

ORIGINAL ARTICLE

Avoiding risky sex partners: perception of partners' risks v partners' self reported risks

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Background: Key strategies advocated for lowering personal risk of sexual exposure to STD/HIV include having fewer partners and avoiding risky partners. However, few studies have systematically examined how well people can actually discern their sex partners' risk behaviours.

Methods: We conducted face to face interviews with 151 heterosexual patients with gonorrhoea or chlamydial infection and 189 of their sex partners. Interviews examined the patients' perceptions of their sex partners' sociodemographic characteristics and risk behaviours. Patients' perceptions of partners were then sociometrically compared for agreement with partner self reports, using the kappa statistic for discrete variables and concordance correlation for continuous variables.

Results: Agreement was highest for perceived partner age, race/ethnicity, and duration of sexual partnership; and lowest for knowledge of partner's work in commercial sex, number of other sex partners, and for perceived quality of communication within the partnership. Index patients commonly underestimated or overestimated partners' risk characteristics. Reported condom use was infrequent and inconsistent within partnerships.

Conclusion: Among people with gonorrhoea or chlamydial infection, patients' perceptions of partners' risk behaviours often disagreed with the partners' self reports. Formative research should guide development and evaluation of interventions to enhance sexual health communication within partnerships and within social networks, as a potential harm reduction strategy to foster healthier partnerships.

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Accurate assessment of a potential partner's risk for HIV or other STDs may assist individuals in making decisions to avoid sexual contact, or to adopt protective behaviours within the partnership (for example, condom use). However, methods to assess the validity and reliability of self reported behaviour or perceived risk behaviour of sex partners have not been standardised. Previous investigators have often used the terms *validity*, *reliability*, and *internal consistency* interchangeably.^{1–8} Recent studies of STD/HIV risk behaviours within partnerships have focused upon concordance or agreement between partners for particular self reported behaviours, thereby avoiding the need to determine which partner's responses were more "valid" or "reliable." For example, Padian *et al*¹⁰ investigated interpartner agreement for STD/HIV risk behaviours among HIV serodiscordant heterosexual couples and among heterosexual couples recruited from an STD clinic, finding moderate levels of agreement for self reported ethnicity, number of penile-vaginal contacts, and condom use, but lower agreement for monogamy, STD history, or drug use. Similarly, Ellen *et al*¹¹ described high levels of agreement for drug use and concurrent sexual partners among STD clinic attendees and their main (steady) sex partners, and Seal¹² examined interpartner concordance of self reported sexual behaviours among college dating couples.

However, such studies of interpartner agreement have primarily been conducted among members of ongoing partnerships of varying duration. People within such established couple relationships might possess greater knowledge of one another's risk behaviours and personal characteristics than individuals not necessarily involved in ongoing stable relationships. In particular, no data are available to evaluate interpartner agreement for sex partner risk behaviours or risk markers among people with recently acquired or detected STD and their sexual contacts. In this study, we sought to compare STD patients' perceptions of their sex partners' sociodemographic characteristics and behaviours with the part-

ners' self reports of these same characteristics and behaviours, irrespective of their status as members of established couples. We employ the term "agreement" as a measure of concordance between patients' perceptions of partner characteristics and behaviours and the partners' self reports. Examination of agreement between perceptions and partner self reports avoids inferences about the veracity of self reported behaviours.

METHODS

From 1992–4, heterosexual people 14–45 years of age with culture positive gonococcal or chlamydial infection in Seattle, Washington, were recruited for study participation. Patients were drawn from the local health department's primary STD clinic, a health department adolescent health clinic serving minority and disadvantaged youth, and a random sample of culture positive people diagnosed at other clinical facilities. People with infection (index patients) were queried about all sex partners within the past 90 days, and partners residing in King County were contacted by a research disease intervention specialist, referred for evaluation and treatment, and offered participation in the study.

Participants were asked about their own sociodemographic characteristics and sexual and drug use behaviours, as well as the perceived characteristics and behaviours of each sex partner. Individual characteristics included age, race/ethnicity, number of sex partners in lifetime and in past 3 months, and history of injection drug use, commercial sex work (exchange of sex for money or other goods), sex with a commercial sex worker, and incarceration. Women were asked whether they had had sex with a bisexual man. Partnership characteristics included duration of presexual relationship (for analysis, dichotomised as less than 1 month v 1 month or more), duration of sexual partnership (less than 6 months v 6 months or more), presexual partner knowledge (how well people had

Table 1 Demographic characteristics, sexually transmitted diseases (STD), and self reported risk markers/behaviours of index patients and their enrolled partners

	Index (n=151)	Partner (n=189)
Sex		
Male	48 (32)	125 (66)
Female	103 (68)	64 (34)
Race/ethnicity		
African-American	63 (42)	91 (48)
White	61 (40)	58 (31)
Other	27 (18)	40 (21)
Mean age (years) (SD)	22.2 (7.2)	23.4 (6.6)
STD diagnoses just before enrolment		
Gonorrhoea	45 (30)	21 (11)
Chlamydial infection	94 (62)	45 (24)
Both	12 (8)	12 (6)
Neither	0 (0)	111 (59)
Self reported risk markers/behaviours		
Injection drug use	13 (9)	17 (9)
Ever incarcerated	63 (42)	96 (51)
Other sex partners in past 3 months	67 (44)	86 (46)
Bisexual (male)	0 (0)	1 (1)
Uncircumcised (male)	11 (24)	25 (22)
Sex with commercial sex worker (male)	2 (4)	12 (10)
Worked as commercial sex worker (female)	8 (8)	11 (17)

Values provided as number (%) unless otherwise stated.

known each other before having sex, measured as very well, fairly well, somewhat, or not at all), frequency of communication about sexual issues (often, sometimes, rarely, or never), and their judgment of the overall quality of communication between partners (very good, fairly good, fair, or poor). Condom use within partnerships was examined as a percentage of use during all reported acts of vaginal intercourse, and then dichotomised for analysis (always used v not always used). Perceived partner and partnership characteristics reported by index patients were then examined for agreement with the characteristics and behaviours reported by the partners themselves. The University of Washington human subjects committee approved all procedures.

Statistical analyses were conducted using SPSS (SPSS v 8.0, Chicago, IL, USA) and S-Plus statistical software (S-Plus v 3.1, Seattle, WA, USA). For age and number of sex partners (continuous variables), agreement was defined as a perceived value within 20% of the stated value by the partner, and

chance corrected agreement was measured by the concordance correlation (ρ). The general formula for concordance correlation is:

$$\rho = 2 S_{12} / (S_1 + S_2 + (m_1 - m_2)^2)$$

where S_1 is the variance of index case responses, S_2 is the variance of partner responses, m_1 and m_2 are the respective means of index case and partners responses, and S_{12} is the covariance between index cases and partners.¹³ In general, concordance correlation values of 0.4 or more are considered to indicate relatively high statistical agreement between observations. For discrete variables, agreement was defined as concordance between the index patient's perception and the partner's self reported description of that characteristic or behaviour. Kappa values were calculated to measure the chance corrected degree of concordance across all partnerships.¹⁴ The general formula for calculating kappa is:

$$\text{kappa} = (A_{\text{obs}} - A_{\text{ch}}) / (N - A_{\text{ch}})$$

Table 2 Agreement between 151 index patient's perceptions of their partners, and 189 partners' self reports

	Agreement (%)	kappa
Demographic characteristics and circumcision		
Partner race/ethnicity*	89.4	0.83
Partner age	94.7	0.88††
Partner is circumcised male	81.3	0.37
Partner risk behaviours/markers		
Partner has used injection drugs	93.1	0.59
Partner has ever been incarcerated	78.2	0.56
Condom use within partnership†	84.4	0.44
Partner is bisexual male	96.0	0.39
Partner has had other partners in past 3 months	65.3	0.29
Partner has been a sex worker (female partner)	85.7	0.27
Partner's total number of other partners in past 3 months	50.0	0.23††
Partner has had sex with a sex worker (male partner)	79.0	0.22
Partnership characteristics		
Duration of sexual partnership‡	88.9	0.78
Frequency of communication with partner§	73.1	0.46
Duration of presexual relationship¶	66.7	0.30
How well known before having sex**	66.0	0.26
Quality of communication with partner††	62.2	0.20

*White v African-American v other; †Always used v not always used; ‡<6 months v ≥6 months; §Often v not often; ¶<1 month v ≥1 month; **Very well/fairly well v somewhat/not at all; ††Very good v not very good; ‡‡Reported as concordance correlation (ρ) for continuous data.

Table 3 "Misperception" by patients of their partners' risk behaviours

Variable	Underestimated partner's risk		Overestimated partner's risk	
	Number perceived "no"	Number (%) partner stated "yes"	Number perceived "yes"	Number (%) partner stated "no"
Injection drug user	168	6 (4)	18	7 (39)
History of sex with sex worker (male partner)	93	5 (5)	26	20 (77)
History of sex work (female partner)	61	9 (15)	2	0 (0)
Partner had other partners in past 3 months	118	42 (36)	58	19 (33)
Bisexual male	75	0 (0)	4	3 (75)

where A_{obs} is observed agreement between partners, A_{ch} is total agreement expected by chance, and N is the total sample size. In general, kappa values of 0.4–0.6 indicate moderate agreement, and values more than 0.6 indicate considerable agreement between observations.^{15 16} To compare kappa values or concordance correlations between subgroups, we used permutation tests.¹⁷

RESULTS

A total of 151 people with gonococcal or chlamydial infection (index patients) and 189 of their sex partners were enrolled (table 1). Index patients were predominantly female (68%), African-American (42%), or white (40%), with a mean age of 22.2 years; most index patients had chlamydial infection (62%). Enrolled partners were predominantly male (66%) and often African-American (48%), with a mean age of 23.4 years. Gonococcal or chlamydial infection was diagnosed in 78 (41%) of the 189 partners. Similar frequencies of risk behaviours were reported by the index case and partner groups, including history of incarceration (42–51%), injection drug use (9%), and having other sex partners in the past 3 months (44–46%). Approximately one third of index patients (34%) reported knowing their partners for less than 1 month before having sex, and a majority (53%) stated that the sexual partnerships were of less than 6 months' duration (data not shown). Only 17% of index patients reported using condoms for all episodes of vaginal intercourse.

Measures of agreement between index patients' perceptions and partner self reports are summarised in table 2. Patients and partners had high levels of agreement for partner race/ethnicity (kappa=0.83), partner age ($p=0.88$), and duration of the partnership (kappa =0.78). Agreement was moderate for injection drug use by the partner (kappa=0.59), partner history of incarceration (kappa=0.56), frequency of communication with the partner (kappa=0.46), and condom use within the partnership (kappa=0.44). By contrast, agreement was low for potentially important STD risk factors, such as whether the partner had other partners in the past 3 months (kappa=0.29), the partner's total number of other partners in the past 3 months ($p=0.23$), history of sex work among female partners (kappa=0.27), and history of male partners having sex with sex workers (kappa=0.22). In general, partner agreement did not vary significantly by age, race/ethnicity, sex of the respondent, or infection status of the partner. Among 57 such comparisons, the only significant differences found were: (1) greater race/ethnicity agreement among respondents >20 years old (kappa=0.75 v kappa=0.91, $p<0.05$ for ≤ 20 v >20, respectively); and (2) greater agreement for history of incarceration among male respondents (kappa=0.71 v kappa=0.42, $p<0.05$ for male v female, respectively).

Both underestimates and possible overestimates of reported partner risk were common (table 3). For example, six (4%) of 168 people who were perceived not to be injection drug users reported a history of injection drug use (that is, index case

may have underestimated partner risk), while seven (39%) of 18 people perceived to be injection drug users denied such risk behaviour (that is, index case may have overestimated partner risk). Similarly, history of commercial sex work among female partners was underestimated for nine (15%) of 61 female partners, while history of having sex with a sex worker may have been overestimated for 20 (77%) of 26 male partners. Thirty six per cent of all people thought not to have other sex partners in the past 3 months in fact reported having multiple partners. Circumcision status of male partners was also commonly misperceived: by physical examination, 14 (15%) of 92 male partners thought to be circumcised were not, while six (40%) of 15 male partners thought not to be circumcised had been circumcised (data not shown).

DISCUSSION

Agreement between patients' perceptions of partners' risks and partners' self reports of risk was highest for fixed personal characteristics such as partner age and race ethnicity, as well as for partnership duration. We found lower rates of agreement for partners' numbers of other sex partners, and for measures of communication within the partnership. Patients' perceptions often overtly disagreed with partners' self reports for many important partner risk behaviours. Interestingly, even the accuracy of a fixed physical characteristic such as circumcision status of male partners was relatively low. This finding mirrors the results of previous research on circumcision, where low levels of agreement have been found between self reported status and confirmation by physical examination.¹⁸

This study differs from previous investigations of validity and reliability of partner self reports by examining perception of risk within STD affected partnerships, rather than mainly within established couples. Earlier studies have focused primarily on agreement within heterosexual couples in ongoing sexual relationships.^{7–11} Agreement between partners' responses in those studies was taken as a proxy measure of "reliability" of the sexual history. However, without independent validators of sexual behaviours (often not measurable, short of direct observation), individual responses defy validation. In this sense, our data do not address the reliability or validity of patient or partner responses, but rather the extent to which both individuals agree on various characteristics of partners and partnerships. In general, agreement about presence of risk may be more reliable than disagreement about risk, or even agreement about absence of risk. We find it noteworthy that, even among people recently diagnosed with an STD, partners' risks were often not perceived.

Our results also corroborate and build upon the findings of Ellen *et al*¹¹, who found moderate to substantial agreement among STD clinic attendees and their main sex partners for risk behaviours such as "crack" cocaine use (kappa = 0.53–0.60), injection drug use (kappa = 0.51–0.80), and partners having other sex partners (kappa = 0.64–0.69). By contrast, our study documented substantially lower rates of

agreement for partners having other sex partners ($\kappa = 0.29$). This distinction is important, since the population studied by Ellen *et al* comprised couples at risk for STD, but not necessarily confirmed to have an STD. In fact, only 25% of the women and 1% of the men in that study were documented to have an STD at the time of examination. Such individuals arguably represent a lower risk pool than the individuals in the present study, who were recruited for participation only after the diagnosis of an STD, and who may or may not have been in an established couple relationship. It is possible that perception of partner risk is actually higher among people who seek screening in the absence of disease, when compared with those who actually acquired an STD.

Strengths of this study include the sociometric research design, which allowed comparison of index patients' perceptions of partners with the self reported characteristics and behaviours of the partners themselves. The study collected data on a broad range of risk markers and behaviours, and the finding of moderately strong agreement for certain partnership characteristics and partner risk behaviours indicates that certain information is appropriately shared and internalised by members of these high risk partnerships. The study was restricted to people with gonorrhoea or chlamydial infection and their recent sex partners in order to focus upon those acquiring and transmitting STD. The research was designed to integrate easily into the ongoing STD partner services activities of the local public health department, as the research interview was included as an added component of routine partner notification activities.

The restriction of study eligibility to people with documented STD is also a weakness: results may not be generalisable to lower risk populations, people in established couple relationships, or general population samples not seeking STD care. Additionally, the study design required personal contact by a disease investigator to recruit and enrol partners for the study; people who were not successfully contacted or who declined enrolment may have more frequently had risky behaviours. Patients were asked whether they perceived their partners as ever having used drugs or practising commercial sex, rather than whether they perceived partners as having such risks in the recent past. A partner's risk behaviours in the distant past may not have contributed to transmission of gonorrhoea or chlamydial infection to the patient. Also, certain risk behaviours were infrequently reported—for example, 9% of partners reported injection drug use and 1% of male partners reported same sex contact. This can lead to circumstances in which percentage of agreement is high but κ values are low, and caution must be utilised in interpreting κ values under these conditions.

The concordance correlation (ρ) evaluates agreement for continuous variables, while κ evaluates agreement for discrete variables; comparisons between ρ and κ warrant caution, however. Although ρ reduces to κ when applied to binary variables, measurement of variables on different scales limits comparability. We dichotomised many continuous variables and evaluated agreement using κ , but differences in measurement and coding of discrete and continuous variables may limit inferences from these dichotomisations.

Mathematical models suggest that choosing less risky sex partners may also influence the spread of infection at the population level.¹⁹ Our findings highlight the need for enhanced awareness among sexually active people of the current inaccuracies in assessment of partners' risks, particularly with regard to whether a partner has multiple other partners. Recent research on the typology of sexual partnerships demonstrates that partnership concurrency is common and perhaps normative during certain life phases (for example, when a long term relationship is ending, or soon after sexual debut).²⁰ Public health efforts are needed to develop and evaluate interventions to promote enhanced awareness of the

Key messages

- Accurate assessment of sex partners' risk behaviours can influence sexual decision making to avoid risky partners, or to adopt protective strategies to reduce STD/HIV risk such as consistent and correct condom use
- People with STDs and their partners were found to have relatively high levels of agreement for certain partner and partnership characteristics (race/ethnicity, age), but relatively low agreement for other important STD/HIV risk factors (partner having other partners)
- Mechanisms to help individuals identify their partners' risk factors and avoid risk exposure may serve to reduce harm, and could contribute to population level STD/HIV control and prevention goals

normative nature of partnership concurrency among sexually active individuals, and the need for enhanced risk assessment and risk disclosure through skills building and self efficacy training. In this sense, "knowing one's partner" represents a harm reduction approach to STD prevention.²¹

Perception of a partner's risks depends largely on that partner's truthful and accurate disclosure of risk within the partnership. STD/HIV prevention efforts must therefore strive to improve early and complete risk disclosure to reduce spread of infection within partnerships, and within networks of partnerships. Recent research on disclosure of HIV serostatus highlights the importance of risk perception and risk disclosure between partners, prior to sexual contact.²²⁻²⁶ The process of disclosing STD/HIV infection status and personal risk behaviours may jeopardise a relationship before sexual intercourse has occurred, and could further jeopardise one's reputation and other relationships. Public health efforts to promote routine questioning of partners about risk behaviours and infection status, to promote risk disclosure, and to overcome the associated stigma, could create greater awareness of disparities between perceived and reported risk; enhance individual skills and self efficacy in such discussions of mutual risk; and attempt to make such discussions normative. Additional research should examine whether enhanced disclosure of risk within, rather than between, risk groups (for example, among men having sex with men, among drug users) can lead to avoidance of risky partners and more consistent use of condoms and other protective behaviours within these risk populations.

In summary, interventions to promote sexual health communication within partnerships may generate greater awareness of partner risk behaviours and promote adherence to protective health strategies to reduce risk of STD transmission. Further research is required to develop, test, and evaluate interventions that promote sexual health communication within partnerships and within partnership networks.

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CONTRIBUTORS

BPS contributed to the study design, questionnaire development, interviewer training, data analysis, and writing the manuscript; WLHW contributed to study design, questionnaire development, interviewer training, data management, data analysis, and manuscript revision; SOA contributed to initial study concept and funding, study design, questionnaire development, data analysis, and manuscript revision; JPH contributed to study design, data management, data analysis, and manuscript revision; HHH contributed to study design, data analysis, and manuscript revision; KKH contributed to initial study concept and funding, study design, questionnaire development, data analysis, and manuscript revision.

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