Sexual HIV Risk Among Male Parolees and Their Female Partners: The Relate Project

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Abstract

Background: The massively disproportionate impact of America's prison boom on communities of color has raised questions about how incarceration may affect health disparities, including disparities in HIV. Primary partners are an important source of influence on sexual health. In this paper, we investigate sexual HIV risk among male-female couples following a man's release from prison.

Methods: We draw upon data from the Relate Project, a novel cross-sectional survey of recently released men and their female partners in Oakland and San Francisco, California (N=344). Inferential analyses use the actor-partner model to explore actor and partner effects on sexual HIV risk outcomes.

Results: Dyadic analyses of sexual HIV risk among male parolees and their female partners paint a complex portrait of couples affected by incarceration and of partners' influences on each other. Findings indicate that demographic factors such as education level and employment status, individual psycho-social factors such as perception of risk, and relationship factors such as commitment and power affect sexual HIV risk outcomes.

Conclusion: The Relate Project provides a novel dataset for the dyadic analysis of sexual risk among male parolees and their female partners, and results highlight the importance of focusing on the couple as a unit when assessing HIV risk and protective behaviors. Results also indicate potentially fruitful avenues for population-specific interventions that may help to reduce sexual health disparities among couples affected by incarceration.

Keywords

HIV; Incarceration; Parole; Couples; Dyadic Analysis

Cover Page Footnote

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ABSTRACT

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Conclusion**:** The Relate Project provides a novel dataset for the dyadic analysis of sexual risk among male parolees and their female partners, and results highlight the importance of focusing on the couple as a unit when assessing HIV risk and protective behaviors. Results also indicate potentially fruitful avenues for population-specific interventions that may help to reduce sexual health disparities among couples affected by incarceration.

Keywords: Couples, HIV, incarceration, dyadic analysis, parole

INTRODUCTION

The United States' incarceration rate has increased dramatically during the past forty years and has been the highest in the world for over a decade (Glaze and Parks 2012; International Centre for Prison Studies 2012). Low-income African-American and Hispanic men, particularly those without a high school diploma, have been heavily affected by this phenomenon (Mauer 1999; Tonry 1995; Western 2006). In 2012, 93% of state and federal prisoners were male, and African-American men were imprisoned at 6 times and Hispanic men at 2.4 times the rate of white men (Carson and Golinelli 2013). Approximately 2.2 million people are incarcerated and 851,000 are on parole in the U.S. on any given day, with an estimated 10 million cycling through correctional facilities each year (Glaze and Herberman 2013).

The massively disproportionate impact of America's prison boom on communities of color has raised questions about how incarceration may affect health disparities (Freudenberg 2001; Iguchi et al. 2005; Kulkarni et al. 2010; Massoglia 2008; Rosen, Wohl and Schoenbach 2011). For example, research on HIV has documented higher prevalence of HIV among incarcerated populations as compared with the general population (Maruschak 2010), HIV risk behavior within correctional facilities (Krebs and Simmons 2002; Wohl et al. 2000), the feasibility of providing HIV testing and treatment in correctional settings (Beckwith et al. 2010; Glaser and Greifinger 1993; Grinstead et al. 2003; Kavasery et al. 2009a; Kavasery et al. 2009b), and challenges to maintaining continuity of care for HIV-positive individuals upon release from jail or prison (Baillargeon et al. 2009; Grinstead, Zack and Faigeles 2001; Rich et al. 2001; Vlahov and Putnam 2006; Westergaard et al. 2011).

People living in neighborhoods with a high prevalence of incarceration often experience the continual removal and return of family members, sexual partners, and others in their social networks (Clear 2009). Further research has focused on how the "dual epidemics" of HIV and incarceration (Wohl, Rosen and Kaplan 2006) may affect HIV infection risk among female partners of incarcerated men and men who have been recently released from incarceration (Comfort et al. 2000; Davey-Rothwell et al. 2012; Grinstead et al. 2005; Johnson and Raphael 2009; Reznick et al. 2011; Swartzendruber et al. 2012). Work in this vein has considered such intertwined factors as the impact of high levels of male incarceration within a concentrated residential area on sex ratios, the dissolution of primary relationships during incarceration, associations between incarceration and concurrent partnerships, and HIV risk behaviors of former prisoners (Adams et al. 2011; Adimora et al. 2003a; Ellen and Fichtenberg 2012; Green et al. 2012; Khan et al. 2011b; Seal, Parisot and DiFranceisco 2012).

Primary partners are an important source of influence for many behavioral health outcomes (Kiecolt-Glazer and Newton 2001), and the context of primary romantic relationships has been identified as playing a key role in sexual risk behavior for HIV (Burton, Darbes and Operario 2010; El-Bassel and Wechsberg 2012; Karney et al. 2010). Relationship factors such as intimacy, satisfaction, and commitment have been found to influence condom use (Murray et al. 2013; Tucker et al. 2007), and among heterosexual couples, condom use has been found to be less likely in primary partnerships than in casual partnerships (Corbett et al. 2009; Hock-Long et al. 2013). Other couple dynamics can also influence sexual behavior. For example, when relationship power is low for a woman, her ability to negotiate condom use can be impaired (Pulerwitz, et al. 2002). Similarly, self-efficacy regarding condom use and sexual communication with one's partner–which entails the ability to initiate and participate in discussions with one's partner pertaining to sexual behaviors and condom use–have been found to be associated with sexual risk taking among African-American adolescent females in two

samples, including one study of adolescents with male partners recently released from incarceration (Crosby et al. 2013; Swartzendruber et al. 2012). It is not known whether similar issues with self-efficacy are salient for older women nor has it been examined for couples. Another aspect of communication that has been shown to be related to sexual risk behavior is HIV-specific social support (HSSPS) (Darbes & Lewis, 2005; Darbes et al. 2012). HSSPS assesses the level of support received from one's partner regarding safer sex (e.g., condom use, reducing numbers of sexual partners, etc.), and has been posited to be a proxy for one's ability to discuss sex with one's partner (Darbes et al., 2012).

In building an in-depth understanding of HIV risk among incarcerated and recently released men and their female partners, it is important to investigate not only the potential impact of incarceration (e.g., condom availability in prison) but also the impact of relationship factors that may be affected by incarceration (e.g., feelings of intimacy following release from prison). Interdependence Theory (Kelley and Thibaut 1978; Rusbult et al. 2004; Rusbult and Van Lange 2003), which posits how social context influences primary relationships, offers a useful framework for analyzing sexual behavior within relationships affected by incarceration. Interdependence Theory takes into account the possibility that an individual's behavior may result from relationship considerations such as maximizing a partner's wellbeing, demonstrating trust, or turn-taking ("I'll do what you want now if you do what I want later"). Interdependence Theory is especially relevant to sexual risk as individuals could engage in behavior that puts them at HIV risk while simultaneously being supportive of their relationship (e.g., having unprotected sex to increase intimacy) (Lewis et al. 2006).

In this article, we extend previous research examining the impact of a man's incarceration on his female partner's HIV risk through an exploratory study investigating sexual HIV risk behavior among both partners within male-female couples following a man's release from prison. Our analysis draws on a novel dataset of men on parole who had been released from prison within the year prior to recruitment ("male parolees") and women with whom they were in an intimate relationship during and after their incarceration ("female partners"). In determining an analytical approach to these data, we were cognizant of the rich relationship theory literature, as well as prior studies addressing HIV risk behaviors among heterosexuals and the impact of the incarceration of African-American men on individuals and neighborhoods. We therefore used Karney et al.'s (2010) Framework for Incorporating Dyads in Models of HIV-Prevention to organize and inform our analysis. In their framework, Karney et al. highlight the importance and interconnectedness of variables at the individual, structural, and relational levels that yield a "dyadic capacity for successful coordination" that in turn leads to "engaging in safer sex" (Karney et al. 2010). We used this framework to create four variable groupings for our analyses: demographic and individual psycho-social (corresponding to Karney's individual-level variables), structural, and relational. Within each grouping, we chose to include variables identified as salient by previous literature (reviewed above) when investigating HIV sexual risk among heterosexual dyads affected by incarceration. Taking this analytical approach, we generated the following hypotheses for each variable grouping:

1. DEMOGRAPHIC factors indicating lower socio-economic status (e.g., younger age; lower education level; non-steady employment; longer recent time in prison [for men] and history of visiting a prisoner [for women]) will be associated with more sexual risk behavior.

2. STRUCTURAL factors indicating higher levels of social inequity (e.g., more exposure to neighborhood violence; more experiences of racism, sexism, and criminal justice discrimination) will be associated with more sexual risk behavior.

3. INDIVIDUAL PSYCHO-SOCIAL factors (e.g., higher psychological distress; higher stress over basic needs; lower sexual communication and condom negotiation self-efficacy; lower HIV risk perception) will be associated with more sexual risk behavior.

4. Higher levels of positive RELATIONSHIP factors (e.g., commitment; satisfaction; HIV-specific social support; relationship power [for women]) will be associated with less sexual risk behavior.

The unique nature of data from intact dyads enabled us to investigate how men's and women's own demographic, structural, psycho-social, and relationship factors (actor effects) as well as their partner's demographic, structural, psycho-social, and relationship factors (partner effects) were associated with their own HIV risk (Kenny, Kashy and Cook 2006). As explained in detail below, inclusion of both actor and partner effects in our analyses enabled us to investigate how men's demographic, structural, psycho-social, and relationship factors affected women's HIV risk and vice versa–and whether those effects differed by gender. This exploratory study contributes to the existing literature in three salient ways. First, we are able to provide demographic, structural, psycho-social, and relationship descriptors of both members of the couple through their own self-report, as opposed to one partner providing information about the other. To our knowledge, this is the first study of incarceration and sexual risk behavior to specifically recruit both partners for study participation, enabling us to build a descriptive foundation for an understanding of how relationship factors influence the sexual health of couples affected by incarceration. Second, collecting data from both partners permits us to study dyadic processes by exploring the impact of each partner on their own and their partner's risk and protective behavior, thereby advancing knowledge about couple-level influences on sexual HIV risk. And third, by generating a better understanding of the profiles of male parolees and their female partners as well as the relationship factors that influence their HIV risk, this study's findings may help to develop new or tailor existing interventions to the specific needs of couples affected by incarceration.

METHODS

Data

Data were collected between January 2009 and February 2011 in Oakland and San Francisco, California. A cross-sectional quantitative interview was conducted with 172 male-female couples (N = 344 participants) in which the male partner was released from state or federal prison in the 12 months prior to recruitment. Participants were recruited using street outreach methods, venue-based presentations, and flyer postings. Eligibility criteria included both parties being 18 years of age or older, being in an intimate relationship with each other during the male partner's most recent incarceration and at the time of eligibility screening, and providing documentation of the male partner's release from prison at least three and no more than 12 months prior to screening.

Potential participants were screened for eligibility by phone; each member of the couple spoke with study staff and answered screening questions in order to determine eligibility. A rigorous screening process was used to ascertain that the couples in the sample were in an intimate relationship. The screening process was conducted separately with each partner, and discrepant answers (e.g., length of time in current relationship) were flagged for discussion by the study team. People who were suspected of possibly not being partners were asked a set of further screening questions (e.g., city of residence for one's own and one's partner's living relatives), and people who again provided discrepant answers were deemed ineligible for study

participation. Couples who were not in a monogamous relationship were considered eligible. Interviewers also had instructions to note any suspicions that arose during interviews about "fake" couples. However, none were noted, which is likely due to the rigorous screening process.

Of the 448 couples screened for eligibility, 257 were deemed eligible. Staff members made every effort to schedule all eligible couples for interview appointments and completed interviews with 172 of them, for a response rate of 67%. From the information received during the screening process, there were no detectable differences between those who were and were not interviewed. The average age for interviewed and non-interviewed callers was not statistically significant ($p = .299$), nor was the relationship length between interviewed and non-interviewed callers ($p = .480$). Couples came to the study appointment at community-based organizations together, and provided informed consent and were interviewed separately in private rooms. Interviews were administered using a combination of computer-assisted personal interviewing (CAPI) and audio computer-assisted self-interviewing (ACASI), the latter of which was used for questions about sexual behaviors and substance use (all data were collected with the Questionnaire Development System, Nova Research Company, Bethesda, MD). Individual interviews lasted between 90 and 180 minutes, and participants were remunerated $50 each in cash ($100 per couple). All study procedures were reviewed and approved by the Institutional Review Boards at the University of California, San Francisco and RTI International.

Measures:

Outcome Variables

Sexual risk behavior outcome variables were (1) unprotected sex (binary), defined as any anal or vaginal sex without a condom with any partner in the past three months (yes/no). (2) Sex with any partners (of any gender) outside of the relationship (binary), defined as having had sex with any outside partners since the participant and the study partner first had sex. (3) Sexual Communication Frequency (continuous/count), a series of 5 yes/no questions developed in our previous work specifically for couples affected by incarceration that ask "After your/your partner's most recent release from prison, did you talk with your study partner about" getting an HIV test, having other sexual partners, injecting drugs, HIV risks for you during the incarceration period, and HIV risks for your partner during the incarceration period (Reznick et al., 2011).

Independent Variables

Demographic:

Race was determined from the check-all-that-apply question "Which one or more of the following do you identify as your race?" Black race was represented with a binary variable indicating whether the participant checked "Black or African-American."

Age was represented as a continuous variable, calculated from the participant's reported date of birth.

Education was a binary variable for the last year of school completed (less than high school vs. high school diploma, GED, or some college or more).

Employment status was derived from responses to the question, "Where did your money and resources come from in the last three months?" Participants were allowed to check all that applied from a list of formal, informal, and "street" work sources, government assistance, and family and friends or other. In the models, a binary variable represented whether the participant checked the response "Working a steady job in the legal economy."

Currently has incarcerated family was represented with a binary variable for the question, "Are any members of your family currently incarcerated in jail or prison?"

Visited others in prison was represented with a binary variable for the question, "Not including your study partner, have you ever visited anyone while he or she was incarcerated? This could have been in a juvenile facility, a jail, or a prison."

Ever had drug or alcohol treatment was represented with a binary variable for the question, "Have you ever been in any kind of drug or alcohol treatment program?"

History of foster care was represented with a binary variable for the question, "Before you turned 18 years old, did you ever live in foster care or a group home?"

Ever visited the male partner in jail or prison was calculated for women only and was represented with a binary variable for the question, "Have you ever gone to visit your study partner while he was incarcerated in jail or prison?"

Length of most recent time in prison was calculated for men only, and was represented by a continuous variable derived from a participant's report of his entry and release dates.

Total length of time incarcerated was also calculated for men only; this continuous variable was derived from the question, "Altogether, how many years and months of your life have you spent incarcerated in juvenile detention, jail, and state and federal prison combined?"

Female partner history of incarceration was represented by a binary variable indicating whether the participant endorsed any response other than zero to a series of four questions about "How many times total in your life have you been incarcerated" in juvenile detention, jail, or state or federal prison.

Relationship length was averaged across the reports of both partners.

Currently trying to conceive was represented with a binary variable at the couple-level if either partner responded affirmatively to "Would you like to conceive a/another child with your study partner" and endorsed "I have already started trying to conceive" in the follow-up question.

Currently married to study partner was a binary variable applied at the couple level if both partners reported being married to each other.

Self-reported HIV status was represented with a categorical variable (HIV-positive, HIV-negative, HIV status unknown).

Income was represented by a continuous variable for responses to the question, "How much money did you receive total from all of the sources you named above in the last 3 months?"

Housing stability was represented as a binary variable for the question, "During the last three months, where did you sleep at night?" Participants could check all that applied from a response list; those who endorsed "On the streets or in a park," "A motel or SRO," or "A shelter" were categorized as unstably housed.

Structural:

Neighborhood safety and exposure to violence (adapted from Attar, Guerra and Tolan 1994; Thompson et al. 2007). Participants were asked to endorse which of 23 events they had experienced (yes/no) in their neighborhood in the past 3 months, including "seen drug deals taking place" and "been afraid to go outside because of violence." Items were summed to get a final score ($\alpha = .82$).

Racism and discrimination (Landrine et al. 2006). This 21-item measure asked participants to endorse how often (never, once in a while, sometimes, a lot, most of the time, all of the time) they had experienced specific racist events in their lifetime such as being treated unfairly by teachers, supervisors, coworkers, friends, neighbors, etc. Responses on these items were summed to create a racist events score ($\alpha = .90$). As well, separate single items asked how

stressful participants have found these experiences to be in aggregate and how different they perceived their lives would have been had they not experienced discrimination due to their race/ethnicity.

Experiences of sexism (adapted from Bowleg, Neilands and Choi 2008). Using a parallel response format and list of sources of discrimination from the racism inventory described above, the 15-item sexism experiences scale targets life history of sexism experienced by female participants (α = .88). As with the racism inventory, separate single items also asked how stressful participants have found cumulative lifetime experiences of sexism and how different their lives would have been had they not experienced discrimination due to being female.

Discrimination due to criminal record (adapted from Landrine et al. 2006). Due to our participants' involvement with the criminal justice system, we adapted 17 items from the racism and sexism inventories to ask about discrimination experienced due having a criminal record. Items asked how often participants had been treated unfairly by employers, strangers, neighbors, etc., and the frequency of other experiences like "being called an insulting name" or "being misunderstood" because of having a criminal record. As with the racism and sexism scales, the sum of the criminal record items was computed (α = .92), and separate single items asked how stressful those events had been in aggregate as well as how different participants perceived their lives would have been had they not experienced this form of discrimination. Only males' criminal justice discrimination scores are used in these analyses.

Individual Psycho-social:

Brief Symptom Inventory (Derogatis 2001). The BSI-18 consists of 18 items on a 5-point Likert scale (not at all, a little bit, a moderate amount, quite a bit, extremely) measuring psychological distress, including somatization, depression, and anxiety. A total score was created from a sum of all 18 items (α = .90).

Stress and competing needs scale. A 7-item scale (α = .73 for women and .82 for men) designed for the Relate Project to measure general stress through items (ex. "general stress in your life", "stress about your housing situation", and "stress about returning to prison") that asked participants to rate their stress levels using an 11-point scale (from 0 to 10). One item differed for men and women: men were asked about the stress around avoiding going back to prison, while women were asked about the stress around their study partner's avoiding going back to prison. Factor analysis was performed on the 7 original items and 6 items were retained and summed to create the final score.

Sexual communication self-efficacy (Rosenthal, Moore and Flynn 1991). Of this 20-item scale, which asks participants to rate on a 1 (very uncertain) to 5 (absolutely certain) their ability to communicate with sex partners effectively, we asked 15 items (α = .58). Example items include "Refuse a sexual advance by your partner" and "Discuss using condoms and/or other contraceptives with a potential partner".

Condom Negotiation Self-Efficacy (adapted from Marín et al. 1998). Eighteen of the twenty original items (α = .95) for men and for women on a 1-5 Likert response format (definitely yes, probably yes, maybe, probably no, definitely no) coded from 1 (definitely no) to 5 (definitely yes) ask participants questions such as whether they can use condoms with regular partners, whether they can insist on using condoms when a partner resists, and whether they can discuss condom use with any sexual partner.

Perception of risk was measured with one item, "What do you think your chances of getting HIV/AIDS are?" with response options of no risk at all, small, moderate, and great.

Relationship:

Commitment (Sternberg 1997). Commitment to the relationship with the study partner was measured using an 8-item scale (α = .94) that included statements such as "Even when my partner is hard to deal with, I remain committed to our relationship." Response options were a 9-point scale with 1 indicating "Not at all true" and 9 indicating "Extremely true."

Relationship Quality (adapted from Spanier 1976). The Dyadic Adjustment Scale (DAS) is a 32-item measure of relationship quality. We used the subset measuring dyadic consensus (the degree to which relationship partners agree, 13 items, α = .87). Items are answered on a 6-point Likert scale (always disagree, almost always disagree, frequently disagree, occasionally disagree, almost always agree, always agree).

Relationship Satisfaction (adapted from Funk and Rogge 2007). We asked four of the 32 original scale items in the Couples Satisfaction Index (CSI), which measures one's satisfaction in a romantic relationship. Three of these items ask participants to rate statements such as "in general, how satisfied are you with your relationship" on a 6-point scale (not at all, a little, somewhat, mostly, almost completely, completely). The fourth item asks participants to indicate the degree of happiness of their relationship on a 7-point scale (extremely unhappy, fairly unhappy, a little unhappy, happy, very happy, extremely happy, perfect). A sum of the four items was calculated for the final score (α = .90).

Intimacy (Miller and Lefcourt 1982). This 17-item scale (α = .91) assesses the degree to which participants experience social intimacy with their partners. Items are asked on a 10-point scale ranging from "very rarely" to "almost always" or "not much" to "a great deal" depending on the item. Sample item: "When you have leisure time, how often do you choose to spend it alone with your partner?"

HIV-Specific social support (Darbes and Lewis 2005). This 24-item scale (α = .91) measures support from one's partner to practice safer sex and includes questions such as "The affection I feel for my partner helps me practice safer sex" and "My partner respects my choice to practice safer sex," with response options of strongly agree, agree, disagree, and strongly disagree.

Power (Pulerwitz, Gortmaker and DeJong 2000). This scale (α = .80 for the full sample, .82 for women and .78 for men, separately) consists of two parts: (1) 15 statements such as "My partner gets more out of our relationship than I do" and "Most of the time, we do what my partner wants to do," and with response options of strongly agree, agree, disagree, and strongly disagree; and (2) 8 questions such as "Who usually has more say about whether you have sex?" with response options of your partner, both of you equally, and you.

Data analysis

Analysis Plan. One-way frequency tables and measures of central tendency were created to describe the sample. Inferential analyses used the actor-partner model to explore actor and partner effects on sexual risk outcomes. Separate intercepts were estimated for males and females (i.e., two-intercept actor-partner interdependence model) (Kenny, Kashy and Cook 2006). Actor-partner analyses regress the participant's outcome score onto his/her own independent variables to investigate possible actor effects, as well as onto corresponding independent variables from his/her partner to uncover possible partner effects. Separate actor and partner effects were generated for men and for women and gender interactions for both actor and partner effects were tested. Due to some significant gender interactions, actor and partner effects were kept separate for men and women. Thus, each independent variable has four distinct effects: (1) male actor effect, (2) female actor effect, (3) male partner effect, and (4) female partner effect. For example, a significant actor effect would be if a woman's own levels of

relationship motives and intimacy are positively associated with her own sexual risk behavior. An example of a partner effect would be if a woman's partner's levels of relationship motives and intimacy are positively associated with her own risk behavior.

Clustered Data. Individuals nested within couples are the unit of analysis, necessitating an analytic approach suitable for clustered data. For the continuous outcome (sum of sexual communication items), we report unstandardized regression coefficients from a linear mixed model with gender-specific residual variances, as recommended by Kenny et al. (2006). Robust HC3-type standard errors were used to guard against model assumption violations (Long and Ervin 2000). For binary outcomes (any unprotected sex and any partners outside the relationship), we report odds ratios resulting from a generalized estimating equations (GEE) analysis with a binominal distribution and a logit link (Loeys and Molenberghs 2013). Missing data were minimal (i.e., <5%) for all outcomes and independent variables with two exceptions: any unprotected sex (13%) and length of most recent incarceration (8%). Multiple imputation was used to handle missing data for models with incomplete data; thus the total *N* is the same (*N*=344) for each analysis. All dependent and candidate independent variables were used together in the creation of 50 multiply imputed datasets to yield optimal inferences.

Independent Variable Screening Analyses. To screen candidate independent variables to enter into subsequent multivariate analyses, variable screening analyses were executed. Each independent variable was represented by four effects: female actor, female partner, male actor, and male partner. Due to their conceptual importance, relationship length and total time the male partner spent incarcerated were control covariates included in all variable screening analysis models.

Multicollinearity Analyses. Before multivariate analyses could be considered, an assessment of collinear independent variables was conducted using the variance inflation factors (VIFs). Several subsets of independent variables shared the same construct "space" based on the hypotheses listed above and taken together in a multivariate model resulted in model instability due to multicollinearity. Within each construct group, variables were ranked in order of importance to both the hypothesis and the analysis. The most important construct group members were then retained.

Multivariate Analyses. In multivariate analyses, backwards elimination was performed with an initial model that included independent variables for which one or more of their constituent male and female actor and partner effects were significant at the .25 level in the variable screening analyses (Hosmer and Lemeshow 2000). For instance, if a male partner effect for an independent variable was significant, the remaining three effects for that independent variable were also included in the multivariate analysis because those four effects were treated as a group. This approach was taken due to the dyadic nature of the data where actor and partner effects have the most substantive meaning in the context of their companion effects.

As in the variable screening analyses, due to their conceptual importance, relationship length and total time the male partner spent incarcerated were controlled for in all multivariate models, regardless of their significance. Independent variables were compared at each step, with the variable with the lowest *p*-value for the set (of all four effects) being identified for each independent variable. The entire independent variable set was dropped when the set's variable with the lowest *p*-value was highest amongst remaining correlates and above 0.05. Model fitting proceeded iteratively in this fashion until all remaining independent variables had at least one male-female/actor-partner effect that was significant at $p < .05$.

RESULTS

Overview and Sample Characteristics. The sample was predominantly black (70%), middle aged (mean age=39), not working a steady, legal job (77%), and the mean relationship length was 9 years (see Table 1). Only 16% of couples reported currently being married (all to each other). Fifteen percent of the sample reported some unstable housing in the last 3 months. On average, men had a lower education level ($p=.04$) and earned less than women ($p<0.001$). Men had spent a mean of 12.6 years of their lifetime incarcerated. Two thirds of women had a history of incarceration. Relatively few couples reported currently trying to conceive a child (16%). Eight participants (4 men and 4 women) were HIV-positive, with 4 couples of discordant HIV-status.

Unprotected Sex. Overall, 89% of men and 80.1% of women reported unprotected sex with any partner. In bivariate variable screening analyses, there were a few results significant at $p < .05$ (see Table 2 for a detailed view of the variable screening analyses and a list of variables subsequently considered in multivariate analyses). For Hypothesis 1 (demographic factors), if the woman had visited her partner in jail or prison, the odds that she reported any unprotected sex increased (actor effect). For Hypothesis 2 (structural factors), no significant associations were found. For Hypothesis 3 (individual psycho-social factors), another actor effect was significant: a man's increased Condom Negotiation Self-Efficacy was associated with his reporting less unprotected sex. For Hypothesis 4 (relationship factors), both an actor and a partner effect were found: a woman's increased HIV-Specific Social Support was associated with more unprotected sex for her (actor effect), and as a woman's Power score increased, her male partner reported less unprotected sex (partner effect). In multivariate analyses, for Hypothesis 1 (demographic factors), there was an actor effect for men: if the man worked a steady, legal job, his average odds of unprotected sex were 10 times higher than a man who did not (AOR = 10.16, 95% CI = 1.65, 62.68). For Hypotheses 2 (structural factors) and 3 (individual psycho-social factors), no significant relationships were found. For Hypothesis 4 (relationship factors), an actor effect for women was observed for HIV-Specific Social Support: an increase in her HSSPS resulted in an increase in her odds of unprotected sex (Adjusted Odds Ratio [AOR]=1.06, 95% Confidence Interval [CI]=1.01,1.11). A partner effect was also found for Relationship Power: an increase in a woman's Power resulted in a decrease in her male partner's odds of unprotected sex (AOR=0.31, 95% CI=0.13, 0.75). None of the couple-level correlates were significant in the final model for unprotected sex.

Sexual Partners Outside the Relationship. Overall, 58.7% of men and 62.2% of women reported having outside sexual partners since the first time they had sex with their study partner. No significant effects were observed for demographic variables measured to address Hypothesis 1, structural variables measured to address Hypothesis 2, or individual psycho-social variables measured to address Hypothesis 3. For Hypothesis 4 (relationship factors), we found only actor effects in the variable screening analyses. For women, an increase in Intimacy with her primary partner resulted in reduced odds of her reporting outside sexual partners. For men, more HIV-Specific Social Support was associated with greater odds of his having sexual partners outside the relationship, while increased Commitment with his primary partner was associated with lower odds of this outcome. We found only one actor effect in the multivariate analyses: in support of Hypothesis 4 (relationship factors), an increase in a man's Commitment score was associated with a decrease in the odds of his having an outside partner (AOR=0.93, 95% CI=0.89, 0.96). There were no significant results for women, couple-level correlates, or control variables in the final model for outside sex partners.

Sexual Communication. In variable screening analyses, there were two actor effects for Hypothesis 1 (demographic factors): older men had lower levels of sexual communication, while a woman who had visited her partner in jail or prison reported higher sexual communication. There were no significant effects observed for constructs measured to assess Hypothesis 2 (structural factors) and Hypothesis 3 (individual psycho-social factors). For Hypothesis 4 (relationship factors), there was a significant partner effect for men: as the female partner's Commitment to the relationship increased, men reported less sexual communication. In multivariate analyses, one significant couple-level control demographic construct remained in the final model countering Hypothesis 1 (demographic factors): for every year that the male partner had been incarcerated over his lifetime, the couple's mean sexual communication increased (β=0.04, 95% CI=0.02, 0.06). Other results from the multivariate analyses indicated primarily actor effects. Counter to Hypothesis 1 (demographic factors), sexual communication was lower for older men (β=-0.02, 95% CI=-0.05,-0.002), but as the age difference between partners increased, his sexual communication also increased (β=0.05, 95% CI=0.02, 0.08). For both men and women who had a high-school diploma/GED-equivalent, sexual communication was higher (β=0.51, 95% CI=0.11, 0.92 for men; β=0.49, 95% CI=0.10, 0.89 for women). For the individual psycho-social factors measured to assess Hypothesis 3, as a woman's perceived risk for HIV increased, her sexual communication increased (β=0.57, 95% CI=0.17, 0.98). For relationship constructs captured to assess Hypothesis 4, we found only one partner effect: as a woman's Commitment increased, her male partner's sexual communication decreased (β=-0.017, 95% CI=-0.03,-0.002).

Table 1. Sample Characteristics

		Male (N=172)	Female (N=172)	Total (N=344)	p-value
Individual-level					
Race	*N (%)*				0.36
Black		126 (73.3)	114 (66.7)	240 (70.0)	
White		18 (10.5)	20 (11.7)	38 (11.1)	
Latino		15 (8.7)	25 (14.6)	40 (11.7)	
Other		13 (7.6)	12 (7.0)	25 (7.3)	
Age	*Mean (SD)*	40.2 (9.0)	38.4 (10.1)	39.3 (9.6)	0.12
Education	*N (%)*				0.04
<High school		57 (33.1)	48 (28.1)	105 (30.6)	
HS grad or GED		85 (49.4)	73 (42.7)	158 (46.1)	
Some college through post doc		30 (17.4)	50 (29.2)	80 (23.3)	
Working steady, legal job	*N (%)*	35 (20.4)	43 (25.2)		0.29
Income	*N (%)*				<.0001
$0-999		62 (37.1)	26 (15.8)	88 (26.5)	
$1000-1999		47 (28.1)	40 (24.2)	87 (26.2)	
$2000-2999		28 (16.8)	34 (20.6)	62 (18.7)	
$3000 or more		30 (18.0)	65 (39.4)	95 (28.6)	
Unstably housed	*N (%)*	27 (15.7)	23 (13.5)	50 (14.6)	0.57
HIV Status as of most recent test	*N(%)*				0.73
HIV Negative		158 (87.8)	151 (91.9)	309 (89.8)	
HIV Positive		4 (2.3)	4 (2.3)	8 (2.3)	
Waiting for result		2 (1.2)	3 (1.7)	5 (1.5)	
Didn't return for result		0 (0.0)	1 (0.6)	1 (0.3)	
Never tested for HIV		8 (4.7)	12 (7.0)	20 (5.8)	
Couple-level					
Relationship length (years)	*Mean (SD)*	—	—	9.0 (7.9)	—
Currently married to each other	*N (%)*	—	—	27 (15.7)	—
Trying to conceive	*N (%)*	—	—	29 (16.2)	—
Total years spent incarcerated (male partner)	*Mean (SD)*	—	—	12.6 (7.8)	—
Length of most recent incarceration (years)	*Mean (SD)*	—	—	2.0 (3.6)	—
History of incarceration (female partner)	*N (%)*	—	—	113 (65.7)	—

	Male (N=172)	Female (N=172)	Total (N=344)	p-value
Couple HIV-serostatus *N(%)*				—
Discordant	—	—	4 (2.3)	
Concordant	—	—	143 (83.1)	
One or both partners don't know status	—	—	25 (14.5)	

Table 2. Variable Screening Results

Any Unprotected Sex				
	Women		*Men*	
	Actor OR (95% CI)	*Partner OR (95% CI)*	*Actor OR (95% CI)*	*Partner OR (95% CI)*
Demographic				
Black race	0.91 (0.36, 2.33)	1.20 (0.42, 3.43)	0.86 (0.26, 2.85)	1.93 (0.61, 6.05)
Age	0.97 (0.93, 1.03)*	0.94 (0.87, 1.02)*	0.97 (0.91, 1.03)	1.02 (0.90, 1.14)
HS graduate	1.08 (0.43, 2.71)	0.81 (0.33, 1.97)	0.66 (0.20, 2.19)	0.77 (0.22, 2.68)
Working	1.20 (0.44, 3.25)	1.34 (0.44, 3.25)	**4.97 (0.62, 40.23)***	0.70 (0.22, 2.18)
Currently has incarcerated family	0.95 (0.41, 2.18)	1.32 (0.56, 3.15)	1.48 (0.49, 4.46)	0.97 (0.34, 2.77)
Visited others in prison	1.54 (0.66, 3.63)	0.47 (0.21, 1.07)*	1.17 (0.41, 3.36)	1.82 (0.65, 5.07)*
Ever had drug/alcohol treatment	1.24 (0.54, 2.90)	0.52 (0.18, 1.50)*	0.75 (0.20, 2.82)	0.92 (0.33, 2.58)
Been in foster care	0.74 (0.28, 1.94)	0.89 (0.30, 2.60)	1.12 (0.30, 4.28)	4.11 (0.52, 32.42)*
Structural				
Attitudes regarding criminal justice authorities	1.07 (0.93, 1.21)	0.90 (0.78, 1.04)*	0.99 (0.84, 1.18)	1.06 (0.90 , 1.25)
Neighborhood safety and exposure to violence	0.98 (0.88, 1.10)	1.04 (0.93, 1.17)	1.05 (0.90, 1.22)	1.03 (0.89, 1.19)
Racism and discrimination				
Racism experiences º	1.01 (0.98, 1.05)	0.97 (0.94, 1.00)**	1.01 (0.97, 1.05)	1.01 (0.97, 1.05)
How stressful were events	1.05 (0.75, 1.49)	0.90 (0.63, 1.28)	1.23 (0.79, 1.93)	1.04 (0.67, 1.60)
How different would life be º	1.02 (0.77, 1.35)	1.05 (0.82, 1.33)	0.82 (0.62, 1.08)*	1.40 (0.78, 2.51)
Individual psycho-social				
Brief symptom inventory (BSI)	1.00 (0.97, 1.04)	0.97 (0.92, 1.01)*	1.01 (0.94, 1.08)	1.01 (0.97, 1.07)
Stress and competing needs	1.01 (0.98, 1.04)	0.99 (0.96, 1.01)	1.00 (0.97, 1.03)	1.02 (0.98, 1.05)
Sexual communication self efficacy	1.03 (0.96, 1.10)	1.02 (0.95, 1.08)	1.05 (0.96, 1.14)	1.05 (0.96, 1.14)
Condom negotiation self efficacy	0.99 (0.95, 1.02)	0.99 (0.97, 1.02)	0.93 (0.87, 0.99)**	0.94 (0.87, 1.01)*
Perception of risk	1.36 (0.49, 3.79)	1.18 (0.36, 3.91)	1.13 (0.24, 5.35)	1.41 (0.43, 4.66)
Relationship				
Commitment	1.01 (0.98, 1.04)	1.02 (0.99, 1.05)*	1.01 (0.96, 1.05)	1.00 (0.97, 1.04)
Relationship quality	0.98 (0.95, 1.02)	0.97 (0.93, 1.02)	0.98 (0.92, 1.03)	0.99 (0.95, 1.04)
Relationship satisfaction	0.98 (0.90, 1.07)	1.03 (0.94, 1.13)	0.96 (0.85, 1.09)	1.00 (0.92, 1.11)
Intimacy	0.99 (0.97, 1.01)	1.01 (0.98, 1.03)	1.01 (0.98, 1.04)	1.01 (0.98, 1.03)
HIV-specific social support	**1.06 (1.01, 1.11)****	1.01 (0.96, 1.06)	1.03 (0.97, 1.09)	1.06 (1.00, 1.12)*

Power	0.61 (0.26, 1.45)	0.44 (0.17, 1.13)*	0.52 (0.17, 1.58)*	**0.34 (0.12, 0.99)****
	Couple *OR (95% CI)*			
Demographic				
Woman visited her partner in prison	3.56 (2.09, 6.07)***			
Male's most recent incarceration length (years)	0.95 (0.87, 1.03)*			
Female has incarceration history	2.18 (1.28, 3.72)***			
Trying to conceive	3.10 (1.18, 8.15)**			
Structural				
Experiences of sexism				
Sexism experiences º	1.06 (1.03, 1.09)***			
How stressful were events º	1.54 (1.25, 1.89)***			
How different would life be º	1.30 (1.09, 1.55)***			
Discrimination due to criminal record				
Discrimination experiences	1.05 (1.02, 1.08)***			
How stressful were events º	1.46 (1.23, 1.75)***			
How different would life be º	1.33 (1.16, 1.52)***			

Sexual Communication

	Women		*Men*	
	Actor *β (95% CI)*	*Partner* *β (95% CI)*	*Actor* *β (95% CI)*	*Partner* *β (95% CI)*
Demographic				
Black race	0.08 (-0.56, 0.40)	0.30 (-0.15, 0.75)*	0.04 (-0.39, 0.47)	-0.25 (-0.72, 0.23)
Age	-0.02 (-0.04, 0.005)*	0.03 (-0.02, 0.07)*	**-0.02 (-0.04, 0.001)***	**0.05 (0.02, 0.09)*****
HS graduate	**0.48 (0.08, 0.87)****	-0.30 (-0.71, 0.10)*	**0.45 (0.06, 0.83)****	-0.35 (-0.77, 0.07)*
Working	0.40 (-.10, 0.89)*	0.04 (-0.46, 0.54)	0.03 (-0.44, 0.50)	0.08 (-0.42, 0.58)
Currently has incarcerated family	-0.03 (-0.41, 0.36)	0.22 (-0.16, 0.61)	0.17 (-0.22, 0.56)	-0.17, -0.56, 0.21)
Visited others in prison	0.19 (-0.23, 0.62)	-0.28 (-0.68, 0.11)*	0.08 (-0.30, 0.47)	-0.07 (-0.46, 0.32)
Ever had drug/alcohol treatment	0.23 (-0.19, 0.66)	-0.13 (-0.59, 0.33)	-0.10 (-0.52, 0.32)	0.22 (-0.18, 0.61)
Been in foster care	0.36 (-0.14, 0.85)*	0.54 (-0.05, 1.13)*	0.25 (-0.31, 0.81)	0.02 (-0.48, 0.53)
Structural				
Attitudes regarding criminal justice authorities	-0.03 (-0.09, 0.04)	-0.001 (-0.06, 0.06)	-0.02(-0.09, 0.05)	0.02 (-0.04, 0.08)
Neighborhood safety and exposure to violence	0.04 (-0.03, 0.10)	-0.004 (-0.06, 0.05)	0.01 (-0.05, 0.07)	0.01 (-0.04, 0.05)
Racism and discrimination				

Racism experiences º	0.01 (-0.002, 0.03)*	0.004 (-0.01, 0.02)	0.02 (0.003, 0.03)**	0.009 (-0.005, 0.02)*
How stressful were events º	0.21 (0.35, 0.39)**	0.03 (-0.14, 0.20)	0.20 (0.03, 0.37)**	0.09 (-0.08, 0.25)
How different would life be º	0.16 (0.02, 0.30)**	0.002 (-0.11, 0.11)	0.15 (0.03, 0.26)**	0.13 (-0.01, 0.27)*
Individual psycho-social				
Brief symptom inventory (BSI)	0.003 (-0.02, 0.03)	0.01 (-0.01, 0.04)	0.02 (-0.01, 0.04)*	0.002 (-0.02, 0.02)
Stress and competing needs º	0.01 (-0.01, 0.02)	-0.003 (-0.02, 0.009)	0.01 (-0.005, 0.02)*	-0.005 (-0.02, 0.01)
Sexual communication self efficacy º	-0.02 (-0.05, 0.01)	0.01 (-.02, 0.04)	-0.02 (-0.06, 0.01)*	0.001 (-0.03, 0.03)
Condom negotiation self efficacy	0.01 (-0.001, 0.02)*	-0.016 (-0.03, -0.003)**	-0.01 (-0.02, 0.01)	0.0004 (-0.01, 0.01)
Perception of risk	**0.57 (0.17, 0.98)*** **	-0.60 (-1.32, 0.12)*	0.35 (-0.21, 0.91)*	0.01 (-0.44, 0.46)
Relationship				
Commitment	0.004 (-0.01, 0.02)	-0.01 (-0.02, 0.008)	-0.001 (-0.02, 0.01)	**-0.02 (-0.03, -0.002)** **
Relationship quality	-0.004 (-0.02, 0.01)	-0.003 (-0.02, 0.02)	0.01 (-0.02, 0.03)	-0.001 (-0.02, 0.02)
Relationship satisfaction º	0003 (-0.04, 0.04)	-0.001 (-0.05, 0.04)	0.04 (-0.01, 0.09)*	-0.03 (-0.08, 0.02)*
Intimacy º	0.01 (-0.003, 0.02)*	-0.01 (-0.02, 0.004)	0.01 (-0.005, 0.02)*	-0.01 (-0.02, 0.01)
HIV-specific social support	0.01 (-0.02, 0.03)	0.01 (-0.01, 0.04)	-0.01 (-0.03, 0.01)	0.02 (-0.005, 0.04)*
Power	0.20 (-0.21, 0.61)	-0.18 (-0.59, 0.23)	0.13 (-0.22, 0.49)	0.09 (-0.33, 0.50)

	Couple *β (95% CI)*
Demographic	
Woman visited her partner in prison	0.30 (0.04, 0.57)**
Male's most recent incarceration length (years)	0.02 (-0.03, 0.07)
Female has incarceration history	0.39, 0.11, 0.68)***
Trying to conceive	0.40 (-0.001, 0.79)*
Structural	
Experiences of sexism	
Sexism experiences º	0.04 (0.03, 0.05***
How stressful were events º	0.23 (0.13, 0.33)***
How different would life be º	0.17 (0.11, 0.24)***
Discrimination due to criminal record	
Discrimination experiences	0.03 (0.02, 0.04)***
How stressful were events º	0.23 (0.15, 0.31)***
How different would life be º	0.13 (0.07, 0.19)***

Any Sexual Partners Outside Primary Relationship				
	Women		*Men*	
	Actor OR (95% CI)	*Partner OR (95% CI)*	*Actor OR (95% CI)*	*Partner OR (95% CI)*
Demographic				
Black race	0.49 (0.23, 1.04)*	0.96 (0.41, 2.29)	0.81 (0.40, 1.63)	0.59 (0.26, 1.32)*
Age	0.97 (0.94, 1.01)*	1.06 (0.98, 1.14)*	1.00 (0.97, 1.04)	1.04 (0.97, 1.11)
HS graduate	0.96 (0.48, 1.93)	1.31 (0.68, 2.54)	0.84 (0.44, 1.63)	0.98 (0.49, 1.95)
Working	0.94 (0.45, 1.96)	1.89 (0.81, 4.38)*	0.86 (0.40, 1.86)	0.75 (0.37, 1.52)
Currently has incarcerated family	0.81 (0.43, 1.56)	1.84 (0.94, 3.59)*	0.95 (0.51, 1.80)	1.05 (0.56, 1.96)
Visited others in prison	1.65 (0.86, 3.16)*	1.09 (0.57, 2.08)	1.25 (0.66, 2.34)	1.31 (0.69, 2.48)
Ever had drug/alcohol treatment	1.07 (0.56, 2.07)	0.99 (0.48, 2.07)	1.24 (0.61, 2.51)	0.91 (0.48, 1.72)
Been in foster care	1.07 (0.48, 2.36)	0.98 (0.43, 2.23)	0.97 (0.43, 2.20)	0.91 (0.42, 1.97)
Structural				
Attitudes regarding criminal justice authorities	0.99 (0.89, 1.10)	0.89 (0.80, 0.99)**	0.98 (0.88, 1.09)	0.95 (0.85, 1.05)
Neighborhood safety and exposure to violence	1.02 (0.93, 1.12)	1.08 (0.99, 1.18)*	1.09 (0.99, 1.19)*	1.01 (0.92, 1.10)
Racism and discrimination				
Racism experiences º	1.02 (1.00, 1.05)*	1.01 (0.99, 1.03)	1.01 (0.98, 1.03)	0.99 (0.97, 1.02)
How stressful were events	1.05 (0.81, 1.38)	1.03 (0.79, 1.35)	0.93 (0.72, 1.22)	0.97 (0.75, 1.26)
How different would life be º	1.14 (0.92, 1.43)*	1.03 (0.86, 1.23)	0.86 (0.74, 1.06)*	0.93 (0.75, 1.15)
Individual psycho-social				
Brief symptom inventory (BSI)	1.01 (0.99, 1.04)	1.02 (0.98, 1.07)	1.05 (1.00, 1.10)**	1.01 (0.98, 1.05)
Stress and competing needs º	1.00 (0.98, 1.03)	1.02 (1.00 , 1.04)*	1.01 (0.99, 1.03)*	1.00 (0.98, 1.02)
Sexual communication self efficacy	1.00 (0.96, 1.05)	0.98 (0.93, 1.03)	0.99 (0.94, 1.04)	0.99 (0.94, 1.03)
Condom negotiation self efficacy	1.00 (0.97, 1.02)	0.99 (0.97, 1.02)	1.00 (0.98, 1.02)	1.01 (0.99, 1.04)
Perception of risk	0.75 (0.34, 1.65)	0.63 (0.23, 1.72)	1.11 (0.44, 2.81)	0.80 (0.36, 1.69)
Relationship				
Commitment	0.99 (0.96, 1.01) †	**0.98 (0.95, 1.00)***	**0.93 (0.890.96)*** †**	1.00 (0.98, 1.02)
Relationship quality º	0.98 (0.95, 1.00)* †	1.00 (0.97, 1.03)	0.95 (0.92, 0.99)*** †	0.99 (0.96, 1.02)
Relationship satisfaction º	0.97 (0.91, 1.03)	0.95 (0.88, 1.03)*	0.89 (0.83, 0.96)***	0.98 (0.91, 1.04)
Intimacy º	0.98 (0.96, 1.00)**	0.99 (0.97, 1.01)*	0.96 (0.94, 0.98)***	1.00 (0.98, 1.01)
HIV-specific social support	1.01 (0.97, 1.05)	1.03 (1.00, 1.07)*	1.05 (1.01, 1.08)**	1.01 (0.97, 1.04)
Power	0.76 (0.41, 1.43)	0.72 (0.37, 1.37)	0.94 (0.50, 1.77)	1.24 (0.67, 2.26)

	Couple *OR (95% CI)*
Demographic	
Woman visited her partner in prison	0.996 (0.68, 1.46)
Male's most recent incarceration length (years)	1.01 (0.90, 1.02)*
Female has incarceration history	1.54 (0.98, 2.41)*
Trying to conceive	0.77 (0.43, 1.40)
Structural	
Experiences of sexism	
Sexism experiences º	1.03 (1.01, 1.06)***
How stressful were events º	1.15 (0.97, 1.35)*
How different would life be º	1.27 (1.10, 1.46)***
Discrimination due to criminal record	
Discrimination experiences	1.02 (1.00, 1.04)*
How stressful were events º	1.17 (1.01, 1.34)*
How different would life be	1.02 (0.92, 1.12)

Notes: N=344 for all models. *** indicates a *p*-value of .01 or less, ** indicates a *p*-value of .05 or less, and * indicates a *p*-value of .25 or less. † indicates a significant (α=0.05) gender interaction for either actor or partner scores. º signifies independent variables that were withheld from the initial backwards model due to multicollinearity with other independent variables in the starting model. Results in boldface represent independent variables that were significant in the final multivariate model.

DISCUSSION

Our dyadic analyses of sexual HIV risk among male parolees and their female partners paint a complex portrait of couples affected by incarceration and of partners' influences on each other, helping to expand our understanding of the potential needs and points of intervention for this population at risk for health disparities. For example, there were two partner effects for men related to Hypothesis 4 (relationship factors). First, we found that an increase in a man's partner's Power was associated with substantially decreased odds of him engaging in unprotected sex. A possible interpretation of this result is that a woman who reports high levels of relationship power may be confident about engaging in sexual-health discussions, including those about whether there is a need for condom use in the relationship. We also found that an increase in a man's partner's Commitment was associated with him reporting less sexual communication. This could be ascribed to the male partner perceiving that, due to the level of commitment demonstrated by his partner, he does not need to have specific conversations with her regarding their sexual practices. This result also could indicate that men with more committed partners do not feel comfortable raising issues about sexual health risk, perhaps because this could be perceived as implying that either member of the couple has outside sexual partners. This underscores the importance of taking the relationship context into account, as prior research has consistently investigated individual-level factors such as communication without taking relationship dynamics such as commitment into consideration. It is also critical to consider how the relationship context may shift priorities for those in relationships. Importantly, the results showing these partner effects for men alert us to the need to not only investigate the impact of men's incarceration on their female partners, but also the influence of female partners on formerly incarcerated men's HIV risk (see Khan et al. 2011a). In addition, sexual communication is a skill that can be targeted and improved by intervention (Crosby et al. 2013), and should be included in future interventions with this population.

We did not find any partner effects for women across the three outcomes. This surprised us, given previous findings that have described women with incarcerated partners to be highly sensitized to their partners' needs (Braman 2004; Comfort 2008; Fishman 1990; Girshick 1996; Peelo et al. 1991). Notably, in the variable screening analyses, a woman who had visited her partner in jail or prison had increased odds of unprotected sex, and her amount of sexual communication also increased. Although these are actor effects, visitation may serve as a proxy for women's responsiveness to their partners' needs as it is an act of caretaking that often entails a considerable investment of women's time, energy, and resources (Christian 2005; Comfort 2002; Comfort 2003; Grinstead et al. 2001; Hairston, Wills and Wall 1996). Our findings suggest that further work is needed to fully understand the role of jail and prison visiting in couples' sexual health.

For unprotected sex, we found that women who reported more HIV-specific social support had higher odds of engaging in unprotected sex. The HSSPS measure used in this study has been hypothesized to assess support received from a partner for talking about sex and HIV (Darbes et al. 2012; Darbes and Lewis 2005). This result therefore points to the importance of sexual communication within partnerships, and the need for couples to have discussions that accurately reflect the potential risks for HIV that may be present for them. It could be that women with higher HSSPS were able to accurately assess that unprotected sex with their partner did not pose risk for HIV. Nonetheless, our hypothesis was not directly supported, as prior research has shown increased HSSPS to be associated with less unprotected sex. Indeed, our examination of the correlates of sexual communication provides more detail about this intimate

issue that lies at the heart of many HIV prevention efforts. In contrast to our previous qualitative findings that incarceration inhibits a couple's ability to talk about sex (Comfort et al., 2005) and in opposition to Hypothesis 1, in the Relate sample a couple's sexual communication increased for each year that the male partner was incarcerated in his lifetime. In interpreting this result, we speculate that there could be a "making up for lost time" effect in which couples that have been prohibited from having sexual communication and contact while the male was in prison may embrace the opportunity to do so when reunited after his release. In addition, in support of Hypothesis 3, we found that women who perceived their risk for becoming infected with HIV to be elevated had more sexual communication with their formerly incarcerated partner. If we consider these two results together, it is possible that a woman whose partner has been incarcerated frequently and/or for long periods of time may feel more at risk for HIV infection and be more likely to discuss sexual health with her partner. This increased likelihood indicates that the incarceration and post-release periods may be opportune moments for interventions that facilitate these conversations by building sexual health communication skills within couples (Grinstead et al. 2008; Reznick et al. 2011). Indeed, women with incarcerated and recently-released partners may be especially open to discussing sexual health with their partners and welcoming of learning skills to help them do so most fruitfully.

Two other sexual communication results can be examined in relationship to each other. Counter to Hypothesis 1, we found that as a man's age increased, his sexual communication decreased. This could be generally due to less comfort among older individuals discussing sex, and particularly HIV (Strombeck and Levy 1998). A somewhat contradictory finding was that as the difference between the male and female partners' ages increased, the couple's mean sexual communication score also increased. This potentially could indicate that people in relationships with older or younger partners may be more inclined to think about HIV risk, perhaps due to generational differences or personal histories of risk behavior, and thus engage their partners in more sexual communication. However, further research is needed to explore both of these results in order to better understand the effects of men's age and age gap between partners on sexual communication.

The only result in the final multivariate model for outside sex partners related to Hypothesis 4 was that an increase in a man's Commitment was associated with decreased odds of him having a partner outside of the relationship. Few studies have focused on men's relationship commitment, and our finding demonstrates that it is important to assess the level of men's investment in their relationships, and that this investment has implications for sexual risk in heterosexual couples. Indeed, Adimora and colleagues (2011) report that women who report concurrent partnerships are more likely to have male partners who also engage in concurrent relationships, thereby increasing the likelihood of HIV infection via expanding sexual networks that confer increased risk. This result, too, supports the need for interventions tailored for couples that both reinforce the positive aspects of relationships, such as maintaining commitment within the context of incarceration, but also support couples in developing sexual-health communication skills with each other regarding decision-making within their relationship.

In addition, several variables that are consistently significant across studies in the incarceration literature emerged in our sexual HIV risk models. Both men and women who were high-school graduates or GED recipients reported more sexual communication than participants who did not finish high school. Low educational achievement is a strong predictor of lifetime likelihood of incarceration, particularly for African-American men (Western 2006). Also, men who reported having a steady, legal job had ten times higher odds of engaging in unprotected sex

than men who did not. The severe obstacles faced by African-American men with criminal records when trying to obtain legal work have been well-documented (Pager 2007), and the large effect of this variable is notable and may speak to employment's role in increasing men's "credibility" as trustworthy partners and potential fathers despite their history of incarceration (Edin and Kefalas 2005). This finding may also point to an increase in men's ability to negotiate or insist on unprotected sex within relationships due to increased financial power (Amaro 1995; Bowleg, Belgrave and Reisen 2000; Wingood and DiClemente 2000).

Our analyses of the Relate Project's unique data set make several contributions to the existing literature on heterosexual HIV risk among couples affected by incarceration. This study is innovative in developing a description of couples by recruiting both partners for participation. These methods permitted us to gain a more in-depth comprehension of intimate relationships after men are released from prison. Much literature focuses on how incarceration breaks apart and inhibits the formation of close relationships (Browning, Miller and Spruance 2003; Harris and Miller 2003; Lopoo and Western 2005; Western and McLanahan 2000). While this undoubtedly occurs, the Relate Project demonstrates that some intimate partnerships can endure during and after correctional sentences, and emphasizes the importance of furthering investigations of how incarceration shapes these partnerships in ways that have consequences for sexual health and health disparities. For example, the prevalence of outside sexual partners among men and women in our sample may be viewed in light of the findings in other studies that incarceration is correlated with concurrent partnerships (Adimora et al. 2003a; Adimora et al. 2003b) and sexually transmitted infections (STIs) (Auerswald et al. 2006), which may help to explain disproportionately high rates of HIV infection among African Americans, particularly women (Johnson and Raphael 2009).

Furthermore, our dyadic analyses provide a novel opportunity to study interactions between male and female partners, and thus to explore the impact of each member of the couple on the other. The Relate Project thereby broadens the scope from examining individual behavior to exploring dyadic processes and couple-level influences on sexual HIV risk such as relationship power, commitment, and communication. By deepening our understanding of how partners affect each other's sexual health, our analyses may provide useful insights both for further epidemiological and behavioral studies of HIV and STIs as well as the development of interventions for couples affected by incarceration. The need for context-specific interventions is bolstered by the findings of the Eban HIV/STD Risk Reduction Intervention, a couples-based intervention specifically developed for African-American HIV serodiscordant couples. In a randomized controlled trial, the Eban intervention successfully reduced rates of unprotected sex (El-Bassel et al. 2010). Eban thus speaks to the strong potential for couples-based interventions, particularly those that integrate general relationship issues with context-specific information and skills training for HIV risk reduction.

Finally, the low prevalence of marriage among Relate Project participants draws attention to the importance of further investigating and finding appropriate ways to ask about sustained, meaningful, non-marital relationships. The low marriage rates among African-American men with incarceration histories are often taken to reflect a lack of engagement in intimate partnerships (Western 2006). Given that all participants in our study were in relationships, came to the interview appointment with their partner, and the mean relationship length was nine years, yet only 16% of participants were married, it is evident that other measures should be included when assessing involvement in partnerships. In addition, the low prevalence of marriage in this study points to a need for further research into the legal and health implications of couples not

being married (e.g., inability to add a partner to one's medical insurance) and how this might intersect with health disparities.

LIMITATIONS

Several limitations should be kept in mind when interpreting the results of this exploratory study. This was a cross-sectional study, and therefore we are unable to determine causality. Also, participants were recruited from two cities in California's Bay Area, Oakland and San Francisco, and all participants were in male-female partnerships of at least 3 months. Our results are not necessarily generalizable to other locations or to people in shorter-term partnerships, and research focusing on same-sex partnerships affected by incarceration is desperately needed. Finally, we did not include measures of drug use in these models. Substance use is an important issue for formerly incarcerated and impoverished populations, and the Relate Project questionnaire contained questions about participants' use of alcohol, marijuana, uppers/stimulants, and downers. Due to the complexity of dyadic data analysis and the concomitant lengthiness of descriptions of the measures, analysis plan, and tables, we report the drug use analyses in a separate paper (Comfort et al., in preparation).

CONCLUSION

HIV infection is inherently dyadic, requiring two people for transmission to occur. The Relate Project provides a novel dataset for the dyadic analysis of HIV risk among male parolees and their female partners, and results highlight the importance of focusing on the couple as a unit when assessing HIV risk and protective behaviors. It is clear that more research is needed to fully comprehend the influence of relationship dynamics on sexual HIV risk among couples affected by incarceration, including longitudinal studies and studies that account for specific "concordancies" and "discordancies" that may affect variables like power and commitment among couples such as incarceration history and employment and housing status. Nonetheless, the results we present here indicate potentially fruitful avenues for population-specific interventions that may help to reduce health disparities, such as including both partners in the intervention and addressing the intersection of incarceration and the relationship dynamics that may underlie sexual HIV risk behavior.

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