (54.23%) compared to HIV-negative women (40.48%), (χ^2 (df = 1) = 9.59; $P < 0.01$). HIV-positive women were also significantly more likely to have reported *either* one kind of abuse history (CSA or ASA) (32.32%) or *both* histories (45.08%) compared to HIV-negative women (*either* history = 35.10%; *both* histories = 32.69%), (χ^2 (df = 2) = 9.50; $P < .01$. The corresponding odds ratios comparing HIV-positive to HIV-negative women, for *either* CSA or ASA history, compared to *no* history of either was equal to 1.31 (95% CI: [0.84, 2.07]), suggesting no significant difference between the two groups, P = ns. However, the estimated odds ratio for HIV-positive women versus HIV-negative, for *both* CSA and ASA histories, compared to *no* history was equal to 1.97 (95% CI: [1.27, 3.06]), suggesting that HIV-positive women were significantly more likely to have histories of both CSA and ASA compared to HIV-negative women.

Men

More than one quarter of the men (26.54%) in the study reported early sexual abuse CSA, with significantly more HIV-positive men reporting CSA (34.93%) compared to HIV-negative men (22.04%), (χ^2 (df = 1) = 10.50; $P < .01$). The odds of having a CSA history were nearly twice as high for HIV-positive compared to HIV-negative men (OR = 1.90; 95% CI: [1.28–2.80]). ASA was reported by 16 (3%) of men in the sample. HIV-positive men were significantly more likely to have a history of ASA (5.19%) compared to HIV-negative men (1.55%), (χ^2 (df = 1) = 5.81; $P = 0.02$). HIV-positive men were also significantly more likely to have reported either *one* kind of sexual abuse history (CSA or ASA) (31.58%) or *both* kinds (4.31%) compared to HIV-negative men (*one* history = 21.15%; *both* histories = 1.28%), (χ^2 (df = 2) = 13.09; $P < .01$). The odds ratio of CSA history for HIV-positive compared to HIV-negative men was equal to 1.81 (95% CI: [1.23, 2.74]). HIV-positive men had nearly twice the odds of having reported a history of CSA compared to HIV-negative men.

Couples

Table 3 presents the rates of couple-level CSA and ASA. Specifically, data were classified into 3-levels for CSA and ASA: whether neither, one, or both partners reported histories of CSA and ASA. Overall, 72% of couples reported one or both partners had a history of child sexual abuse. The distribution of couple-level CSA is significantly different in couples where the HIV-positive partner is male, compared to couples in which the HIV-positive partner is female, (χ^2 (df = 2) = 17.24; $P < 0.01$). A higher prevalence of CSA for *at least one partner* was reported for couples where the female was HIV-positive compared to couples where the male was HIV-positive (74.8 and 68.6%, respectively). However, couples where the HIV-positive partner was male had a higher CSA prevalence reported by *both* partners (26.57% in couples with HIV-positive males, compared to 15.08% in couples with HIV-positive females). Early sexual abuse was reported by 67.9% of female partners and 22.0% of male partners in couples with

HIV-positive females. In contrast, CSA was reported by 60.0% of female partners and 34.9% of male partners in couples with HIV-positive males. Finally, HIV-positive males reported a significantly higher prevalence of CSA (34.9%) compared to HIV-negative males (22.0%), (χ^2 (df = 1) = 10.50; $P < 0.01$). However, this difference was only marginally different for females (67.9% for HIV-positive s compared to 60.0% for HIV-negative females), (χ^2 (df = 1) = 3.48; $P = 0.06$).

The distribution of the 3-level couple ASA measure is significantly different in couples where the HIV-positive partner is male, (χ^2 (df = 2) = 10.02; $P < 0.01$). Approximately 45% of couples in which the female partner was HIV-positive did not report ASA compared to 57% of couples where the male was the HIV-positive partner. When the HIV-positive partner was female, 54.57% of couples reported one partner experiencing ASA, compared to 41.43% of couples where the male was HIV-positive. There were only six couples where *both* partners had experienced ASA.

We fit a cumulative logistic multinomial regression model for each 3-level couple CSA score (CSA experienced by neither, one, or both partners) as a function of couple-type (HIV-positive partner is either male or female) in order to examine the association between couple-type and the total number of incidents per couple. The odds of fewer total CSA incidents per couple was not statistically different between couples in which the female was HIV-positive and those in which the male was HIV-positive (odds ratio = 1.14, 95% CI [0.81, 1.59]).

Discussion

This study reports the prevalence of child and adult sexual abuse in one of the largest samples of African-American couples in the United States. A total of 535 serodiscordant couples were recruited from four major cities with high HIV prevalence rates—Atlanta, New York, Philadelphia and Los Angeles. The sample included men and women with average age in their 40 s, most of who lived together, had a high school education or less, and were living at or well below the poverty level for the US [3]. Women were less likely than their male partners to be employed. Most of these couples had a history of incarceration, spent time in drug treatment programs, and lived in residential facilities, such as half-way houses and homeless shelters. The rates of Hepatitis C, low CD 4 count and reports of high viral loads suggest that this is a health compromised sample of men and women, even though most have access to HIV and non-HIV medications through public insurance. A person living with HIV may have increased responsibility of taking care of the uninfected partner, which placed couples and families at increased economic and health related risks. Thus this population's vulnerability not only to HIV infection, but also to other social and structural factors is clear.

This study also examines the relationship between sexual abuse histories by gender and HIV serostatus. Given that one of the major sources of HIV transmission is through sexual contact [1], most studies report on sexual behaviors, but do not assess or separate consensual from non-consensual sexual experiences. This is a necessary distinction because past histories can influence current behaviors. If the full range of sexual experiences is not taken into account, the effectiveness of the prevention services that couples receive may be limited [36]. The findings indicated a strong relationship between HIV serostatus and abuse history. In this population, 72.3% of couples reported that one or both partners had a history of child sexual abuse. Consistent with previous studies [14]. African American women, especially those who were HIV-positive, were more likely to report CSA histories than HIV-negative women. Other studies reporting the prevalence of sexual abuse primarily among African American men, have focused on men who had sex with men [18, 35]. It is important to recognize same gender sexual experiences among these couples as well, but in this sample they were few in number. These findings help to highlight the common occurrence of early sexual abuse experiences in couples, particularly among those where one partner is HIV positive and the other is HIV negative.

Over half of the couples in which the female was HIV-positive (55.4%) and 43.3% of the couples in which the HIV-positive person was male, reported a history of attempted or completed incidents of adult rape. While fewer persons reported ASA incidents than CSA incidents, the rates of ASA are nevertheless notable. When early sexual abuse occurs, the likelihood of being re-victimized increases [69, 70]. In this sample, HIV-positive women (45.1%) were more likely to report sexual re-victimization after age 18 compared to HIV negative women (32.7%) or men (5.6%). Both partners were most likely to report early sexual abuse in couples where the male was HIV-positive.

When sexual risk taking among couples was examined, there were different patterns noted for individuals who reported abuse over their life course versus those who reported abuse only in childhood or adulthood. Individuals who reported histories of CSA and ASA tended to report psychological vulnerability, including psychological distress, and histories of being in drug and residential treatment programs. In addition, they were also more likely to; (1) report having had sex in exchange for money, food or drugs; (2) have an STI; (3) be HIV positive; and (4) to be women. These findings suggest that economic problems that impacted daily living were associated with histories of

abuse. HIV positive female partners with this pattern across time seem to be the most psychologically impacted and at risk for STI and HIV transmission among women.

Further, patterns of sexual abuse both before and since age 18 were related to outcomes associated with substance abuse, housing, or other psychological problems that increase women's vulnerability in relationships. We also confirmed that HIV positive women were less likely to use condoms with their partners and to have STI histories. While these women's risks may have been diminished, STI transmission can still occur among couples where the woman is HIV infected and may have an STI, as well.

Women with histories of CSA but not ASA reported a different constellation of sexual risks, including engaging in unprotected sex [50] and less frequent vaginal sex with their primary partner [36]. However, they reported more concurrent partners [21]. More research is needed to determine if these women were more sexually active with partners outside of their primary relationship than they were in their current relationships. They may also have engaged in risky sexual practices before the relationship with partners in this study. Individuals who reported histories of ASA, but not CSA, were more likely to use condoms when engaging in sexual encounters.

These findings suggest that while histories of sexual abuse among African American couples need to be addressed, HIV-positive African American women, in particular, may require additional skills to effectively negotiate with partners about high-risk behaviors and to protect themselves from future abuse [48]. Risky but long-established coping strategies may influence their physical health and well being [46, 47] and could create or maintain a power imbalance between sexual partners [66]. Research examining how past experiences can heighten risks for abuse and trauma in current relationships awaits further study [67, 68].

It is important to recognize that serodiscordant couples who are seeking therapy or counseling may not be asked about their serostatus or histories of sexual abuse. Training health professionals to address these issues may help to minimize HIV transmission, sexual re-victimization and help couples develop healthy sexual relationships. Recently, histories of sexual abuse have been integrated into HIV interventions that have been developed for African-American women and men [18, 36]. These interventions have addressed the gender and cultural context needed to reduce individual risks and to enhance HIV-related sexual and violence self-protection. The findings also highlight the importance of recognizing gender and sexual orientation in future interventions. There may be critical socialization issues involving cultural beliefs and values that men and women learn, as well as misinformation about gender-related sexual stereotypes that need to be clarified [19].

This study had several unique qualities. It is one of the largest and most comprehensive studies of serodiscordant couples at multiple sites with at-risk African Americans [1]. Most CSA research is conducted with college or clinic samples who fail to report the ethnicity of their participants [75]. This study, though not representative, is based on community sample of African American serodiscordant couples. Research has not focused on the prevalence, circumstances, and long-term correlates of sexual abuse in African Americans who are in committed relationships and are affected by HIV. The study also uses a comprehensive measure of CSA and ASA. Most research examining sexual abuse uses single-item questions, in contrast to the present measure. This accounts for the consensual nature of the sexual activity, victim and perpetrator age discrepancy, as well as the specific sexual behaviors that occurred. This measure has been used for almost three decades in numerous studies, which provides a sense of consistency in the method and design of this study [12]. However, limitations of the current research should be addressed. Recruitment was based on convenience sampling and thus limits the representativeness of the findings. Although efforts were made to recruit highly diverse couples with regard to age and length of relationships, our sample tended to be older and more established, highlighting the need to expand research with younger couples in newer relationships. Finally, the focus of this study is on self-identified African Americans, and similar research with other ethnic groups or individuals is needed.

Future research should examine the relationships between histories of child and adult sexual abuse in couples and specific behaviors like concurrency of partners that may heighten risks to uninfected partners. This paper reports the high prevalence of such sexual abuse, as well as sexual risks and psychological vulnerability, especially among HIV-positive women. The study findings stress the need for interventions that can help to reduce the effects of trauma as a result of sexual abuse histories and HIV serostatus [36]. African American couples can benefit from learning trauma related coping skills to maintain relationships that can enhance the quality of their lives while reducing HIV-related risk.

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ORIGINAL PAPER

The Contribution of Male and Female Partners' Substance Use to Sexual Risks and STDs Among African American HIV Serodiscordant Couples

The NIMH Multisite HIV/STD Prevention Trial for African American Couples Group

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Abstract Growing evidence suggests that drug and alcohol use are fueling the heterosexual transmission of HIV among African Americans. This study aims to examine the relative contribution of drug and alcohol use of male and female partners to risks of heterosexual transmission of HIV among 535 African American HIV serodiscordant couples ($N = 1{,}070$ participants) who participated in an HIV prevention trial. Associations found between use of drugs and alcohol by one or both partners and sexual risk indicators varied by type of substance and whether male or female partner or both partners reported use. The findings suggest multiple ways in which substance use of male and female partners may be contributing to the heterosexual transmission of HIV and other STDs among African Americans and underscore the need for HIV prevention strategies to address dyadic patterns of substance use that lead to sexual risks.

The NIMH Multisite HIV/STD Prevention Trial for African American Couples Study Group

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Introduction

The epidemic of HIV among African Americans in the United States has continued unabated. African Americans or blacks represented 51% of all HIV/AIDS cases even though they represented less than 13% of the U.S. population in 2006 [1]. Estimated HIV/AIDS diagnosis rates among African American men were 7 times higher than for white men; rates for African American women were 20 times higher than rates than for white women [1]. Two features distinguish the epidemic in black Americans: the high rate of infection in women and the high proportion of HIV cases attributed to heterosexual transmission; both are also characteristic of the epidemic in Africa. From 2001 to 2005, CDC surveillance data indicate that almost one-quarter (24%) of HIV positive African American men were infected by heterosexual contact compared to 6% of white men, while 80% of African American women were infected through heterosexual contact compared to 53% of white women [1]. Growing evidence suggests that drug and alcohol use may be fueling the heterosexual transmission of HIV among African American men and women. To date, however, few studies have examined how the drug and alcohol use patterns of male and female partners contribute to sexual risk behaviors that result in HIV infection among African American heterosexual couples.

Understanding the role of alcohol and various drugs in contributing to male and female partners' individual and shared sexual risk behaviors among African American HIV serodiscordant couples may inform the design of more effective prevention strategies to stem the epidemic among African Americans. Accumulating research over the past two decades has found that drug and alcohol use are associated with having unprotected sex, having concurrent sexual partners, and contracting HIV and other sexually transmitted diseases (STDs) among African American men and women [2–5]. This research, however, suggests that these associations vary substantially by type of substance use. Unclear, however, is the extent to which the use of different drugs and alcohol by the male partner, by the female partner or by both partners may contribute to inconsistent condom use, sex with outside partners and other sexual risks that may increase the likelihood of HIV and STD acquisition.

Substantial evidence indicates alcohol use and binge drinking are consistent predictors of having sex with multiple partners [4, 6, 7], not using condoms [7] and testing positive for HIV or STDs [4] in several populations, including African Americans. Binge drinking was found to be associated with engaging in sex with multiple concurrent partners in a study of 206 African American HIV positive men and women [6]. In a recent study of 672

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heterosexual African American men, binge drinking was associated with having unprotected sex, sex trading and recent HIV/STD diagnosis [4]. While these studies suggest that alcohol use indicators are associated with a range of sexual risk behaviors among both men and women, the effect of different couple drinking patterns (i.e. whether one or both partners use alcohol) on sexual risk behaviors has not yet been adequately researched.

Crack cocaine use has also been identified as importantly contributing to the disproportionately high rates of HIV infection and other STDs among heterosexual African Americans [2, 3, 8]. Substantial evidence indicates that crack cocaine use among African Americans and mixed populations increases the likelihood of a range of sexual risk behaviors, including having unprotected sex [8, 9], having multiple partners [3, 5], and exchanging sex for money or drugs [10, 11]. Crack cocaine use is also associated with a higher incidence of testing positive for HIV among heterosexual African Americans [2, 12, 13].

Research findings on the relationship between use of illicit drugs other than crack cocaine and sexual risks are sparser and have not focused specifically on African Americans. Studies of injecting drug users (IDUs) have found low rates of condom use, high rates of having multiple sexual partners and high rates of STDs [14–16], suggesting that sexual transmission may be accounting for a substantial portion of HIV incidence among IDUs. Some evidence also has linked non-injection opiate use to inconsistent condom use, multiple sexual partners and STDs [14–16]; however, other studies have found no significant associations between non-injection opiate use and condom use or having multiple sexual partners [17]. Although several studies have found that marijuana use increases the likelihood of inconsistent condom use, multiple sexual partners, and STDs among adolescents [18–20], few studies have examined the relationship between marijuana use and sexual HIV risk behaviors and STDs among adults.

This study aims to address some of the gaps in the research. We examined the effect of use of alcohol and drugs on a range of sexual risk behaviors and biological prevalence of STDs in a sample of 535 African American HIV serodiscordant couples ($N = 1070$). By using couple-level data from both male and female partners on patterns of different types of substance use and sexual risk behaviors and biologically confirmed STDs, this study aims to examine the relative contribution of the drug and alcohol use of male and female partners to the risk of HIV/STD transmission in heterosexual African American HIV serodiscordant couples. By differentiating drug use by type and severity of use for both partners and using multiple sexual risk indicators, this study seeks to advance a more nuanced understanding of the relative contribution of both partners' substance use to HIV/STD transmission risks. The specific purpose of this study is twofold: (1) to describe the prevalence of use of different drugs and alcohol, sexual HIV risk behaviors, and biologically confirmed STDs (i.e., Chlamydia, gonorrhea, and trichomoniasis) among African American HIV serodiscordant couples; and (2) to examine the multivariate associations between the use of alcohol and various drugs by male and female partners and three outcomes: frequency of condom use, having sex with outside partners, and biological STD prevalence, adjusting for the sociodemographics of the couples.

Methods

Study Design

This article used baseline data from the Eban study, a two-arm, couples-based randomized controlled intervention trial of HIV serodiscordant African-American couples from four cities in the U.S. (Atlanta, GA, Los Angeles, CA, New York, NY, and Philadelphia, PA). The study tested the efficacy of a couple-focused HIV/STD risk reduction intervention versus an individual-focused health promotion intervention in reducing sexual risk behaviors and STD incidence [21]. The study design and details are described in the NIMH Multisite HIV/STD Prevention Trial [22] in this issue. For more detail on study design, see also Bellamy et al. [23] and NIMH Multisite HIV/STD Prevention Trial for African American Couples Group [21].

The Study Sample and Recruitment of the Couples

The study includes 535 couples (1,070 individuals) enrolled at four different urban study sites in the U.S.—Atlanta, Los Angeles, New York and Philadelphia. Couples at all four sites were recruited from HIV care clinics, HIV testing and counseling sites, primary care clinics, AIDS services organizations, substance abuse treatment programs, churches and HIV/AIDS ministries, HIV/AIDS providers and community-based coalitions and advocacy organizations. Study recruitment procedures and eligibility criteria are described in NIMH Multisite HIV/STD Prevention Trial [22] in this issue.

Data Collection

Participants completed an Audio Computer-Assisted Survey Interview (ACASI), which assessed socio-demographics, relationship characteristics, frequency of use of different

The NIMH Multisite HIV/STD Prevention Trial for African American Couples Group
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drugs in the past 90 days, drug dependency, alcohol dependency, and sexual behaviors. Males provided a urine specimen and women provided two self-obtained vaginal swab specimens that were assayed for three STDs (chlamydia, gonorrhea, and trichomonas). The data summarized in this article were obtained exclusively from ACASI and from biologically confirmed STDs.

Assessment of Self-Report Measures

The socio-demographic and sexual behavior measures are described in detail in NIMH Multisite HIV/STD Prevention Trial [22] in this issue. The Cutting down, Annoyance by criticism, Guilty feeling and Eye-openers (CAGE) brief screener was used to assess lifetime alcohol dependence [24] and the Texas Christian Drug Screen II (TCUDS) [25] to identify individuals with a history of heavy drug use and dependence. Alcohol and drug problems were denoted by CAGE scores greater than or equal to 2 and by TCUDS scores greater than or equal to 3, respectively.

Statistical Analysis Methods

Descriptive summaries were calculated for sociodemographic characteristics and sexual behaviors, and appropriate paired two-sample methods were employed to compare male and female participants. Table 1 presents means and standard deviations for continuous measures, with paired t-tests and the resulting *P*-values comparing mean male and female measures. Similarly, categorical measures are summarized by frequencies and percents and corresponding Cochran–Mantel–Hansel (χ^2_{CMH}) chi-squared tests with appropriate degrees of freedom comparing the distribution of those frequencies in men and women. Table 2 summarizes the couple distributions of all substance use variables of interest. Additionally, this table presents the average Cochran-Mantel-Hansel estimated odds ratio (OR), 95% confidence interval (CI) and associated p-value from testing the null hypothesis that if one and only one partner in a couple is alcohol- or drug-dependent, the probability that it is the male equals the probability that it is the female.

Table 3 presents estimated ORs and corresponding 95% CIs resulting from logistic regression modeling of each binary outcome (proportion condom-protected sex, presence of STDs, and concurrent sexual partners) versus couple response (whether both partners reported 'yes' for the outcome, the male only reported 'yes', the female only reported 'yes', or neither partner reported 'yes' [the reference group]) for various substance-use measures. Similarly, ordinary linear regression was used to estimate mean differences and corresponding 95% CIs for the log-frequency of unprotected sexual episodes with study partner in the past 90 days versus the drug and alcohol outcomes of interest. If participants reported no unprotected sexual episodes with their partners in the past 90 days, we imputed 0.01 for those responses so they would be represented in the fitted model. Finally, adjusted models were also fit, modeling each outcome versus each substance abuse measure, adjusting for the following couple-level variables: gender of the HIV positive partner; the couple's age difference, (male partner's age–female partner's age), relationship length, marital status, employment status and whether both partners were African American.

Because unadjusted and adjusted analyses were similar, we only report the adjusted analyses (adjusted for gender of HIV positive partner, couple age difference, relationship length, marital status, employment status, and whether both partners were African American) in the text; however, both unadjusted and adjusted analyses are presented in Table 3.

All analyses were completed using SAS Version 9 (SAS Institute, Cary NC).

Results

Sociodemographics

Table 1 summarizes baseline sociodemographics, relationship characteristics, alcohol and drug dependency characteristics of the sample. Additionally, this table summarizes the sexual risk behaviors (proportion of condom-protected sex, frequency of unprotected sex, prevalence of concurrent sexual partners), and prevalence of STDs. Participants were on average in their low to mid-forties, a little more than a one-quarter were employed (28.4%), 71.0% were earning less than $850 per month, and nearly a third (30.7%) did not have a high school degree. Compared with male partners, females were significantly younger (mean age 41.7 (sd = 7.68) vs. 45.09 (sd = 8.13); paired $t = 9.95$, $P < 0.0001$), less likely to be employed (22.8 vs. 34.1%, $\chi^2_{CMH} = 19.89$, $P < 0.0001$), reported significantly shorter times being in a relationship with their study partners (mean years 6.74 (sd = 6.44) vs. 7.09 (sd = 6.68); paired $t = 3.22$, p = 0.0014), more likely to have health insurance (81.9 vs. 68.9%, $\chi^2_{CMH} = 25.98$, $P < 0.0001$), and less likely to have been incarcerated (48.5 vs. 76.4%, $\chi^2_{CMH} = 90.24$, $P < 0.0001$).

Female participants were significantly less likely to score positive for alcohol dependency (CAGE $\geq$ 2) than were their male partners (13.15 vs. 19.02%, $\chi^2_{CMH} = 7.57$, $P = 0.0059$), however there were no gender of partner differences in drug dependency (TCUDS $\geq$ 3; 15.31% vs. 19.09% for females and males, respectively; $\chi^2_{CMH} = 3.33$, $P = 0.07$). The average proportion of condom-protected sex was 0.44 (sd = 0.43); however, female participants

Table 1 Demographic characteristics of study population

	Males ($n = 535$)	Females ($n = 535$)	Total ($N = 1,070$)	Statistic
Age	45.09 ± 8.13	41.73 ± 7.68	43.41 ± 8.08	9.95****
Education				15.38***
<HS graduate	141 (26.55%)	185 (34.77%)	326 (30.67%)	
HS graduate/GED	249 (46.89%)	188 (35.34%)	437 (41.11%)	
Some college	141 (26.55%)	159 (29.89%)	300 (28.22%)	
Employed	181 (34.09%)	121 (22.83%)	302 (28.4%)	19.89****
Income				3.47
<$400/month	158 (29.81%)	149 (28.11%)	307(28.96%)	
$400–850/month	212 (40.00%)	234 (44.15%)	446 (42.08%)	
$851–1,650/month	103 (19.43%)	102 (19.25%)	205 (19.34%)	
$1,651+/month	57 (10.75%)	45 (8.49%)	102 (9.63%)	
Insured	365 (68.87%)	435 (81.92%)	800 (75.40%)	25.98****
Years lived in U.S.	44.25 ± 9.73	40.31 ± 10.01	42.29 ± 9.89	8.18****
Living arrangement				0.96
My own/family home/Apt	446 (83.99%)	452 (84.96%)	898 (84.48%)	
Someone else/not family	24 (4.52%)	25 (4.70%)	49 (4.61%)	
Rooming/welfare resident	59 (11.11%)	52 (9.77%)	111 (10.44%)	
Homeless	2 (0.38%)	3 (0.56%)	5 (0.47%)	
Living with study partner	405 (76.42%)	401 (75.52%)	806 (75.97%)	0.71
Time with study partner	7.09 ± 6.68	6.74 ± 6.44	6.91 ± 6.56	3.22**
Married to study partner	175 (32.97%)	170 (32.02%)	345 (32.49%)	0.95
Previously incarcerated	405 (76.42%)	256 (48.48%)	661 (62.45%)	90.24****
Alcohol dependency (CAGE ≥ 2)	101 (19.02%)	70 (13.15%)	171 (16.10%)	7.57**
Drug dependency (TCUDS ≥ 3)	101 (19.09%)	81 (15.31%)	192 (17.20%)	3.33^{+}
Outcomes of interest				
Proportion condom-protected sex	0.46 ± 0.43	0.42 ± 0.43	0.44 ± 0.43	3.14**
Unprotected Sex	14.57 ± 25.25	16.57 ± 35.36	15.57 ± 30.71	-1.26
Any STD	28 (5.27%)	120 (22.51%)	148 (13.91%)	75.60****
Concurrent sexual partner	56 (10.59%)	52 (9.77%)	108 (10.18%)	0.29

Values shown are N (%) or mean ± stddev. P-values for continuous variables were determined by paired t-tests; pvaluesfor categorical variables were determined by CMH tests

$^{+}$ $P < 0.10$; * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$; **** $P < 0.0001$

Table 2 Alcohol and drug dependency and use of different substances among both partners, male partner only and female partner only ($N = 535$ couples)

Frequency (%)	Neither	Female only	Male only	Both	OR_{CMH} (95% CI)
Alcohol dependency	379 (71.78%)	48(9.09%)	79(14.96%)	22(4.17%)	1.65(1.15, 2.36)**
Drug dependency	374(71.37%)	50(9.54%)	70(13.36%)	30(5.73%)	1.40(0.97, 2.01)$^{+}$
Substance use in the past 90 days					
Used any substances to get high or relax	240(45.80%)	60(11.45%)	119(22.71%)	105(20.04%)	1.98(1.45, 2.71)****
Smoked marijuana	318(61.15%)	56(10.77%)	92(17.69%)	54(10.38%)	1.64(1.18, 2.29)**
Injected heroin, cocaine or any other drugs	480(92.84%)	11(2.13%)	21(4.06%)	5(0.97%)	1.91(0.92, 3.96)$^{+}$
Used any other illegal drugs	337(65.31%)	50(9.69%)	78(15.12%)	51(9.88%)	1.56(1.09, 2.23)*

Odds ratios for males only versus females only (OR), confidence intervals (CI) and *P*-values are from the Cochran–Mantel–Haenszel (CMH) chi-square test for categorical variables

$^{+}$ $P < 0.10$, * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$, **** $P < 0.0001$

Table 3 Associations between substance use exposure variables (*rows*) and sexual behavioral and STD outcomes (*columns*)

Sexual behaviors and STD outcomes (*columns*) Substance abuse exposures (*rows*)	Condom-protected sex[a]		(log)Unprotected sex[b]		STD[a]		Concurrent sexual partner[a]	
	Unadjusted	Adjusted[c]	Unadjusted	Adjusted[c]	Unadjusted	Adjusted[c]	Unadjusted	Adjusted[c]
Alcohol dependent								
Female only[d]	1.52(0.83, 2.79)	1.46(0.83, 2.58)	0.24(−0.40, 0.88)	0.19(−0.46, 0.84)	1.20(0.61, 2.34)	1.18(0.59, 2.35)	2.85(1.49, 5.47)	2.53(1.27, 5.06)
Male only[d]	0.67(0.38, 1.16)	0.69(0.38, 1.25)	−0.20(−0.89, 0.50)	−0.15(−0.84, 0.54)	1.09(0.65, 1.84)	1.09(0.63, 1.88)	1.39(0.73, 2.64)	1.57(0.81, 3.05)
Both[d]	1.32(0.49, 3.54)	1.61(0.61, 4.24)	−0.42(−1.71, 0.88)	−0.14(−1.41, 1.13)	1.49(0.60, 3.71)	1.24(0.46, 3.37)	1.14(0.38, 3.44)	1.26(0.39, 4.04)
Drug dependent								
Female only[d]	1.05(0.61, 1.80)	1.46(0.81, 2.63)	0.52(−0.26, 1.29)	0.29(−0.46, 1.03)	2.11(1.13, 3.95)	2.13(1.09, 4.16)	2.23(1.20, 4.14)	1.99(1.00, 3.96)
Male only[d]	0.92(0.47, 1.79)	0.86(0.45, 1.63)	−0.11(−0.84, 0.62)	0.14(−0.64, 0.91)	2.49(1.43, 4.34)	2.57(1.41, 4.69)	1.54(0.85, 2.81)	1.51(0.79, 2.89)
Both[d]	0.71(0.34, 1.50)	0.70(0.30, 1.65)	0.97(0.12, 1.83)	1.27(0.45, 2.09)	0.74(0.29, 1.92)	0.56(0.20, 1.58)	3.40(1.59, 7.26)	3.73(1.63, 8.58)
Used any substance to get high/relax								
Female only[d]	1.18(0.66, 2.10)	1.47(0.78, 2.77)	0.27(−0.38, 0.93)	0.24(−0.39, 0.88)	2.89(1.47, 5.67)	2.86(1.39, 5.87)	2.39(1.17, 4.91)	2.18(1.01, 4.72)
Male only[d]	0.83(0.50, 1.38)	0.78(0.47, 1.27)	0.04(−0.58, 0.66)	0.18(−0.43, 0.79)	1.91(1.13, 3.23)	1.75(1.02, 3.00)	2.05(1.19, 3.53)	1.71(0.96, 3.04)
Both[d]	0.61(0.36, 1.03)	0.69(0.40, 1.20)	0.71(0.13,1.28)	0.87(0.29, 1.46)	2.49(1.51, 4.12)	2.18(1.28, 3.72)	2.09(1.15, 3.82)	1.74(0.93, 3.26)
Smoked marijuana								
Female only[d]	1.11(0.62, 1.99)	1.37(0.72, 2.61)	0.40(−0.26, 1.06)	0.42(−0.25, 1.08)	1.76(0.91, 3.40)	1.63(0.82, 3.26)	2.79(1.48, 5.25)	2.77(1.42, 5.40)
Male only[d]	1.13(0.64, 1.98)	1.07(0.60, 1.89)	0.37(−0.21, 0.96)	0.45(−0.10, 1.00)	1.42(0.80, 2.54)	1.27(0.71, 2.28)	1.30(0.69, 2.44)	1.07(0.55, 2.08)
Both[d]	0.71(0.39, 1.30)	0.76(0.42, 1.40)	1.02(0.32, 1.73)	1.12(0.40, 1.83)	2.99(1.70, 5.25)	2.86(1.61, 5.06)	1.84(0.91, 3.74)	1.89(0.91, 3.92)
Injected heroin, cocaine, other								
Female only[d]	0.56(0.20, 1.58)	0.60(0.20, 1.80)	1.59(0.89, 2.28)	1.54(0.76, 2.32)	0.29(0.04, 2.40)	0.26(0.03, 2.22)	1.02(0.25, 4.18)	0.84(0.18, 3.97)
Male only[d]	0.71(0.26, 1.96)	0.61(0.19, 1.97)	0.69(−0.31, 1.70)	0.97(−0.05, 1.99)	0.70(0.24, 1.99)	0.60(0.20, 1.78)	1.51(0.58, 3.93)	1.34(0.47, 3.88)
Both[d]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Used other illicit drugs								
Female only[d]	1.74(1.00, 3.02)	2.33(1.31, 4.16)	−0.07(−0.81, 0.66)	−0.16(−0.85, 0.53)	1.84(0.94, 3.61)	1.69(0.81, 3.50)	1.83(0.91, 3.67)	1.79(0.85, 3.76)
Male only[d]	0.62(0.38, 1.01)	0.69(0.43, 1.12)	−0.10(−0.82, 0.63)	−0.02(−0.74, 0.70)	2.05(1.16, 3.63)	1.84(1.03, 3.29)	1.85(1.05, 3.25)	1.70(0.92, 3.15)
Both[d]	0.52(0.26, 1.03)	0.64(0.32, 1.30)	0.82(0.11, 1.54)	0.82(0.08, 1.55)	1.33(0.64, 2.75)	1.28(0.62, 2.66)	1.97(1.00, 3.88)	1.81(0.87, 3.77)

($n = 1{,}070$ participants; 535 couples)

[a] Odds ratio (OR) and corresponding 95% CI presented

[b] Mean difference and corresponding 95% CI presented

[c] Adjusted for gender of the HIV positive partner; the couple's age difference, relationship length, marital status, employment status and whether both partners were African American

[d] Partner(s) reporting the given substance use exposure behavior, compared to the reference category, which is defined as neither partner reporting the given substance use exposure behavior

reported significantly lower proportions than their male partners (0.42 (sd = 0.43) vs. 0.46 (sd = 0.43), paired $t = 3.14$; p = 0.0018). The prevalence of STDs was significantly higher in females than in males (22.51 vs. 5.27%, $\chi^2_{CMH} = 75.60$; $P < 0.0001$). There were no gender-of-partner differences in reported frequency of unprotected sex or prevalence of concurrent sexual partners.

Substance Use

Table 2 presents cross classification summaries of each binary substance abuse variable (e.g., drug dependency, alcohol dependency, any drug use in the past 90 days, sniffed or smoked heroin in the past 90 days, smoked marijuana in the past 90 days, injected drugs in the past 90 days, or used any other illicit drug in the past 90 days) with the 4 level variable characterizing the gender of the affected partner (e.g., neither partner affected, female partner only affected, male partner only affected, or both partners affected). Additionally, average OR_{CMH}, 95% CI and corresponding p-values are also presented to address the hypothesis that if one and only one partner in a couple is alcohol- or drug-dependent, the probability that it is the male equals the probability that it is the female. There were no gender-of-partner differences in the prevalence of injection drug use ($OR_{CMH} = 1.91$, 95% CI: 0.92, 3.96) or drug dependency ($OR_{CMH} = 1.40$, 95% CI: 0.97, 2.01). However, male partners were significantly more likely than female partners to be the only one in the couple who was alcohol dependent ($OR_{CMH} = 1.65$, 95% CI: 1.15, 2.36), to have used drugs in the past 90 days to get high or to relax ($OR_{CMH} = 1.98$, 95% CI: 1.45, 2.71), to have sniffed or smoked heroin ($OR_{CMH} = 2.00$, 95% CI: 1.00, 4.00), to have smoked marijuana in the past 90 days ($OR_{CMH} = 1.64$, 95% CI: 1.18, 2.29), or to have used some other illicit drug in the past 90 days ($OR_{CMH} = 1.56$, 95% CI: 1.09, 2.23).

Table 3 summarizes the results from fitted regression models which examine the associations between different substance use variables and four sexual risk outcomes: (1) condom-protected sex, (2) (log) frequency of unprotected sexual episodes with study partner in the past 90 days, (3) presence of an STD, and (4) at least one concurrent sexual partner. The adjusted models include the following covariates: gender of HIV positive partner, couple age difference, relationship length, marital status, employment status, and whether both partners were African American.

Alcohol Dependency and Sexual HIV Risks

There were no observed differences in likelihood of condom-protected sex, frequency of unprotected sex or prevalence of STDs based on which partner(s) if any, in a couple had alcohol dependency. However, couples where the female partner (only) scored positive for alcohol dependency were more likely to report concurrent sexual partners than couples where neither partner scored positive for alcohol dependence (OR = 2.53; 95% CI: 1.27, 5.06).

Drug Dependency and Sexual HIV Risks

Couples where both partners scored positive for drug dependence had approximately 3.56 more unprotected sexual episodes in the past 90 days, compared with couples where neither partner was drug dependent ({log} unprotected sex D = 1.27; 95% CI: 0.45, 2.09). Couples where only the female partner or only the male partner was drug dependent were more likely to test positive for an STD, compared with couples where neither partner was drug dependent (AOR = 2.13; 95% CI: 1.09, 4.16, and AOR = 2.57; 95% CI: 1.41, 4.69, respectively). Couples where only the female partner or where both partners were drug dependent were more likely to report concurrent sexual partners compared with couples where neither partner scored positive for drug dependency (AOR = 1.99; 95% CI: 1.00, 3.96, and OR = 3.73; 95% CI: 1.63, 8.58, respectively).

Use of any Substance to Get High/Relax and Sexual HIV Risks

Couples' reported use of any substance to get high or relax in the past 90 days was associated with increased STD prevalence. Couples where the female partner only, the male partner only, or both partners reported such substance use in the past 90 days were more likely to be STD positive, compared with couples where neither partner reported drug use (AOR = 2.86; 95% CI: 1.39, 5.87, AOR = 1.75; 95% CI: 1.02, 3.00, and AOR = 2.18; 95% CI: 1.28, 3.72, respectively). Couples where only the female partner reported substance use in the past 90 days were more likely to report concurrent sexual partners than couples where neither partner reported substance use in the past 90 days (AOR = 2.18; 95% CI: 1.01, 4.72). Compared with couples where neither partner reported using substances to get high or to relax in the past 90 days, couples where both partners reported substance use had 2.39 more unprotected sexual episodes ({log} unprotected sex D = 0.87; 95% CI: 0.29, 1.46).

Marijuana Use and Sexual HIV Risks

Couples where both partners reported marijuana use in the past 90 days had approximately 3.06 more unprotected sexual episodes than did couples where neither partner reported marijuana use ((log) unprotected sex D = 1.12; 95% CI: 0.40, 1.83). Couples where both partners reported

marijuana use were more likely to test positive for an STD than were couples where neither partner reported marijuana use (AOR = 2.86; 95% CI: 1.61, 5.06), and couples where only female partners reported using marijuana were more likely to have concurrent sexual partners (AOR = 2.77; CI: 1.42, 5.40).

Injection Drug Use and Sexual HIV risks

Because there were so few couples (<1%) where both partners reported injection drug use, this group was excluded from regression analyses. Couples where females were the only partner to report injection drug use had an average of 4.66 more unprotected sexual episodes than couples where neither partner reported use ({log} unprotected sex D = 1.54; 95% CI: 0.76, 2.32).

Use of Other Illicit Drugs and Sexual HIV Risks

Couples where female partners reported using other illicit drugs (not including marijuana or injection drug use) in the past 90 days were more likely to have protected sex (OR = 2.33, 95% CI: 1.31, 4.16); couples where both partners reported using other drugs reported an average of 2.27 more unprotected sexual episodes ((log) unprotected sex D = 0.82; 95% CI: 0.08, 1.55); and couples where only male partners reported other illicit drug use were more likely to test positive for STDs (OR = 1.84, 95% CI: 1.03, 3.29) than couples where neither partner reported other illicit drug use. There were no other observed differences.

Discussion

This study found multiple associations between use of various drugs and alcohol among both partners and a range of sexual HIV risks, including biologically confirmed STDs, among this sample of 535 African American HIV serodiscordant heterosexual couples. These associations varied by type and severity of substance use and type of sexual risk indicator and whether the female partner only, male partner only or both reported substance use. Findings from this study extend previous research on the relative contribution of the female partner's and male partner's use of different drugs and alcohol to increasing the likelihood of sexual risks and STDS among African American HIV serodiscordant couples.

Both the male and female partner's drug dependency increased the likelihood of testing positive for an STD. Drug dependency by the female partner only also increased the likelihood of reporting concurrent sexual partners and reporting a greater number of unprotected sexual episodes. Similarly, self-report of any substance use to get high or relax in the past 90 days by female partner only, male partner only and both partners increased the likelihood of testing positive for an STD. Any substance use by the female partner only was also associated with self-report of having concurrent sexual partners and any substance use by both partners was associated with a greater number of unprotected acts of sexual episodes. Contrary to findings from some previous studies [4, 6, 7], alcohol dependency by one or both partners was not associated with testing positive for STDs or self-reported sexual risk indicators except that female alcohol dependency increased the likelihood of concurrent sexual partners. These findings suggest that substance use in general, and drug dependency in particular, may increase the likelihood of HIV transmission among HIV serodiscordant couples who report substance use as they are more likely to engage in unprotected sex and more likely to test positive for an STD. Testing positive for an STD not only serves as a biological proxy indicator for HIV risk but the presence of an STD may also facilitate the transmission of HIV through open lesions and sores.

Self-reported marijuana use by either or both partners was linked to a range of sexual risk indicators, consistent with previous findings from studies of adolescents [18–20]. Marijuana use by both partners was associated with reporting a higher number of unprotected sexual acts and testing positive for an STD. Marijuana use by female partners increased the likelihood of concurrent sexual partners. While the role of marijuana use in contributing to HIV/STD transmission among adults is not well understood, these results suggest that there are multiple ways in which marijuana use by both partners or by the female partner may increase the likelihood of transmission. The rate of injection drug use was relatively low in this sample and did not increase the likelihood of HIV/STD transmission risks with the exception that injection drug use by the female partner was associated with a greater number of unprotected sexual acts. Use of other illicit drugs by both partners was associated with a higher number of unprotected sex acts and use of other illicit drugs by the male partners increased the likelihood of concurrent sexual partners. The combination of these findings suggests that use of other illicit drugs, like crack cocaine, may also contribute to HIV/STD transmission among this sample of African American HIV serodiscordant couples.

Several limitations of this study should be acknowledged. Because various drugs and alcohol were often used in combination, it was not possible to isolate the specific effects of individual drugs or alcohol on HIV/STD transmission. In addition, there was no separate indicator for crack cocaine use (crack cocaine use was included in "other illicit drug use"), which has been found to be associated with a range of sexual risk behaviors and HIV/

STDs [2, 12, 13]. Second, the study was not able to account for a broader range of psychosocial covariates that may have influenced the relationship between substance use and HIV risk indicators. Third, because this is not a random sample and because there may be selection bias, there are limits to the generalizability of these study findings. Finally, the inability to establish temporal sequencing between substance use and sexual risk indicators in this cross-sectional sample limits our ability to interpret study findings. These limitations should be addressed in future research.

In spite of these limitations, this study represents several methodological improvements over previous studies by: (1) examining a range of self-reported sexual risk indicators and biologically confirmed prevalence of three different common STDs; (2) collecting self-reported data on substance use and HIV risks from both partners and using couple-level risk behavioral indicators and controlling for couple-level socio-demographics; (3) enrolling African American HIV serodiscordant couples from four different urban locations across the U.S.

The study findings have several implications for policy and programs to prevent HIV/STD transmission among African American HIV serodiscordant heterosexual couples. First, the high rates of substance use, particularly among male partners, and their associations with multiple sexual risk indicators underscore the need to conduct routine screening for substance misuse in HIV treatment and care services and to improve service linkages to appropriate substance abuse treatment programs. More than one-quarter (28.6%) of the couples indicated that one or both partners scored positive for drug dependency, and 28.2% scored positive for alcohol dependency. Reversing drug and alcohol dependency in both female and male partners is likely to have numerous health benefits, including lowering the risk for HIV/STD transmission and increasing adherence to HIV medication. Second, the relatively high rate of biologically confirmed STDs found among this sample, which is consistent with STD rates in another recent study of African American drug users [12], also suggests the need to conduct routine screening for STDs among HIV positive men and women receiving HIV treatment and their HIV negative sexual partners. Failure to detect STDs in these HIV serodiscordant couples is likely to increase their risk of HIV transmission, as open lesions and sores from STDs can facilitate the transmission of HIV. Third, there are multiple contexts in which use of various drugs and alcohol and substance misuse may contribute to HIV/STD transmission in HIV serodiscordant couples, including: having sex with multiple concurrent partners, having sex under the influence of drugs with impaired ability and judgment to negotiate safer sex and to use condoms, trading sex for money or drugs to satisfy addiction needs and avoid going through withdrawal for self or partners, and contracting STDs. Finally, the study findings underscore the need for couple-based HIV prevention interventions that address the different drug-related triggers for sexual HIV risk behaviors among African American HIV serodiscordant heterosexual couples. Such couple-based HIV prevention strategies may synergistically address dyadic patterns of drug involvement and substance misuse that lead to inconsistent condom use and having multiple concurrent sexual partners. In sum, these study findings build upon previous research that suggests that drug and alcohol use may be playing a significant role in the spread of HIV and other STDs among African Americans. Effective intervention strategies to reduce drug involvement and substance misuse while addressing co-occurring HIV risks in this population are urgently needed in the public health arena. Such strategies may ultimately help curb the HIV epidemic among African American heterosexual men and women.

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ORIGINAL PAPER

Concordant and Discordant Reports on Shared Sexual Behaviors and Condom Use Among African American Serodiscordant Couples in Four Cities

The NIMH Multisite HIV/STD Prevention Trial for African American Couples Group

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Abstract This paper examines the concordance of reported shared sexual behaviors, including condom use, among 535 heterosexual, African American, serodiscordant couples and identifies factors that might predict discordant reports. Percentages of agreement, Kappa and McNemar's statistics and conditional probability indices are used to measure concordance. Logistic regression models identify predictors of couples' discordant sexual reports. Analyses revealed Kappa statistics for reporting anal sex, fellatio and cunnilingus indicated moderate to substantial agreement. The effects of demographics and the couples' relationship contexts on concordance of reported sexual behaviors were found to vary somewhat by gender and type of sexual behavior. Findings showed that concordance of reporting between the couples was consistent for the past 90 and 30 days. Findings from this paper provide new scientific insights into the knowledge base of self-reported couples' data and suggest that these data can be used to evaluate their accuracy and serve as a proxy for validity.

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Keywords HIV · Serodiscordant · Concordance · Discordance · African American couples

Introduction

Retrospective self-reports remain the primary mode of assessing condom use and other shared sexual behaviors in research on HIV, including controlled clinical trial studies. Because of the sensitivity of these topics, HIV researchers have raised concerns about the reliability, validity and potential biases of self-reports [1, 2].

Several researchers suggest that concordance of responses from couples reporting on shared sexual behaviors may serve as an approach to evaluate the accuracy of self-reported data and a marker of validity [2, 3]. Discordant reports of sexual activity and HIV risk behaviors among couples are also recognized as important because increasing evidence demonstrates that such behaviors are associated with STD transmission [4].

It is important to highlight that although using couples-based data may be a useful approach to evaluate accuracy and validity, the literature on self-reports of sexual behaviors suggests that measurement and participation bias [1, 5], different understandings of the meaning of the questions, not knowing or forgetting the correct true answer over time, and random or systematic distortion in recollection [2] may still contribute to discordant reports between sexual partners. These issues need to be taken into consideration when couples-based data are collected. Moreover, the time frame of the measurement collection may affect the reliability, validity and quality of the data. The literature has addressed this issue. For example, Jaccard et al. [6] found that the assessment of sexual behaviors over moderate time durations (3 or 6 months) rather than short or long durations (1 month or 12 months) have better self-report accuracy. Wyatt et al. (2004) [7] found that a longer time frame such as 90 days compared to 30 days is more appropriate for rare behaviors such as sexual behaviors among HIV positive women, who tend to be sexually active, but who engage in sex less frequently than negative women.

Research findings on the level of concordance on shared sexual behaviors and condom use are mixed but, overall, they demonstrate fair to good inter-partner agreement [1, 5, 8–15] Identifying specific respondent factors predicting partners differing on sexual reports may contribute to improving couple assessment by anticipating such discrepancies and developing effective mechanisms of quality assurance to avoid, address, or better explain such discordance in couple data sets.

The findings in the literature on individual and relationship predictors on shared sexual behaviors and condom use are also mixed. Several studies found partner agreement on sexual behaviors and risks (condom use, number of sexual partners, commercial sex) did not vary by age, ethnicity, or infection status and relationship factors

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(duration of relationship, quality of relationship) [14, 16], whereas others found associations between shared sexual behaviors and demographic variables [3, 12], and between shared sexual behaviors and relationship characteristics [3]. Moreover, a study by Witte et al. (2007) [3] found that among couples where the male partner was HIV positive, there was higher discordant reporting on whether the couple used condoms compared to those in which the men were HIV negative.

Although progress has been made in HIV research on concordance of reports of sexual behaviors among couples and on the associations between demographics, relationship factors and discordant shared sexual behaviors, there are considerable gaps in the literature on these research areas, particularly with reference to serodiscordant African American couples. Furthermore, in much of the research, the sample size studied has been very small. This paper addresses some of the gaps in the literature by focusing on a large sample of African American serodiscordant couples recruited from four U.S. cities.

Two primary research questions are addressed in this paper: (1) What is the concordance of reports of sexual behaviors (oral, anal, and vaginal intercourse) and use of male and female condoms during sexual intercourse in the past 90 and 30 days among 535 heterosexual, African American, serodiscordant couples? (2) What individual-level characteristics (age, ethnicity, marital status, level of education, HIV serostatus) and relationship-level characteristics (length of relationship, sexual dysfunction and relationship quality assessment) predict discordant reporting on shared behaviors and use of male and female condoms during the past 90 and 30 days among heterosexual, African American, serodiscordant couples? The implications of these findings for prevention intervention development and future research are presented.

Methods

Study Design

This paper used baseline data from the Eban study, a two-arm, couples-based randomized controlled intervention trial of HIV serodiscordant African American couples from four U.S. cities (Atlanta, GA, Los Angeles, CA, New York, NY, and Philadelphia, PA). The study tested the efficacy of a couple-focused HIV/STD risk reduction intervention versus an individual-focused health promotion intervention in reducing sexual risk behaviors and STD incidence (For more details on the study design see Bellamy [17] and NIMH Multisite HIV/STD Prevention Trial for African American Couples Group [18]). The study design and details are described in the NIMH Multisite HIV/STD Prevention Trial in this issue [19].

The NIMH Multisite HIV/STD Prevention Trial for African American Couples Group
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The Study Sample and Recruitment of the Couples

The study includes 535 couples (1,070 individuals) recruited from HIV care clinics, HIV testing and counseling sites, primary care clinics, substance abuse treatment programs, churches and HIV/AIDS ministries, HIV/AIDS services providers and community-based coalitions of advocacy organizations. Participants met specific study criteria (see NIMH Multisite HIV/STD Prevention Trial for African American Couples Group [18] for greater detail on study recruitment and criteria). Study recruitment procedures and eligibility criteria are described in NIMH Multisite HIV/STD Prevention Trial in this issue [19].

Assessment of Self-Report Measures

At baseline, data were obtained from three sources. First, participants completed a 90-min Audio Computer-Assisted Survey Interview (ACASI), which assessed sociodemographic and relationship characteristics, sexual behaviors and condom use, and psychosocial mediators that had sound psychometric properties and had previously been implemented with adult African American populations. Although both participating male and female partners completed the same ACASI assessments, the sexual behavior items were written to be appropriate for each specific gender. Subsequently, a trained African American interviewer administered validated and reliable assessments on sexual and physical abuse and a brief index assessing study participants' commitment to the African American community. Finally, males provided a urine specimen and women provided two vaginal swab specimens that were assayed for three STDs and HIV testing (for more detail see NIMH Multisite HIV/STD Prevention Trial for African American Couples Group [18]).

Sociodemographic Characteristics

Study partners were asked to indicate their age, education, marital status, employment status, income, type of health insurance, and incarceration history. HIV serostatus at baseline was determined via biological testing.

Relationship Characteristics

Study participants were asked questions that addressed relationship characteristics including length of relationship,

whether or not participants were cohabiting with their study partner, sexual dysfunction items and quality of relationship.

Sexual Dysfunction

Each participant was asked three questions from the Watts Sexual Function Questionnaire [20] to examine sexual dysfunction. Both partners were asked if they desired sex with their study partner and responses ranged from (0) never (1) almost never (2) sometimes (3) almost always to (4) always. Sexual desire dysfunction was defined by responses less than 2 on this single item. Additionally, females were asked about frequency of vaginal dryness (sexual arousal dysfunction) with an identical choice of 5 responses (i.e., (0) never to (4) always). Sexual arousal dysfunction in females was defined by responses greater than 2 on this single item. Females were asked a final question regarding how often they were able to climax sexually and 5 possible responses: (0) never (1) less than half the time (2) half the time (3) more than half the time and (4) always. Sexual orgasm dysfunction in females was defined by responses less than 2 on this single item. Similarly, sexual arousal dysfunction was defined for male participants by responses of never or almost never to their reported ability to get an erection and sexual orgasm dysfunction was defined by males who responded that they had experienced premature ejaculation either more than half the time or always. For the purpose of this paper, we constructed a single binary sexual dysfunction measure (present or absent) that was equal to one if any form of sexual dysfunction was present (orgasm, desire or arousal) [20].

Relationship Assessment

A general scale developed by Hendrick [21] to measure relationship satisfaction in intimate relationships was used in this study. The scale consists of seven items and summary scores range from 7 (low satisfaction) to 35 (high satisfaction). Questions on this scale include: (1) "How well does your study partner meet your needs?" and (2) "In general, how satisfied are you with your relationship?" This measure has been used by a range of populations including urban African American and Latino women [22].

Sexual Behaviors

Participants provided data on the use of male and female condoms during sex and different types of sexual behaviors they had engaged in with study partners (vaginal, anal and oral intercourse) over the past 90 and 30 days. For example, female participants were asked: "In the past 90 and 30 days, about how many times did your study partner put his penis into your vagina?", and "In the past 90 and 30 days, when your study partner put his penis into your vagina, about how many of these times was a male condom used?"

Table 1 Baseline demographic, relationship, alcohol and substance use characteristics

	Males ($n = 535$)	Females ($n = 535$)	Statistic
Agea	45.1 ± 8.1	41.7 ± 7.7	9.95**
Education			
<HS graduate	141 (26.6%)	185 (34.8%)	15.4**
HS graduate/GED	249 (46.9%)	188 (35.3%)	
Some college	141 (26.6%)	159 (29.9%)	
Employed	181 (34.1%)	121 (22.8%)	19.9**
Income			
<$400/Mo.	158 (29.8%)	149 (28.1%)	3.5
$400–850/Mo.	212 (40.05)	234 (44.2%)	
$851–1,650/Mo.	103 (19.4%)	102 (19.3%)	
$1,651+/Mo.	57 (10.8%)	45 (8.5%)	
Insured	365 (68.9%)	435 (81.9%)	26.0**
Previously incarcerated	405 (76.4%)	256 (48.6%)	90.2**
HIV positive	212 (39.6%)	323 (60.4%)	23.0**
Sexual dysfunction	119 (22.4%)	159 (29.9%)	7.5*
Living with study partner	405 (76.4%)	401 (75.5%)	0.7
>5 years with study partner	250 (47.4%)	242 (45.6%)	3.6^{+}
Married to study partner	175 (33.0%)	170 (32.0%)	0.9
Relationship assessment[a]	28.6 ± 4.3	28.1 ± 5.1	2.0^{+}

Values shown are *N* (%) or mean ± SD. *p* values for continuous variables were determined by paired *t* tests; *p* values for categorical variables were determined by Chi-square tests

$^{+}$ $p < 0.10$; * $p < 0.05$; ** $p < 0.01$

Statistical Analysis Methods

Distributions of categorical variables are summarized by frequencies and percents while continuous variables are summarized by means and corresponding standard deviations. Because of the couple pairings, appropriate paired test statistics were constructed and evaluated. Paired *t* tests are presented in order to compare the distribution of continuous measures for males and females in the study, while Mantel–Hansel statistics are presented in order to compare the distribution of categorical measures for males and females.

We report the frequency and percent of concordant responses (e.g., both partners reporting "yes" and/or both partners reporting "no") and discordant responses (one partner reporting "yes" and one partner reporting "no") to questions asking whether the participants had engaged in vaginal, anal or oral sex with their study partners in the past 90 days, as well as questions on sexual risk behaviors (e.g., consistent condom use in the past 30 days and the past 90 days, and condom use at last vaginal and anal sex). Kappa statistics are also reported to measure concordance of couple responses, over and above what would be expected by chance alone. In general, values of Kappa from 0 to 0.20 indicate poor agreement, 0.21 to 0.40 indicate fair agreement, 0.41 to 0.60 indicate moderate agreement, 0.61 to 0.80 indicate substantial agreement, and values greater than .80 indicate excellent agreement [23]. However, it has been widely shown that Kappa values can be misleadingly low when the prevalence of the responses being measured is skewed. Thus, as proposed by Ochs and Binik [10] we present conditional probability indices (CP+ and CP−), in conjunction with Kappa, as an additional measure to explore the degree to which couple reporting of categorical sexual behavior data are consistent. The positive conditional probability (CP+) is the averaged probability that one partner reports a behavior of interest, given that the other partner also reports the activity. Similarly, the negative conditional probability (CP−), is the averaged probability that one partner does not report a behavior, given that the other partner also does not report that activity.

A third measure of agreement, McNemar's statistic, is also provided, along with its associated *p* value. Unlike the Kappa and conditional probability measures, McNemar's statistic does not address agreement within couples directly. Instead, it measures the symmetry of discordant responses. Applied in the context of this study, McNemar's statistic reflects the difference between the number of couples where women answered "yes" but men answered "no" and the number of couples where men answered "yes" but women answered "no" for each binary outcome of interest. Thus, a significant *p* value associated with a test of McNemar's statistic implies that the observed discordance is related to a tendency of men to answer the question differently than women, independent of the experience of any given couple.

Concordance of reporting on continuous sexual behavioral measures was examined using paired *t* tests to measure the differences between partners' reports of shared

Table 2 Concordance of couple's reported sexual behaviors (in the past 90 days)

	Agreement *N* (%)	Kappa	CP+[a]	CP−[b]	McNemar statistic
Had vaginal sex					
Both report yes	494 (94.6%)	0.11	0.97	0.13	0.2
Both report no	2 (0.4%)				
Discordant	26 (5.0%)				
Total	522				
Had anal sex					
Both report yes	64 (12.1%)	0.65	0.71	0.94	4.3^{+}
Both report no	410 (77.8%)				
Discordant	53 (10.1%)				
Total	527				
Had oral sex (cunnilingus)					
Both report yes	259 (49.2%)	0.43	0.78	0.64	10.2**
Both report no	125 (23.8%)				
Discordant	142 (27.0%)				
Total	526				
Had oral sex (fellatio)					
Both report yes	279 (53.4%)	0.51	0.83	0.68	1.0
Both report no	127 (24.3%)				
Discordant	117 (22.4%)				
Total	523				

$^{+}$ $p < 0.10$; * $p < 0.05$; ** $p < 0.01$

[a] Positive conditional probability index—see definition in "Methods" section

[b] Negative conditional probability index—see definition in "Methods" section

Table 3 Concordance of couple's reported sexual risk behaviors (categorical variables)

	Agreement *N* (%)	Kappa	CP+	CP−	McNemar statistic
Consistent condom use (past 90 days)					
Both report yes	53 (10.9%)	0.34	0.48	0.85	3.2^{+}
Both report no	319 (65.8%)				
Discordant	113 (23.3%)				
Total	485				
Used condom at last vaginal sex					
Both report yes	152 (29.0%)	0.50	0.71	0.80	1.6
Both report no	246 (47.0%)				
Discordant	126 (24.1%)				
Total	524				
Used condom at last anal sex					
Both report yes	11 (17.7%)	0.23	0.50	0.73	0.2
Both report no	29 (46.8%)				
Discordant	22 (35.5%)				
Total	62				

sexual behaviors including: frequency of vaginal, anal, and oral sex and frequency of condom-protected sex over the past 30 days and the past 90 days. Additionally, we calculated correlation statistics (Pearson and Spearman) and the frequency of identical responses reported by both male and female partners in each couple. We also constructed Wilcoxon signed rank tests to compare median values of male and female responses via the S statistic (the sum of the ranks of non-identical male and female responses) and its corresponding p value.

To identify predictors of discordant reports, we first created binary discordant response variables to identify cases where only one partner in a couple reported engaging in a given behavior. We then fit logistic regression models for the discordant response variable on each reported binary sexual or sexual risk behavior, adjusting for male and female partners' sociodemographic characteristics and relationship characteristics. Odds ratios and corresponding 95% CIs are presented to summarize these findings. All analyses were completed using SAS Version 9.2 (SAS Institute, Cary NC, USA).

Results

Individual and Relationship Characteristics

Table 1 presents gender-specific summaries of individual and relationship characteristics. Males were significantly older than their female partners (45.1 vs. 41.7 years; $p < 0.01$), were more likely to have a high school diploma/GED equivalent, (73.5 vs. 65.2%; $p < 0.01$) and were more likely to be employed (34.1 vs. 22.8%; $p < 0.01$). Male partners were less likely to have health insurance (68.9 vs. 81.9%; $p < 0.01$) and reported significantly higher incarceration histories (76.4 vs. 48.6%; $p < 0.01$) than female partners. Males were less likely to be HIV positive (39.6 vs. 60.4%; $p < 0.01$).

Relationship Contexts

Males were less likely to report sexual dysfunction (22.4 vs. 29.9%, $p < 0.01$). On average, males reported significantly higher relationship satisfaction scores than females (28.6 vs. 28.1, $p = 0.05$).

Consistency of Couple Reports

Table 2 reports the concordance and discordance of both partners responding either "yes" or "no" to having engaged in vaginal, anal and oral sex (fellatio and cunnilingus) with their study partner in the past 90 days. The percentages of agreement for each type of sexual behavior are high (73–95%). Kappa statistics for reporting anal sex, fellatio and cunnilingus indicate moderate to substantial agreement (0.43–0.65). However, Kappa for reporting vaginal sex indicates poor agreement (0.11), in spite of the exceptionally high percentage (95%) of concordant responses to this question. This is an example of an oft-cited situation wherein Kappa values appear misleadingly low when the prevalence of the responses is skewed [24], as is the case with reports of vaginal sex (where both partners report "yes" in 94.6% of couples). In this case in particular, the conditional probability indices provide additional insight into the results. The Positive Conditional Probability Index (CP+) shows that the agreement for positive responses (i.e., agreement that it occurred) on vaginal sex is high (0.97), but the Negative Conditional

Table 4 Concordance of couple's reported sexual risk behaviors in the past 90 days (continuous variables)

	Males mean ± SD	Females mean ± SD	Paired *t* test statistic	Pearson's correlation	No identical responses	Spearman's correlation	Signed rank test *S* statistic
Frequency of vaginal sex ($n = 513$)	25.1 ± 33.7	25.1 ± 37.6	0.01	0.33***	47	0.42***	2551
Frequency of anal sex ($n = 523$)	0.9 ± 4.2	0.7 ± 3.7	0.84	0.28***	429	0.65***	490^{+}
Frequency of oral sex (fellatio) ($n = 519$)	9.0 ± 25.4	7.7 ± 14.7	1.1	0.19***	164	0.57***	1459
Frequency of oral sex (cunnilingus) ($n = 518$)	8.1 ± 19.5	10.1 ± 33.3	−1.3	0.22***	158	0.50***	−3754^{+}
Frequency of protected sex ($n = 512$)	11.7 ± 24.2	9.5 ± 18.1	2.3*	0.41***	153	0.55***	3497^{+}

$^{+}$ $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Probability Index (CP−) shows that the agreement for negative responses (i.e., agreement that it did not occur) is low (0.13), since only two couples provided concordantly negative responses. These indices also show high agreement on both positive and negative responses for anal and oral sex (0.64–0.94). A higher percentage of agreement on negative responses versus positive responses is found for anal sex (0.94 vs. 0.71), but higher agreement on positive responses versus negative responses is found for cunnilingus and fellatio (0.78 vs. 0.64 and 0.83 vs. 0.68).

The *p* value for McNemar's statistic is not significant for questions on vaginal sex or fellatio, indicating relative symmetry between male and female responses across couples with discordant answers to these questions. However, the McNemar's test for anal sex is significant ($p = 0.05$), reflecting the fact that there were only 19 couples (3.6% of the total) where the female partner reported "yes" but the male partner reported 'no,' vs. 34 couples (6.5%) where the male partner reported "yes" and the female partner reported 'no.' The McNemar's test for cunnilingus is also significant ($p = 0.002$), but with asymmetry in the opposite direction. Here, there were 90 couples (17.1% of the total) where the female partner reported "yes" and the male partner reported 'no,' vs. only 52 couples (9.9%) where the male partner reported "yes" and the female partner reported "no".

Table 3 presents a similar summary of percent agreement, Kappa and McNemar statistics and conditional probability indices for three reported sexual risk behaviors (consistent condom use with study partner during the past 90 days, condom use at last vaginal sex with study partner, and condom use at last anal sex with study partner). We observed high agreement for couple responses for each of these behaviors: 76.7% agreement for consistent condom use; 76.0% agreement for condom use at last vaginal sex and 64.5% agreement for condom use at last anal sex. The corresponding estimated Kappa statistics for these three outcomes were 0.34, 0.50 and 0.23, respectively, indicating fair to moderate agreement. The conditional probability indexes show higher agreement on negative responses than positive responses for these three condom use behaviors, while the McNemar statistic indicates relative symmetry among discordant responses for these three condom use behaviors. The analysis of condom use at last vaginal sex with the study partner and condom use at last anal sex with the study partner were restricted to those participants who reported engaging in those behaviors in the past 90 days. Note that the prevalence of anal sex in the study was very low, so the number of individuals contributing to summaries of this behavior was also low. Participants were also asked about consistent condom use over the past 30 days, and the concordance of their responses to this question (not shown in Table 3) was similar to that for the question of consistent condom use over the past 90 days. Specifically, the Kappa for the 30-day question was 0.38, vs. 0.34 for the 90-day question. The positive and negative conditional probability indices for the 30 days were 0.55 and 0.83, respectively, compared to values of 0.48 and 0.85, respectively, for the 90 days. The McNemar statistic for the 30 days question (0.7, $p = 0.45$) was lower than that for the 90 days time frame (3.2, $p = 0.09$), indicating more balance between male and female responses among discordant couples, but neither result was statistically significant.

Table 4 summarizes results from paired *t* tests, Pearson's and Spearman's correlation coefficients and Wilcoxon signed rank tests for continuous sexual behavior outcomes with study partners in the past 90 days. Consistency of male and female partner reporting for each of these outcomes was moderately high. Specifically, Spearman's correlation coefficient ranged from 0.42 to 0.65 and all estimated coefficients were significantly different from zero ($p < 0.001$ for each outcome). There were no significant differences in male and female reports of frequency of sexual activity during the past 90 days (frequency of

Table 5 Estimated odds ratio (OR) and 95% confidence intervals (CI) from logistic regression analysis predicting discordant couple reports of sexual behaviors with study partner

Outcome	Vaginal sex past 90 days	Anal sex past 90 days	Cunnilingus past 90 days	Fellatio past 90 days	Consistent condom use past 90 days	Condom use at last vaginal sex	Condom use at last anal sex
No of discordant responses	26	53	142	117	113	126	22
Adjusting for male partner characteristics							
Age	1.0 (0.96, 1.1)	1.0 (0.98, 1.1)	1.0 (0.98, 1.0)	1.0 (0.97, 1.0)	1.0 (0.97, 1.0)	1.0 (0.97, 1.0)	1.0 (0.9, 1.1)
<HS graduate	2.5 (1.1, 5.5)*	1.5 (0.8, 2.7)	1.1 (0.7, 1.7)	1.1 (0.7, 1.7)	1.3 (0.8, 2.1)	1.0 (0.6, 1.6)	1.2 (0.4, 3.8)
Income <$850/mo	3.5 (1.0, 11.7)*	1.5 (0.8, 3.0)	1.1 (0.7, 1.7)	1.3 (0.8, 2.1)	1.2 (0.8, 1.9)	1.7 (1.1, 2.7)*	2.2 (0.6, 7.7)
Insured	0.9 (0.4, 2.2)	1.2 (0.6, 2.2)	0.7 (0.5, 1.1)	1.2 (0.8, 1.9)	0.8 (0.5, 1.2)	1.0 (0.6, 1.5)	3.0 (0.9, 10.5)
Incarceration history	1.8 (0.6, 5.2)	0.7 (0.4, 1.3)	1.0 (0.7, 1.6)	0.7 (0.4, 1.1)	0.7 (0.4, 1.2)	0.7 (0.5, 1.1)	0.7 (0.1, 3.5)
HIV positive	2.2 (0.98, 4.8)	0.6 (0.3, 1.1)	1.0 (0.7, 1.5)	1.0 (0.7, 1.6)	1.3 (0.9, 2.0)	1.6 (1.1, 2.4)*	0.9 (0.3, 2.7)
Sexual dysfunction	2.8 (1.2, 6.3) *	1.3 (0.7, 2.4)	1.4 (0.9, 2.2)	1.3 (0.8, 2.1)	1.0 (0.6, 1.6)	0.9 (0.6, 1.5)	2.1 (0.6, 7.6)
>5 years with study partner	1.3 (0.6, 2.9)	1.0 (0.6, 1.8)	0.7 (0.5, 0.99)*	0.8 (0.5, 1.2)	1.1 (0.7, 1.6)	1.0 (0.7, 1.6)	0.8 (0.3, 2.3)
Relationship assessment	1.0 (0.9, 1.0)	1.0 (0.9, 1.0)	1.0 (0.95, 1.0)	1.0 (0.96, 1.1)	1.0 (0.95, 1.1)	1.0 (0.9, 1.0)	1.0 (0.9, 1.1)
Married to study partner	0.6 (0.2, 1.5)	0.9 (0.5, 1.6)	0.6 (0.4, 0.97)*	0.7 (0.4, 1.1)	0.96 (0.6, 1.5)	1.2 (0.8, 1.8)	1.0 (0.3, 3.5)
Adjusting for female partner characteristics							
Age	1.0 (0.99, 1.1)	1.0 (0.97, 1.1)	1.0 (0.98, 1.0)	1.0 (0.96, 1.0)	1.0 (0.99, 1.0)	1.0 (0.99, 1.0)	1.0 (0.96, 1.1)
<HS graduate	2.3 (1.0, 5.1)*	1.8 (1.0, 3.2)*	1.0 (0.7, 1.5)	1.0 (0.6,1.5)	1.2 (0.8, 1.9)	1.3 (0.8, 1.9)	2.1 (0.7, 6.3)
Income < $850/mo	1.7 (0.6, 4.5)	2.0 (0.9, 4.2)	1.1 (0.7, 1.6)	1.5 (0.9, 2.5)	1.3 (0.8, 2.0)	1.2 (0.7, 1.9)	1.0 (0.2, 3.7)
Insured	1.2 (0.4, 3.7)	1.5 (0.7, 3.4)	0.8 (0.5, 1.3)	0.8 (0.5, 1.3)	0.6 (0.4, 1.1)	0.9 (0.5, 1.5)	1.6 (0.4, 6.7)
Incarceration history	0.4 (0.2, 0.96)*	1.8 (1.0, 3.3)*	1.1 (0.8, 1.7)	1.0 (0.6, 1.5)	0.7 (0.5, 1.1)	0.6 (0.4, 0.9)	1.1 (0.4, 3.2)
HIV positive	0.5 (0.2, 1.0)	1.8 (0.9, 3.3)	1.0 (0.7, 1.4)	1.0 (0.6, 1.5)	0.8 (0.5, 1.2)	0.6 (0.4, 0.9)*	1.1 (0.4, 3.1)
Sexual dysfunction	2.1 (0.96, 4.7)	0.8 (0.4, 1.6)	1.6 (1.1, 2.5)*	1.6 (1.0, 2.4)*	1.0 (0.6, 1.6)	1.4 (0.9, 2.2)	1.2 (0.4, 3.8)
>5 years with study partner	1.1 (0.5, 2.5)	1.1 (0.6, 1.9)	0.7 (0.4, 0.97)*	0.9 (0.6, 1.4)	0.9 (0.6, 1.4)	1.0 (0.7, 1.6)	1.1 (0.4, 3.1)
Relationship assessment	0.9 (0.9, 1.0)	1.0 (0.9, 1.0)	1.0 (0.96, 1.0)	1.0 (0.95, 1.0)	1.0 (0.9, 1.0)	1.0 (0.95, 1.0)	1.0 (0.9, 1.1)
Married to study partner	0.5 (0.2, 1.4)	0.8 (0.4, 1.5)	0.7 (0.4, 1.0)	0.8 (0.5, 1.2)	0.9 (0.6, 1.4)	1.3 (0.8, 2.0)	1.1 (0.3, 3.7)

* $p < 0.05$

vaginal sex, anal sex, or oral sex). However, males reported a statistically significant higher frequency of condom-protected sex than did their female partners (11.7 vs. 9.5; paired t test $p = 0.02$; signed rank test $p = 0.05$).

The concordance of responses with regard to frequency of vaginal sex, frequency of anal sex, and frequency of protected sex over the past 30 days was similar to that of responses to the equivalent 90 days questions. Specifically, with regard to frequency of vaginal sex, the mean response from males exactly matched that from females for both the 90 days question (25.1 sex episodes) and the 30 days question (9.8 episodes). The p values from a paired t test (0.99 and 0.97) and the Pearson's (0.33 and 0.31) and Spearman's correlation coefficients (0.42 and 0.49) were very similar for the 90 days and 30 days questions, respectively.

The signed rank test statistic for the 90 days question was higher than that for the 30 days question (2551 vs. 445), but both p-values were non-significant (0.38 vs. 0.87.) The concordance of responses to the question of the frequency of anal sex over the past 90 days and 30 days were also fairly similar, as shown by the p-value for the paired t test (0.40

and 0.19, respectively), the Pearson's correlation coefficient (0.28 and 0.19, respectively), and Spearman's correlation coefficient (0.65 vs. 0.47.) While only the 30 days time frame produced a significant result to the signed rank test, the *p* values for the 90 days and 30 days questions were very close (0.06 vs. 0.04). Finally, for the frequency of protected sex, the concordance results for the 90 days question and the 30 days time frame were nearly identical as measured by the Pearson's correlation coefficient (0.41 vs. 0.45, respectively), the Spearman's correlation coefficient (both 0.55), and the signed rank test ($p = 0.05$ in both cases). The *p* value for the paired *t* test was only significant for the 90 days question ($p = 0.02$), but the result for the 30 days time frame was relatively close ($p = 0.09$).

Predicting Discordance on Vaginal Sex

Table 5 presents multivariate models for predicting discordant responses (that is, responses wherein one partner reports "yes" and the other reports "no") on each binary sexual behavior. Couples in which the male partner did not have a high school diploma or GED were significantly more likely to have discordant reports on vaginal sex in the past 90 days compared with those in which the male partner did have a high school diploma/GED (OR = 2.5, 95% CI = 1.1–5.5). Couples in which the male partner reported income of less than $850 per month were significantly more likely to have discordant reports on vaginal sex compared with those couples in which the male partner reported income over $850 per month (OR = 3.5, 95% CI = 1.0–1.7). Compared with couples in which the male partner did not report sexual dysfunction, those couples in which the male partner reported sexual dysfunction were significantly more likely to have discordant reports on vaginal sex in the past 90 days (OR = 2.8, 95% CI = 1.2–6.3).

Couples in which the female partner did not have a high school diploma or GED were more likely to have discordant reports on vaginal sex than those in which the female partner did have a high school diploma/GED (OR = 2.3, 95% CI = 1.0–5.1). Couples in which the female partner had a history of incarceration were significantly less likely to have discordance on vaginal sex than those couples in which the female partner had never been incarcerated (OR = 0.4, 95% CI = 0.2–0.96).

Predicting Discordance on Anal Sex

Couples in which the female partner did not have a high school diploma or GED were significantly more likely to have discordant reports on anal sex in the past 90 days compared with those in which the female partner did have a high school diploma or GED (OR = 1.8, 95% CI = 1.0–3.2). Couples in which the female partner had incarceration history were significantly more likely to have discordant reports on anal sex than those couples in which the female partner had never been incarcerated (OR = 1.8, 95% CI = 1.0–3.3).

Predicting Discordance on Oral Sex (Cunnilingus)

Couples in which the male partner reported having been with his study partner for at least 5 years were less likely to have discordant reports on cunnilingus in the past 90 days than those couples in which the male partner reported less than 5 years with his study partner (OR = 0.7, 95% CI = 0.5–0.998). The same held true for couples where the female partner reported having been with her study partner for at least 5 years versus those couples in which the female partner reported less than 5 years together (OR = 0.7, 95% CI = 0.4–0.97). Males who reported being married to their female study partners were more likely to have discordant reports on having engaged in cunnilingus in the past 90 days, compared to unmarried male participants (OR = 0.628, 95% CI: 0.409, 0.965). There was a similar effect for married females (relative to unmarried females), however this finding was not statistically significant (OR = 0.670, 95% CI: 0.436, 1.030). Couples in which the female partner reported sexual dysfunction were significantly more likely to have discordant reports on cunnilingus than couples in which the female partner did not report sexual dysfunction (OR = 1.6, 95% CI = 1.1–2.5).

Predicting Discordance on Oral Sex (Fellatio)

Couples in which the female partner reported sexual dysfunction were more likely to have discordant reports on fellatio in the past 90 days than those in which the female partner did not report sexual dysfunction (OR = 1.6, 95% CI = 1.0–2.4).

Predicting Discordance on Condom Use

Couples in which the male partner reported income of less than $850 per month were significantly more likely to have discordant reports on condom use at the last vaginal sex compared with those couples in which the male partner reported income over $850 per month (OR = 1.7, 95% CI = 1.1–2.7). Couples in which the male partner was HIV positive were significantly more likely to have discordant reports on condom use at the last vaginal sex compared with those couples in which the female partner was HIV positive (OR = 1.6, 95% CI = 1.1–2.4). No significance was found in the models for predicting discordance on condom use at the last anal sex or consistent condom use in the past 90 days. We also examined predictors of discordance on the question of consistent condom use in the past

30 days. The results here were consistent with the results found on consistent condom use in the past 90 days, with one minor exception. Couples with men who were HIV positive were more likely to have discordant reports on consistent condom use over the past 30 days than couples with HIV negative men (OR = 1.6, 95% CI = 1.0–2.4.) Although significant, this still differs only slightly from the results on concordance for the corresponding 90 days question (OR = 1.3, 95% CI = 0.9–2.0).

Discussion

To our knowledge, this is the only paper in the HIV literature that examines concordance of sexual behaviors and condom use and predictors of discordant reports of these behaviors, exclusively focusing on a large sample of African American serodiscordant couples recruited from four U.S. cities.

Couples' reports on having had anal and oral sex in the past 90 days (both reported 'yes,' both 'no,' and discordant), show moderate to high concordance as measured by the Kappa index, which is consistent with most previous studies [2, 3, 10, 12, 14, 25]. However, Kappa for reporting vaginal sex indicates poor agreement (because Kappa values can be misleadingly low when the prevalence of the responses is skewed, as is the case with reports of vaginal sex). Using Conditional Probability Indices shows that the agreement of positive response (e.g., that it occurred) on vaginal sex is high, but low for Negative Conditional Probability Index. These indices are high for anal and oral sex. The p-value for McNemar's statistic is not significant for vaginal sex or fellatio, indicating relative symmetry between male and female responses across couples with discordant answers to these questions. However, the McNemar's test for anal sex is significant. This means that more male partners report anal sex than the female partners. These results may reflect gender norms in which women compared to men may perceive anal sex as unacceptable behavior. For cunnilingus, the McNemar's test is significant with asymmetry in the appositive direction. More female partners reported this sexual act. This result may also be explained that female partners compared to male partners are more likely to perceive cunnilingus as an acceptable sexual act.

We also found high agreement for couples' reports on consistent condom use over 90 days and for condom use at last vaginal and anal sex; Kappa statistics for these three variables were in fair to moderate agreement, which is also consistent with previous studies [2, 3, 10, 12, 14, 25]. Using continuous variables, we had findings consistent with previous studies, showing moderate to high concordance on frequency of vaginal, anal and oral sex for both fellatio and cunnilingus in both 90 and 30 days time frames [2, 3].

Demographics and relationship predictors of couple's discordant reports on sexual behaviors varied somewhat by gender and type of sexual behavior (vaginal, anal and oral). Unlike other studies [3, 12], age was not associated with discordant reports for female and males. However, the findings were consistent with Witte et al. [3] on the associations between discordant sexual behaviors reported and level of education and income.

Among couples where females and males have no high school diploma compared to those with this degree, discordant reports for vaginal sex were more likely to occur, but for anal sex, this was only true for couples where the female partner lacked a high school diploma. Couples in which the male partner had low income (less than $850 per month versus more than $850) were more likely to have discordant reports on vaginal sex and consistent condom use for vaginal sex. These findings underscore the need to invest in strategies to improve self-reports on sexual behaviors and condom use among couples with lower levels of education and low income men. Although men were more likely to have a history of incarceration than women, this did not influence whether their reports were discordant. Among couples where the female had a history of incarceration versus females with no incarceration history, discordance on vaginal and oral sex were more likely to be reported. This was not significant for men. Women who have been incarcerated may fear being judged and stigmatized, which in turn may affect how they report their sexual behaviors.

In terms of relationship contexts, couples who were together for 5 years compared to those with less than 5 years together were less likely to have discordant reports for anal sex. Males married to their female study partners were more likely to have discordant reports of having engaged in cunnilingus in the past 90 days, compared to unmarried male participants. There was a similar effect for married females (relative to unmarried females); however, this finding was not statistically significant. These findings are consistent with those in Witte et al. [3].

Couples in which the male partner reported sexual dysfunction (compared to their counterparts) were significantly more likely to have discordant reports on vaginal sex in the past 90 days. Couples in which the female partner reported sexual dysfunction (compared to couples where the female partner did not report this dysfunction) were more likely to have discordant reports on female to male oral sex (fellatio). These findings may be explained by self-presentation and social desirability. Each member of the couple may mask their sexual dysfunction by reporting higher sexual abilities and sexual functioning, which lead them to have discordant reports about their shared sexual behaviors.

Couples in which the male partner was HIV positive (compared with those in which the female partner was HIV

positive) were significantly more likely to have discordant reports on condom use at the last vaginal sex. This was also true for questions about consistent condom use over the past 30 days, although in this case the results were just borderline significant. These findings clearly underscore the need to provide condom communication skills to increase concordant results and help couples to protect each other.

The study has several limitations. The study sample was not selected randomly. We recruited HIV serodiscordant couples engaging in HIV risk behaviors. Couples who participated in this study could be self selected and could differ from other African American serodiscordant couples. Moreover, this paper focuses only on shared sexual behaviors reported in data collected at the baseline interview.

Despite these limitations, the study's findings show a high level of concordance on self reported shared sexual behaviors among the couples across various time frames and for multiple types of sexual behaviors.

If a greater number of studies focused on the couple dyad, there would be more opportunities to expand our understanding of couples' reporting on shared and non-shared sexual behaviors such as on partner concurrency, sex trading, etc. There is also a need to conduct qualitative research where couples debrief on the differences in their reports. More research is required to assess predictors of discordant data over time. Ellish et al. [9] found that partner agreement for condom use and frequency of sexual activity decreased as the recall period increased and higher agreement was found for questions with definite answers compared to the more open-ended sexual behaviors questions.

The findings from this paper provide new scientific insights into the knowledge base on the utility of self-reported data generated by couples and may suggest that these data can be used to evaluate their accuracy and may serve as a proxy for validity. If the couples do not agree in their reports, then the accuracy and validity may be doubtful. Measuring discordant behaviors among couples separately may enable HIV intervention researchers to better understand how to target these issues in the intervention, using strategies to normalize fears and concerns and provide a safe environment for disclosure of these behaviors.

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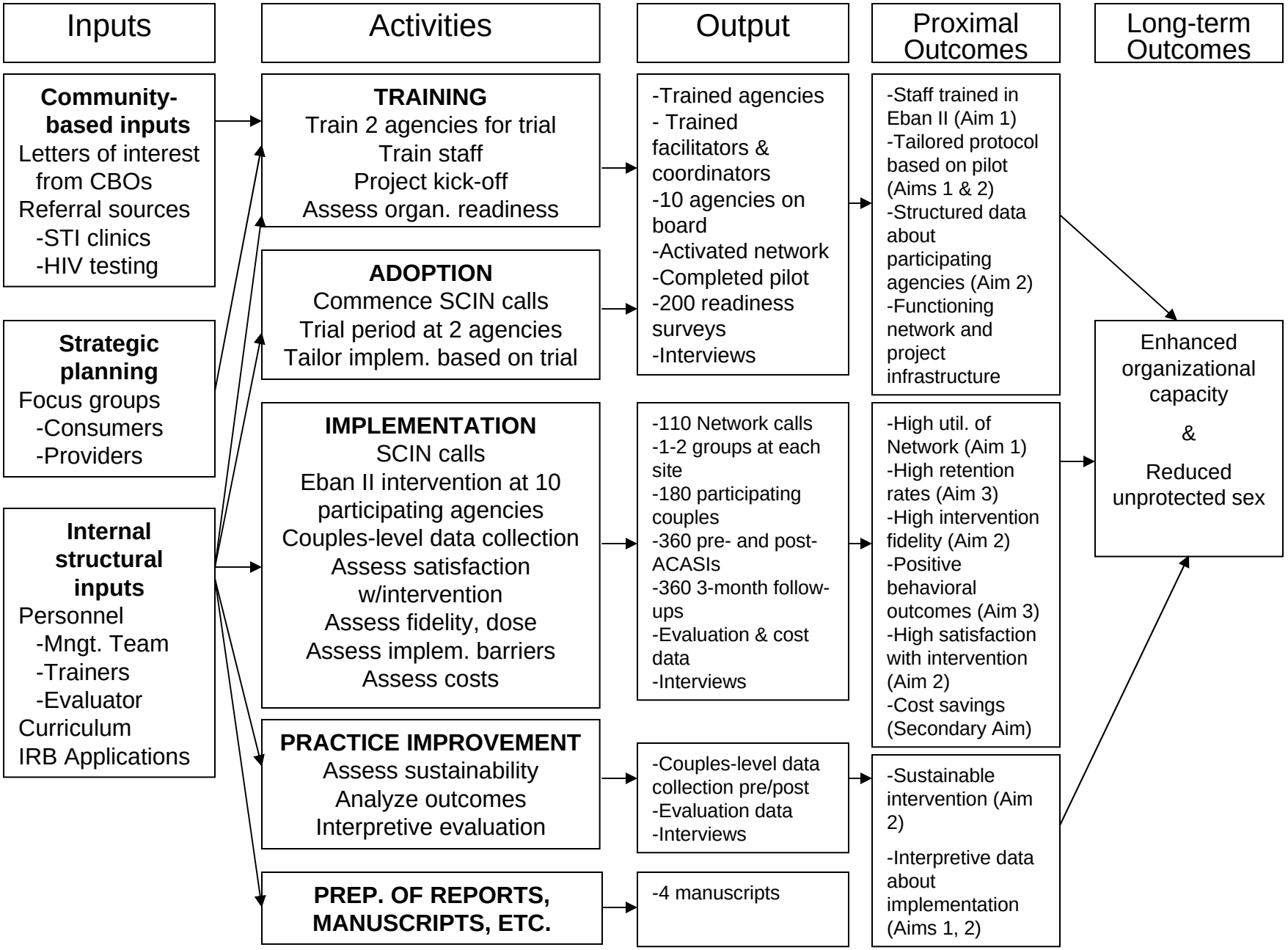
2. Logic Model



Eban II Logic Model

3. Comparison of EBAN I with DEBI Criteria

PRS Efficacy Criteria for Best-Evidence (Tier 1) Community-level Interventions (CLIs)	**EBAN**
Intervention Description	
Clear description of key aspects of the intervention	YES; see (2008), J Acquir Immune Defic Syndr, 49(1), pp. S15-S27, S28-S34
Quality-Study Design	
Prospective study design	YES (baseline, post, 6- and 12-month follow up); see (2008), J Acquir Immune Defic Syndr, 49(1), p. S9.
Appropriate and concurrent control/comparison arm	YES (health promotion control); see (2008), J Acquir Immune Defic Syndr, 49(1), pp. S8-S10
At least 4 communities per arm	YES; 4 cities, each with multiple communities; see (2008), J Acquir Immune Defic Syndr, 49(1), p. S7
Select similar communities (units) for assignment	YES; recruitment took place in the same communities for both treatment and control arms; randomization followed. See (2008), J Acquir Immune Defic Syndr, 49(1), pp. S7-S8.
Quality-Study Implementation and Analysis	
Sample individuals from assigned Communities in acceptable ways (e.g., random, systematic) and use identical methods and eligibility criteria for selecting participants in each community, study arm, and data collection wave	YES; *after couples met entry criteria for* the study, couples were randomized into one of two arms. See (2008), J Acquir Immune Defic Syndr, 49(1), p. S8.
• Follow-up assessment at least 3 months post completion of entire time-specific CLI	YES; follow up assessment conducted at post, 6- and 12-months. see (2008), J Acquir Immune Defic Syndr, 49(1), p. S9.
If cohort, at least 70% retention rate at a single follow up assessment for each study arm	YES, See NIMH Multisite HIV/STD Prevention Trial for African American Couples: Behavioral and Biological Outcomes of a Cluster-Randomized Trial (under review), Figure 1.

Comparison between intervention arm and appropriate comparison arm	YES, See (2008), J Acquir Immune Defic Syndr, 49(1), pp. S8-S10.
Analysis of communities (units) and analysis of individuals within the communities as originally assigned regardless of contamination or logistic/ implementation issues	YES, intent-to-treat analyses. See NIMH Multisite HIV/STD Prevention Trial for African American Couples: Behavioral and Biological Outcomes of a Cluster-Randomized Trial (under review), Table 1.
Analysis of individuals within the communities (units) regardless of individual level of intervention exposure	Yes, individuals and couples were used as a unit of analysis
Use of appropriate cluster-level analyses, e.g.,adjusting for ICC	YES, Individual charactertistics were examined by HIV serostatus and gender. See NIMH Multisite HIV/STD Prevention Trial for African American Couples: Behavioral and Biological Outcomes of a Cluster-Randomized Trial (under review).
Analysis must be based on postintervention levels or among pre-post changes in measures	YES; See NIMH Multisite HIV/STD Prevention Trial for African American Couples: Behavioral and Biological Outcomes of a Cluster-Randomized Trial (under review), Table 3.
For pre-post changes used in analysis, measures must be identical, including identical recall period	YES
Analysis based on an a =.05 (or more Stringent) and a 2-sided test	Prevention Trial for African American Couples: Behavioral and Biological Outcomes of a Cluster-Randomized Trial (under review), p. 14.
Either no statistical differences in baseline levels of the outcome exist or baseline differences are controlled for in the analysis, regardless of allocation (e.g., randomization, non-randomization)	YES

Strength of Evidence-Significant positive intervention effects

Positive and statistically significant (p<= .05) intervention effect for at	YES; See NIMH Multisite HIV/STD Prevention Trial for African American

least one relevant outcome measure	Couples: Behavioral and Biological Outcomes of a Cluster-Randomized Trial (under review), pp. 2-3.
Effect at the follow-up and based on the analyses that meet study implementation and analysis criteria	YES

Strength of Evidence-Negative Intervention Effects

No negative and statistically significant ($p < .05$) intervention effect for any relevant outcome	YES
No other statistically significant harmful intervention effect	NONE