The Relationship Context for Risky Sex among HIV-Positive Adults in the United States

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Most research on the correlates of sexual risk behavior among HIV-positive people has focused on individual rather than relationship characteristics. Number of sexual partners is routinely measured, and tends to be positively related to high-risk sex (Heckman, Kelly and Solai 1998; Reilly and Woo 2001). However, few studies have delved into how HIV-positive individuals manage their sexual relationships. How people manage risk within their relationships receives much more attention than the processes of relationship formation and dissolution that determine how many occasions there will be for risk management--or risky behavior--to occur. Hoff and her colleagues (Hoff et al. 1996) examined psychological and behavioral differences between gay men who were in primary relationships and gay men who were single, finding that men in relationships had fewer partners but were more likely to have unprotected anal intercourse than single men. Interestingly, HIV-positive men in primary relationships had more partners and were less likely to be monogamous than HIV-negative men, perhaps reflecting selection for high-risk behavior related to their HIV status.

The risk that HIV-positive individuals transmit infection to their sexual partners depends not only on whether they engage in unprotected sexual activity but also with whom. For example, individuals in mutually monogamous relationship with a partner who is also HIV-positive can engage repeatedly in unprotected sex without posing any risk of transmitting HIV to their partner for the first time, although they may risk transmitting another STD or a new strain of HIV Moreover, HIV-positive individuals who are in a long-term monogamous relationship with a seronegative partner risk

transmitting only to that partner, and they can reduce that risk by using condoms and/or engaging in lower-risk sexual activity.

In contrast, individuals who have multiple partners pose a higher risk of HIV transmission, especially if partnerships are concurrent. . Results of simulation models show that the existence of concurrent partnerships has an exponential effect on the growth rate of an epidemic in its early phases (Morris and Kretzschmar 1997), largely because concurrency creates pathways for the virus to spread rapidly instead of being trapped in a monogamous partnership. It is important to note that concurrent partnerships increase the risk of infection even when number of partners is controlled; that is, it is riskier to have n partners who overlap than n serial partners (Rosenberg et al. 1999). This is likely to be important for HIV-positive as well as HIV-negative people. Having concurrent partners increases the risk that they will be exposed to other pathogens, including other strains of HIV and other STDs. Such increased risk has implications not only for their own health but also for that of their partners.

Despite the importance of relationship context for understanding the risk of sexual transmission of HIV from HIV-positive individuals to their partners, few data are available that describe relationship context in this population. In this paper, we analyze data on the sexual behavior of a national probability sample of adults receiving HIV care to examine the relationship patterns that may be observed in this population. In particular, we focus on three relationship parameters of interest: the number of sexual partners reported, whether an individual has a primary relationship partner (PRP), and whether that PRP is among the individual's sex partners. Each of these relationship

attributes has some bearing on the risk of HIV transmission. The greater the number of partners an HIV-positive person has, the greater the number of people potentially exposed to the risk of HIV transmission (unless all such partners are themselves HIV-positive). Being in a primary relationship is potentially protective against HIV transmission to partners if it reduces the total number of partners exposed, establishes long-term "HIV risk-free" relationships in which both partners have already seroconverted, or provides conditions facilitating maintenance of safer sex practices. Whether it does these things is an empirical question.

Traditional wisdom suggests that having a PRP or spouse is protective against transmission to the broader public, if not to the PRP. However, this rests on the assumption that the PRP is the only sex partner. However, some in this population may have partners in addition to the PRP. Others may not have sex with their PRP at all, and seek out other sex partners instead. This last pattern is likely to occur at least occasionally in this population, where PRPs may also be HIV-infected and too ill to have sex, or may be HIV-negative and not wish to risk even protected sex with their HIV-positive partner. Thus, we examined relationship patterns defined along three dimensions: whether the individual has a PRP/spouse, whether the PRP/spouse is among the respondent's sex partners, and whether the respondent has multiple sex partners. There are six possible sexual relationship patterns resulting from this system of categorization.

The risk that sexual contact will lead to transmission of HIV infection to a sexual partner depends on the HIV serostatus of the partner, the riskiness of the particular sexual act, and whether a condom is used. To assess how relationship patterns are related to behavioral risk, we examine two key factors in a relationship context: engagement in vaginal or anal sex without protection of condoms and HIV serostatus of partners. Transmission risk is highest when serodiscordant partners engage in unprotected sex. Some research also suggests that unprotected sex mainly occurs within close, presumably monogamous relationships, where risk may have been negotiated or both partners may be HIV-positive. In this analysis, we map the occurrence of unprotected vaginal or anal sex onto these relationship categories.

Method

Sample and Procedure

Data were collected as part of the Risk and Prevention (R&P) follow-up (n = 1,421) to the HIV Cost and Services Utilization Study (HCSUS), which used multistage national probability sampling to select random samples of geographic areas, medical providers, and adults with known HIV infection who had at least one health care visit at a facility other than a military, prison, or emergency department from January 1996 to February 1996. The sample and procedures of HCSUS are presented in greater detail elsewhere (Bozzette et al. 1998; Shapiro et al. 1999).

Respondents were participants in the HIV Cost and Services Utilization Study (HCSUS), a national probability sample of 2,864 persons at least 18 years old with known HIV infection who made at least 1 visit to a nonmilitary, non-prison medical

provider other than an emergency department in the contiguous United States during the first 2 months of 1996 (Shapiro et al. 1999; Frankel et al. 1999). The Risk and Prevention sample consisted of 1,421 persons from the HCSUS sample. Eligible members of the HCSUS sample were those who were interviewed in English at HCSUS baseline, whose gender was unambiguous based on HCSUS data, and who participated in the second follow-up HCSUS interview, conducted from August 1997 through January 1998 (n=2,205). We drew a subsample of 1,794 from this group, sampling randomly after stratifying by primary sampling unit, type of healthcare provider, age, ethnicity, and reported gender of sexual partners prior to HIV diagnosis (Ciccarone et al. 2003). Eligible white gay men aged 40 and over were sampled with probability 1/3, eligible white gay men aged 39 and younger were sampled with probability 4/9, and all other groups were sampled with a probability one. Interviews were conducted from September through December 1998. The completion rate was 79%, and the response rate after allowing for known mortality was 84%.

The sample of 1,421 individuals from the Risk and Prevention (R & P) study was weighted to represent a population of 199,613 adults receiving medical care in the 48 contiguous states of the U.S in 1996 and surviving until 1998. The analytic weights adjusted the sample to represent the entire reference population taking into account differential selection probabilities across subgroups of the population, nonresponse, and multiplicity, i.e., the fact that some patients had more than one opportunity to enter the sample.

Survey Instrument and Procedures

R & P participants were contacted using information they provided at earlier waves. The survey covered sexual activities, attitudes, and beliefs related to HIV transmission and its prevention. All interviews were conducted in person, using a combination of computer-assisted self-interview (CASI) and computer assisted personal interview (CAPI) methods. Interviewers asked questions and entered responses for most of the interview using a laptop computer. However, to enhance privacy, the computer was turned over to respondents for the section of the survey concerning sexual behavior.

Sexual behavior was assessed for the period of six months prior to the interview date. The portion of the interview assessing sexual behavior began by defining sex as oral, anal, or vaginal sex, describing each of these activities. After consulting a calendar, respondents were asked to indicate the number of different sex partners they had had in the previous six months. Respondents also indicated the date of their last sexual encounter. Those who had been sexually active within the last six months were asked a series of questions concerning this most recent encounter, including items concerning protected and unprotected behavior and partner characteristics. Respondents who reported having sex with this partner more than once in the last six months were also asked to describe their usual sexual behavior with the partner during that period. Participants who had multiple partners during the six-month period were asked about the number of times they had sex, partner characteristics, and usual behavior with each successively less recent partner, until respondents had described all their partners during the six-month period or had described their five most recent partners during the past six months. Respondents who had a spouse or primary relationship partner (PRP) who was not among their five most recent partners were asked separate questions about that

person, irrespective of when they last had sex, resulting in the assessment of six partners for these respondents.

Analysis Samples

To categorize sexual relationship patterns based on the number and type of relationships, we used respondents' reports on their five most recent sexual partners and PRP. Respondents were included in the analysis only if they reported having sex with one or more partners in the last six months and reported having vaginal, anal, or oral sex and a date of most recent sex with at least one partner that fell within the six-month window. At the relationship level, we examined whether the respondent reported having sex with each partner at least once in the six months prior to the interview and the reported date of last sex with this partner. Partnerships were included in the analysis only if the respondent reported sexual activity with that partner on a date within six months of the interview. Our analysis sample consists of 932 sexually active respondents who reported on a total of 1,750 individual partners, reduced to 1,749 observations during cleaning, after deletion of a duplicate observation for a partner that had been described twice by the same respondent.

For the 1,749 observations that represent sexual partnerships within the reference period, we conducted additional data cleaning and imputation to resolve problems of missing or inconsistent data. Of particular note for this analysis, for a total of 128 respondents, we adjusted the total number of partners respondents reported in the last six months based on a review of the information they provided on specific partners. For example, if a respondents reported having two sexual partners in the past six months but then named three or more specific partners with appropriate activities and dates, we adjusted the total number reported to equal the number individually named. Conversely, we adjusted the total number of reported partners downward when review of data on specific partnerships led to their exclusion. Missing data were imputed

using various methods, including logical imputation and linear regression. Hierarchical rules for imputation were developed and consistently applied.

Measures

Gender/orientation group. Sexual orientation was measured by self-reported identification at the time of the R & P survey and was combined with gender, measured at HCSUS baseline, to create three gender/sexual orientation groups: women (n=321), heterosexual males (n=172), and gay/bisexual males (n=439).

Sexual partnership patterns. Sexually active respondents were classified in terms of sexual partnerships. We classified partnerships as seroconcordant if the respondent reported that the partner was HIV-positive. Other relationships were those in which the partner was reported to be HIV negative (n=583), the partner's HIV status was unknown to the respondent (n=696) or the respondent refused to answer (n=1). We constructed two measures at the respondent level: (1) an indicator variable for whether any of the respondent's partners were HIV-negative or of unknown HIV serostatus; and (2) the proportion of the respondent's partners who were HIV-negative or of unknown HIV serostatus.

Sexual risk behavior. *Unprotected sex* refers to any anal or vaginal sex without a condom. This was defined at the partnership level based on responses to the question(s), "In the past six months, when you had anal [vaginal] sex, how often did you or [name of partner] use a condom?" Any response other than "always" resulted in a code of unprotected sex for that relationship. At the respondent level, the respondent was classified as engaging in unprotected sex if he or she reported any unprotected sex with one or more partners. Oral sex was not included in our definition of *unprotected sex* because it poses a much lower HIV transmission risk than anal or vaginal sex. (Samuel,

Hessol, Shiboski, Engel, Speed, and Winkelstein 1993.) *High-risk sex* was defined as unprotected anal or vaginal sex between a respondent and a potentially serodiscordant partner (i.e., one who was either HIV-negative or of unknown HIV serostatus). At the respondent level, respondents were coded as engaging in high-risk sex if any of their relationships involved high-risk sex. For unprotected and high-risk sex, we also constructed a respondent-level variable indicating the proportion of the respondent's partners with whom the respondent engaged in each of these behaviors.

Relationship patterns were classified according to number of partners with whom the respondent had sex in the past six months (1 vs. > 1) and whether the respondent reported having a primary relationship partner (PRP) or spouse in the past six months. Some respondents identified more than one PRP in the six-month period, and some of those identified as PRPs had not been sexual partners during the six-month period. Our classification of relationship status was based on whether the respondent identified any PRP or spouse, regardless of sexual activity. However, PRPs and spouses were included as sexual partners only if they had sex with the respondent during the 6-month reference period.

Analysis

Analyses were conducted at the respondent level with 932 respondents who reported having any oral, vaginal, or anal sex in the preceding 6 months.

Extrapolations to the partnership level were derived from two types of questions. Estimates of the total number of partnerships were based on responses to the question, "Please think back over the last 6 months, and remember all your sex partners. As best you can tell, with how many different people have you had either oral, anal, or vaginal

sex in the last 6 months? Your best estimate is fine." Analyses examining partner-specific behaviors (i.e., whether sex was unprotected or high-risk) and the partner's HIV serostatus were based on responses to questions about the five most recent partners in the past six months and the PRP if also a sexual partner within that period but not among those five.

We report adjusted weighted proportions of respondents who report: (1) any unprotected sex; (2) any partner whose HIV serostatus is negative or unknown: and (3) any high-risk sex. To test whether these proportions differ for the six relationship patterns, we performed an adjusted Wald F test. If the p value was < .10, we then performed adjusted Wald F tests for differences related to having a PRP relationship and having more than one partner. We tested for associations between relationship patterns and gender/orientation groups using a Chi square test.

Dataset creation and management and variable derivation were performed in SAS (SAS Institute, Cary, NC). To conduct statistical tests and adjust standard errors for the differential weighting and complex sample design, we used Taylor series linearization methods in SUDAAN (Research Triangle Institute, Research Triangle Park, NC).

Results

We estimate that in the reference population, 71% of gay/bisexual men, 60% of heterosexual men, and 65% of heterosexual women had vaginal, oral, or anal sex in the six months prior to the interview. The rows in Table 1 represent relationship categories that are defined by all possible combinations of having a PRP or spouse, with whom the respondent may or may not have had sex in the last six months, with a total of one or more than one sexual partner in the last six months. All possible relationship patterns

occur, with frequencies that vary according to sexual orientation and gender. One of the most striking findings is that most sexually active respondents identify a PRP or spouse, including 77% of gay/ bisexual men, 94% of heterosexual men, and 95% of heterosexual women. However, if we count only those PRP or spousal relationships in which sex took place during the six-month window, the corresponding percentages are 68% of gay/bisexal men, 86% of heterosexual men, and 90% of women. (Chi square = 85.57, d.f. = 10, $p < .001$ for differences between gender/orientation groups).

For heterosexual men and women, the most common pattern is to have a PRP as the sole sexual partner. However, this pattern only describes 34% of gay and bisexual men, an equal percentage of whom report having a PRP who is only one of their sexual partners. A sizeable minority of gay and bisexual men (9%) and heterosexual men (8%) but fewer women (3%) report that they have sex only with partners other than their PRP. Twenty-three percent of gay and bisexual men, versus only 6% of heterosexual men and 7% of women report no PRP.

Table 2 shows our weighted estimates of the total number of sexual partners for the reference population as well as the mean number of partners for each relationship pattern. Because of small sample sizes for certain subgroups, results are not disaggregated by sexual orientation and gender. Across all relationship categories, we estimate that the sexually active HIV-positive adults in the reference population had a total of 522,400 sexual partners during the six-month period, with a mean of 3.91 partners. More than two thirds (69%) of these half million or so partnerships were linked to an HIV-positive person who had a PRP or spouse. Nearly half (49%) of these partnerships involved persons who reported multiple partners including a PRP, and 86%

involved a person with multiple partners of some type. In the three subgroups of people with multiple partners, the mean number of partners over the past six-months ranged from 5.75 to 9.5, with wide confidence intervals reflecting the skewed distributions. Not shown in the table, 84% of all sexual partners for this population were partnered with a gay or bisexual man, 8% with a heterosexual man, and 8% with a woman.

Table 3 displays data on the relationship pattern and individual risk behavior. The left column shows the percentage of respondents who reported engaging in any unprotected sex, across all recent partnerships that they described in the interview. Overall, 39% of the sexually active population represented by our sample engaged in any unprotected vaginal or anal intercourse. The percentage varied significantly by relationship category (adjusted Wald $F = 7.37$, $p < .001$). Persons with multiple partners were more likely to report having unprotected sex (53%) than persons with only one partner (29%, $p < .001$). The likelihood of engaging in any unprotected sex was only marginally greater for those with a PRP/spouse versus those without (40% versus 35%) (adjusted Wald $F = 0.5$, $p = .48$).

The middle column in Table 3 shows the percentage of respondents who reported having one or more partners who were either HIV-negative or of unknown HIV serostatus. Weighting our data to represent the sexually active HIV-positive adult population, we estimate that 78% of all persons in this population had sex with one or more partners who was HIV-negative or whose status was unknown. Again, this varied significantly across relationship categories (adjusted Wald $F = 6.92$, $p < .001$). Among those with a PRP or spouse, 75% had sex with a partner who was HIV-negative or whose status was unknown, compared with 93% of those with no PRP or spouse (adjusted Wald

F = 12.1, p < .001). Among those who reported only one partner, 69% had sex with a partner who was HIV-negative or whose status was unknown, compared with 90% of those with more than one partner (adjusted Wald F = 35.1, p < .001).

The rightmost column in Table 3 shows the percentage engaging in high-risk sex by relationship pattern. Overall, 22% of sexually active persons in this population report engaging in high-risk sex, defined as unprotected vaginal or anal sex with a partner whose HIV status is either seronegative or unknown to them. This is just over half as many as the 39% who report any unprotected sex. The prevalence of high-risk sex varies significantly by relationship category (adjusted Wald F = 18.55, p < .001). High-risk sex is more prevalent among persons with multiple partners (35%) than among persons with one partner (13%) (adjusted Wald F = 35.66, p <.001). However, it is nearly equal in prevalence (22%) among persons who report a PRP or spouse and those who do not (adjusted Wald F = 0.0, p =.99).

Table 4 displays results that are parallel to those in Table 3, except that the dependent variable in Table 4 is the mean percentage of sexual partnerships during the six-month period that involved unprotected sex, an HIV-negative partner or partner of unknown HIV status, and high-risk sex. Since the percentages are calculated for each respondent across all partnerships described in the interview and are then weighted to the sexually active population of HIV-positive people, the results do not describe the prevalence of these behaviors across the population of all sexual partnerships of the HIV-positive adults represented in this study; not all sexual partnerships are represented, and those represented are not weighted equally in this respondent-level analysis. However,

Table 4 does describe the average rate of occurrence of each risk factor across all relationships as viewed from the respondent level.

The first column in Table 4 shows that on average, HIV-positive adults in this population engaged in unprotected sex with 30% of their partners during the six-month period. This varied only modestly by relationship category (adjusted Wald F = 2.27, p = .064). Those with a PRP engaged in unprotected sex with 31% of their partners, compared with 20% for those without a PRP (adjusted Wald F = 4.78, p = .033). This behavior did not differ significantly for those with one partner (29%) versus more than one partner (31%) (adjusted Wald F = 0.35, p = .555). The second column in Table 4 shows the mean percentage of partnerships involving a partner whose HIV status was negative or unknown. The overall percentage was 70%, and this did not vary much by relationship category (adjusted Wald F = 2.01, p = .097). However, persons with a PRP had fewer partnerships in which their partner's HIV serostatus was negative or unknown (68%) than did those without a PRP (80%) (adjusted Wald F = 8.72, p = .005). This was primarily because only 7% of those with a PRP and no other partners were unaware of their partner's HIV serostatus.

The third column in Table 4 shows the mean percentage of partnerships iinvolving high-risk sex; i.e., unprotected anal or vaginal sex with a potentially uninfected partner. High-risk sex occurred on average in 15% of partnerships. This varied significantly by relationship category (adjusted Wald F = 5.0, p =.001). Persons who had a PRP engaged in high-risk sex in a slightly greater percentage of their relationships (15%) than those without a PRP (11%), but the difference was not significant (adjusted Wald F = 1.77, p = .183). Similarly, those with more than one

partner reported high-risk sex with a somewhat greater percentage of their partners (17%) than those with just one partner (13%), but again, the difference was not significant (adjusted Wald F = .2.41, p = .127). The greatest percentages of partnerships involving high-risk sex are among those who have a PRP but have sex with other people (e.g., 19% for those who have sex with their PRP and others). The lowest percentage of partnerships involving risky sex is among those who have no PRP but have sex with multiple others.

From an epidemiological perspective, the greatest number of new infections will occur in the types of partnerships that expose large numbers of susceptible (uninfected) partners to high-risk sex that could potentially transmit HIV. The resulting number of new infections will depend on the prevalence of different types of partnership patterns as well as on the prevalence of high-risk sexual behavior associated with them. Table 5 displays weighted numerical estimates by relationship type of the number of recent partnerships involving HIV-positive adults during the six-month reference period that involve unprotected sex, HIV-negative or unknown partners, and high-risk sex. Because we count only the partnerships that respondents told us about in the interview, these estimates are based on a maximum of six partnerships per respondent. When weighted to the population, they represent 266,700 sexual partnerships (95% CI: 187,900-345,500), compared with the 522,400 (95% CI: 310,400-734,400) sexual partnerships in Table 2. Because the population estimates in Table 5 derive from the most recent partners covered in detail in the interview and omit a substantial proportion of all partnerships engaged in by sexually active HIV-positive adults, the absolute numbers in Table 5 are of little interest. However, the relative frequency of partnerships by relationship category is

important, because it provides quantitative estimates of the relationship patterns that are most strongly associated with HIV transmission risk. This is most readily seen in the columns giving point estimates for the percentage distribution.

The distribution on the left of Table 5 shows that 84% of all partnerships in which unprotected sex occurs involve an HIV-positive person who has a PRP; 50% involve a person who has sex with a PRP.and other partners. The distribution in the middle shows that 73% of all partnerships with a potentially serodiscordant partner involve an HIV-positive person with a PRP. Once again, HIV-positive persons who have sex with both a PRP and other people account for the largest percentage of such partnerships, with 42%. For this risk factor, the next largest category consists of those who do not have a PRP but do have sex with multiple partners, who account for 24%. The distribution on the right shows that of all partnerships in which high-risk sex occurs, 84% involve an HIV-positive person with a PRP, and 52% involve such a person who has sex both with the PRP and with other persons. Within that latter category, 38% of the partners with whom high-risk sex occurred were described as PRPs, and 62% as partners other than PRPs.

Persons who have sex only with their PRP account for 18% of all partnerships in which high-risk sex occurs, and persons with multiple partners but who do not have a PRP account for 15%.

Discussion

About two thirds of HIV-positive adults who had been receiving HIV care for at least two years at the time of this survey had been sexually active in the last six months. Eighty-four percent of those who were sexually active were partnered with someone they

identified as a PRP, whether or not they were monogamous. Among those who were sexually active, more than 20% of heterosexual men and women and 60% of gay and bisexual men had multiple partners. Although having multiple partners was more common among those who did not identify a PRP, it was also common among those who did have a PRP, especially gay and bisexual men. Heterosexual men and women displayed sexual relationship patterns that were quite similar across gender, with more than two-thirds reporting sex only with a PRP or spouse. Among gay/bisexual men, patterns were more varied, with only 34% reporting sex only with a PRP.

A unique feature of the dataset is that it comes from a national probability sample of men and women with HIV who were receiving medical care, and it is therefore possible to weight the data to represent the population. Since we asked all sexually active respondents to tell us how many people they had sex with in the past 6 months, their estimates, when suitably weighted to population, also provide an estimate of the number of sexual partners linked to this population by sexual contact in a 6-month period. Our point estimate of 522,400, although it has a wide confidence interval, suggests that the number is large relative to the estimated number of new HIV infections in the United States of about 40,000. Considering that our reference population does not include HIV-positive people who are undiagnosed or not receiving medical care, the number of sexual partners linked to all HIV-positive persons would be larger. The relatively small number of new infections compared to the large number of persons exposed likely reflects a combination of factors, including the relatively low efficiency of sexual transmission of HIV and steps taken by HIV-positive people and their partners to reduce risk by using

condoms, avoiding the highest-risk sexual activities, or selecting partners who are seroconcordant.

Our analysis of the distribution of partners by relationship type shows that the vast majority of sexual partners (86%) are linked to an HIV-positive person who has multiple partners, and more than two thirds (69%) are linked to someone who has a PRP. These results, along with those on the risk factors associated with relationship patterns, suggest that it would be a mistake to consider primary relationships to be protective against risk. When we extrapolate from data on the five most recent sexual partners, 84% of all partnerships in which high-risk sex occurs also involve an HIV-positive person who has a PRP, and 78% involve someone with multiple partnerships. These results show that multiple partnerships not only present greater risks at the partnership level, but from a population perspective, they are also where a large share of the action is. Moreover, the potential role of primary relationships as a focus of HIV prevention efforts should be further explored in light of these findings. It may be especially important to understand relationship dynamics and motivations for those who have multiple partners in the context of primary relationships.

Our examination of the relationship patterns associated with unprotected sex, serodiscordant partnerships, and high-risk sex shows that these behavioral risks are significantly associated with relationship patterns at the bivariate level. Persons with more than one partner were more likely to report having unprotected sex with one or more partners, but this seems to be largely a matter of a greater number of opportunities for unprotected sex to occur, since they did not report unprotected sex with a greater *proportion* of their partners. Persons who had a PRP reported having unprotected sex

with a greater proportion of their partners than did those who did not have a PRP. The proportion of partnerships involving unprotected sex was greatest among those who had a PRP and other partners. This finding could have important implications for prevention if it persists in multivariate analyses.

Our data on the prevalence of high-risk sex across relationship types suggest that HIV-positive people take steps to avoid the combination that defines high risk—having unprotected anal or vaginal sex with someone who could become infected. Only 22% of the sexually active population report engaging in any high-risk sex during the six-month reference period, and such activity reportedly occurred in an average of 15% of partnerships. Again, this behavior varied by relationship category. When we examined the likelihood of engaging in any high-risk sex, we found that people with multiple partners were more than twice as likely to have high-risk sex. However, a different picture emerged when we considered the average proportion of relationships in which high-risk sex occurred. Having multiple partners made little difference, suggesting that the effect of having multiple partners on the likelihood of having any high-risk sex was largely a result of greater opportunity with multiple partners rather than increased risk per partner. By either measure, there was little difference between those who had a PRP and those who did not.

However, relationship pattern made a significant difference nonetheless. High-risk sex was most prevalent in the partnerships of HIV-positive people who have a PRP and have sex with other people; it was least prevalent among HIV-positive people who have no PRP but have sex with multiple others. This pattern was fairly consistent across

gender/orientation groups. Further work is needed to elucidate possible reasons for this finding, which could have important implications for prevention.

This study has several limitations that should be kept in mind in interpreting the results. First, the study focuses only on HIV-positive adults who were receiving medical care. HIV-positive adults who do not know they are infected and those who had been diagnosed but were not receiving medical care are not part of the reference population. Moreover, the people we studied had all been receiving care for at least two and a half years. Because many individuals do not seek treatment until they begin having symptoms, this study represents those whose HIV disease is more advanced, on average, than would be found in the population of all those who are HIV-positive. The prevalence of behavior that poses HIV transmission risk has been shown to decline sharply following HIV diagnosis and again after the first year post-diagnosis (Weinhardt 2005). Sexual relationship patterns may also change in the years following an HIV-positive diagnosis. In addition, as a study of people receiving medical care, our study underrepresents those with poor access to care, including the uninsured, minorities, and persons with low incomes. Second, all data are self-reported. Some HIV-positive persons may be reluctant to admit that they engage in sexual behaviors that may transmit HIV; accordingly, the behavioral estimates reported here may be lower-bound estimates. However, underreporting bias may have been mitigated somewhat by the fact that our sample had already been interviewed several times, establishing a relationship with the larger HCSUS study, and we used CASI methods that have been shown to improve the accuracy of data obtained from self-report (Turner et al. 1998).

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Table 1
Sexual Relationship Categories for Sexually Active HIV-Positive Adults, by Sexual Orientation and Gender

Weighted Percentage in Relationship Category	Gay/Bisexual Men (n=439) % (95% CI)	Heterosexual Men (n= 172) % (95% CI)	Women (n=321) % (95% CI)
Has PRP or spouse:	77	94	93
Sex only with PRP	34 (28, 40)	69 (59, 77)	72 (67, 77)
Sex with PRP and others	34 (28, 41)	17 (10, 26)	18 (13, 25)
Sex only with non-PRP	2 (1, 5)	5 (2, 12)	2 (0.6, 4)
Sex only with multiple non-PRPs	7 (4, 11)	3 (1, 10)	1 (0.7, 3)
No PRP or spouse:	23	6	7
Sex with one partner	4 (2, 8)	3 (2, 7)	4 (2, 8)
Sex with multiple partners	19 (15, 24)	3 (1, 7)	3 (1, 8)

Table 2

Estimated Distribution of Sexual Partnerships by Relationship Pattern

Relationship Pattern	Weighted Estimates (95% CI)		
	Total Number	Percentage	Mean
Has PRP or Spouse:			
Sex only with PRP (n=499)	65,300 (37,700–92,900)	13	1.00
Sex with PRP and others (n=243)	254,800 (110,000–399,600)	49	6.98 (4.05 - 9.91)
Sex only with non-PRP (n=27)	3,500 (1,300-5,700)	< 1	1.00
Sex only with multiple non-PRPs (n=34)	38,000 (17,200-58,800)	7	5.75 (3.23 – 8.26)
No PRP or Spouse:			
Sex with one partner (n=34)	5,400 (2,400 – 8,400)	1	1.00
Sex with multiple others (n=95)	155,300 (89,400–221,300)	30	9.50 (6.40 – 12.60)
Total	522,400 (310,400–734,400)	100	3.91 (2.60 – 5.22)

NOTE: Based on respondent reports of total number of sexual partners in past 6 months.

Table 3

Percentage of Sexually Active Adults Reporting Any Unprotected Sex and Any High-Risk Sex, by Relationship Pattern

Relationship Pattern	Weighted Percentage of Respondents Reporting Any: (95% CI)		
	Unprotected Sex	HIV-Negative or Unknown Partner	High-Risk Sex
Has PRP or Spouse:	40 (35-46)	75 (71-79)	22 (19-27)
Sex only with PRP (n=499)	29 (25-34)	67 (62-71)	12 (9-15)
Sex with PRP and others (n=243)	59 (48-68)	87 (81-91)	36 (30-42)
Sex only with non-PRP (n=27)	27 (8-62)	86 (67-95)	26 (7-62)
Sex only with multiple non-PRPs (n=34)	56 (37-74)	88 (68-96)	49 (29-69)
No PRP or Spouse:	35 (10-49)	93 (86-97)	22 (15-32)
Sex with one partner (n=34)	20 (7-46)	84 (65-93)	14 (3-46)
Sex with multiple others (n=95)	39 (27-54)	97 (88-99)	25 (17-37)
Total	39 (35-44)	78 (75-81)	22 (19-26)

Table 4

Mean Percentage of Partnerships Involving Any Unprotected Sex, any HIV-Negative Partner, and Any High-Risk Sex, within Each of Six Relationship Patterns

Relationship pattern	Weighted Mean Percentage of Partnerships Involving Any: (95% CI)		
	Unprotected sex	HIV-negative or unknown partner	High-risk sex
Has PRP or spouse:	31 (28-35)	68 (65-72)	15 (13-18)
Sex only with PRP (n=498)	29 (25–34)	67 (62-71)	12 (9-15)
Sex with PRP and others (n=240)	35 (28-42)	70 (63-76)	19 (15-24)
Sex only with non-PRP (n=27)	27 (0-56)	86 (72-99)	26 (0-55)
Sex only with multiple non-PRPs (n=33)	33 (20-46)	67 (50-85)	21 (14-28)
No PRP or spouse:	20 (12-29)	80 (73-87)	11 (5-17)
Sex with one partner (n=34)	20 (1-40)	84 (70-98)	14 (0-34)
Sex with multiple others (n-92)	20 (13-28)	79 (72-86)	10 (5-15)
Total	30 (26-33)	70 (67-73)	15 (12-17)

Table 5

Distribution of Recent Partnerships Involving Risk Factors for HIV Transmission, by Relationship Pattern

Relationship Pattern	Estimated Distribution of Recent Partnerships Involving Any:					
	Unprotected Sex		HIV-Negative or Unknown Partner		High-Risk Sex	
	Number	%	Number	%	Number	%
Has PRP or Spouse:	66,200 (43,600-88,900)	84	144,300 (97,900-190,700)	73	34,900 (6,700-18,700)	84
Sex only with PRP (n=498)	19,100 (10,200 – 27,900)	24	43,500 (24,500-62,500)	22	7,700 (3,800-11,600)	18
Sex with PRP and others (n=240)	39,400 (23,600 – 55,300)	50	82,400 (53,900-110,900)	42	21,800 (13,200-30,400)	52
Sex only with non-PRP (n=27)	900 (0 – 2,300)	1	3,000 (900-5,000)	2	900 (0-2,300)	2
Sex only with multiple non-PRPs (n=33)	6,800 (2,100 – 11,500)	9	15,400 (5,200-25,600)	8	4,500 (1,300-7,700)	11
No PRP or Spouse:	12,700 (6,700-18,700)	16	52,500 (34,700-70,200)	27	6,900 (3,600-10,200)	16
Sex with one partner (n=34)	1,100 (0 – 2,400)	1	4,600 ((1,800-7,300)	2	800 (0-2,000)	2
Sex with multiple others (n=92)	11,600 (6,300 – 16,900)	15	47,900 (31,300-64,500)	24	6,100 (3,100-9,200)	15
Total	78,900 (52,600-105,300)	100	196,800 (136,900-256,700)	100	41,800 (28,200-55,500)	100

NOTE: Based on respondent reports of the five most recent sexual partners in the past six months, plus the PRP if a sex partner in that period but not among the most recent five.