Concordance in perceived partner-types and adolescent couples' inconsistent condom use:

Analysis of reciprocally nominated heterosexual dyads

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Abstract:

Contraceptive and condom practices vary by partner-type (main vs. casual). Couple-level sexually transmitted infection (STI) interventions require both partners' participation, and may also require both people to perceive the other as their main partner. The objectives of this study were to examine 1) the reciprocity of adolescents' sexual relationships (i.e. both partners agreed that they were sexual partners), 2) the concordance in partner-types reported by females and males among reciprocal dyads, and 3) odds ratios of dyad-level inconsistent condom use by relationship-types reflecting concordance in perceived partner-types (main-concordant, discordant, and casual-concordant) among reciprocal dyads.

Data were obtained from the Bayview Network Study (CA), designed to examine STI risk prevalence and transmission patterns among adolescents between July 2000 and October 2001. A total of 332 unique heterosexual relationships were identified, only 110 of which were reciprocally acknowledged by two partners. One hundred nine females and 99 males contributed to form these 110 reciprocally nominated heterosexual dyads. The disagreement between adolescents and their sex partners on the types of sexual relationship was very high (>85 %). Multivariate logistic regression analysis found that main concordance in partner-type significantly increased the odds of couples' inconsistent condom use (AOR =6.7, p=0.10). There was no difference between the odds of couples' inconsistent condom use for dyads in which at least one partner perceived the other as casual (i.e. discordant and casual-concordant). Multivariate logistic regression analysis also found that ORs of dyad-level inconsistent condom use by perceived partner-types did not differ between female and male.

This study uniquely advanced the knowledge about the role of individuals' perceived partner-types on dyadic behavior, couples' condom practice, by using information from both

partners in a dyad. Adolescent couples were more likely to report inconsistent condom use only when both partners agreed that they were main partners (main-concordant), and there was no interaction between perceived partner-type and gender of respondents. This study addressed one of the potential causes of biased implication from studies that examined the association between condom practices and partner-type based on individuals' perception data.

Background:

One of the most consistent predictors of condom practice by adolescents is partner type. Adolescents use condoms more consistently with casual, less intimate partners and less consistently with main, stable, intimate partners[1,2,3,4,5,6,7,8,9]. The research in this area has relied on egocentric data in which consistency of condom use is reported by the same person who has labeled the partner-type. Studies in which information about the exposure and outcome collected from a single respondent might result in misclassification known as information bias. In the studies of partner-types and condom practice, the exposure is measured as individuals' perceptions about sex partner while the outcome is a couple-level behavior, not an individual's behavior. Thus, collecting data on the exposure and the outcome in these studies from one member of a couple could lead to biased results.

The research reported here utilizes dyadic data that is data collected from both members of a partnership to examine association between condom practice and partner-type. We used baseline data collected in this longitudinal social network study, the Bayview Network Study, that employed two sampling methods to recruit participants: population-based random sampling and snowball sampling methods. By combining the population-based random sample

of index individuals and the snowball sample of index individuals' social friends and sex

partners, we were able to construct a population based sample of adolescent sexual dyads.

Data were collected from predominantly African American adolescents, who referred

their social friends and sex partners to the study. These referred friends and sex partners

separately provided information about their own sexual activities. The specific aims of this

study were to 1) describe the reciprocity (i.e. both partners agreed that they were sex partners)

among adolescents' sexual relationships, 2) estimate the level of the concordance in partner-

types reported by females and males among reciprocal dyads, 3) determine the odds ratios of

dyad-level inconsistent condom use by relationship-types reflecting concordance in perceived

partner-types (main-concordant, discordant, and casual-concordant) among reciprocal dyads, and

4) compare the odds ratios of dyad-level inconsistent condom use by partner-types reported by

females and males among reciprocal dyads.

Methods:

Study description and participants

The Bayview Network Study was designed to examine sexually transmitted infection

risk prevalence and transmission patterns among adolescents in the Bayview-Hunters Point area

in San Francisco between July 2000 and October 2001. **Seed**[i] individuals of local social and

sexual networks were identified and recruited though random digit telephone sampling and

household enumeration. Adolescents were eligible to be seed individuals of Bayview Network

Study if their age was between 14 and 19 and they were residing in Bayview-Hunter's Point

neighborhood of San Francisco. Seed individuals, who reported having ever had sex, formed **the**

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[i] Seed: the initial sampled respondents in a snowball (chain-referral) sampling design.

index cohort of the study reported here. Snowball sampling methods were employed to recruit social friends and sexual partners of the index individuals.

The **name generator**[ii] of the snowball sampling of social friends was used once, and allowed each index individual to nominate up to two closest social friends. In order to increase the size of eligible sexual networks for this study, we pooled index individuals and their social friends that together served as **the initial cohort** of snowball sampling of their sex partners. Adolescents in the initial cohort were asked to nominate their sex partners (i.e. their local sexual network). The name generator of the snowball sampling of sex partners was repeated 3 times, each of which allowed adolescents in the initial cohort to nominate up to six sex partners in the past three months. This sampling design of the Bayview Network Study set the analytical boundary for the study reported here.

Homogeneity in sexual behaviors within friend clusters was assumed; however, we believe that the advantage of increasing sample size of the initial cohort using the friends exceeded the extent to which the clustering effect could be problematic. The number of reciprocal dyads was small and it was highly unlikely that every sexual partnership in a given friend's cluster was a reciprocally nominated dyad and therefore included in the analysis. The recruitment of social friends and sex partners was conducted independently from that of index individuals; thus, the data from the referred participants were not influenced by the referring index individuals. The recruitment procedures of the Bayview Network Study are discussed in more detail elsewhere[10].

Definition and eligibility of sexual networks and sex partners

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[ii] Name generator: the questions in a network survey that are used to elicit the names of respondents' partners.

We defined a directed **walk**[iii] of length 2 observed at the baseline survey of the Bayveiw Network Study, which was heterosexually connected, as **a chain of sexual relationships**. A chain of sexual relationships in this study was specified with three positions connected by two ties: an individual, her/his sex partner(s), and sex partner(s) of sex partner(s). A group of chains of sexual relationships that originated from a single individual was defined as **a local sexual network** in this study. **(**Figure 1.**)** Chains of sexual relationships in this study included reciprocal dyads, and triads constituted by directed **paths**[iv]. We defined **a reciprocal dyad** as a chain of sexual relationships in which an individual nominated a sex partner, and the sex partner also nominated the individual as (one of) her/his sex partner(s); involved two individuals in the three positions, one person was counted twice. We defined **a triad** as a directed path in which an individual nominated a sex partner, and the sex partner nominated someone else other than the individual who originally nominated the sex partner; involved three individuals in the three positions, no one was counted twice.

The name generator of the Bayview Network Study for the enrollment of sex partners was repeated to cover partners as far as three generations away from the initial cohort; therefore, there were three types of sex partners depending on their positions relative to an individual who served as **a root**[v] of a chain of sexual relationships. We defined **1st generation sex partner** as sex partners who were directly connected with individuals in the initial cohort. Similarly, we defined **2nd generation sex partners as** sex partners of 1st generation sex partners, and **3rd generation sex partners** as sex partners of 2nd generation sex partners. First and 2nd generation sex partners were contacted and interviewed, and 3rd generation sex partners were only nominated, but not contacted or interviewed.

[iii] Walk: a sequence of adjacent nodes (person).
[iv] Path: a sequence of adjacent nodes in which each intervening node is counted (visited) only once.
[v] Root: an individual from which each directed walk of length 2 originates.

We identified all possible chains of sexual relationships. A chain of sexual relationships was eligible for the analysis when every member of the chain was not only nominated but also interviewed. Individuals in the initial cohort or 1st generation sex partners could serve as roots of chains of sexual relationships; chains of sexual relationships starting from adolescents in the initial cohort (an individual in the initial cohort→ 1st generation sex partner→ 2nd generation sex partner), and starting from 1st generation sex partners (1st generation sex partner→ 2nd generation sex partner→3rd generation sex partner). Chains of sexual relationships starting from individuals in the initial cohort could included reciprocal dyads and triads; however, chains of sexual relationships starting from 1st generation sex partners included only reciprocal dyads due to the eligibility of the chains for this analysis (i.e. every member of a chain of sexual relationships must be interviewed) and the sampling frame of the Bayview Network Study (i.e. repeated name generators covered individuals as far as three generations away from the initial cohort).

Only reciprocal dyads were the focus of the 2nd and 3rd objectives of this study, in which adolescent and sex partner(s) not only acknowledged each other as sex partners but also identified partner-types (i.e. main or casual). Reciprocal dyads included both concordant and discordant dyads with respect to their partner-type identification; whether they identified each other as main or casual partners. Two types of chain of sexual relationships were mutually exclusive, a reciprocal dyad and a triad; however, an individual could form more than one type of chain of sexual relationships simultaneously.

Variables and data analyses

The distribution of female and male adolescents and their sex partners were compared by race, current age, age at first sex, number of life-time sex partners, number of sex partners in the last 3 months, prevalence of chlamydia and gonorrhea, and ever-experienced pregnancy for the entire sample and the 110 reciprocal dyads. Two sample t-tests and Chi-square tests were employed to test equal means for continuous variables and equal proportions for categorical variables. Explanatory variables of interest were female and male adolescents' perceived partner-types (main or casual), and the relationship-types reflecting concordance in perceived partner-types (main-concordant, discordant, and casual-concordant).

There were originally two items about condom practice, the outcome of this study, in the Bayview Network Study questionnaires; condom use at last sex (binary: used, did not use), and frequency of condom use in the past 3 months (categorical: every time, most of time, a few times, never). There were no missing observations in condom use at last sex, and less than 4% in frequency of condom use in the past 3 months. Interviews of two partners in a dyad did not always happen at the times that we could reasonably assume that two partners referred to the same sexual event. The agreement between females' and males' responses to these two items were found to be poor (kappa statistics: 0.40 (70.0 % agreement) for condom use at last sex, and 0.23 (43.8 % agreement) for frequency of condom use in the past 3 months). In order to maximize the rational utilization of responses from two partners which disagreed on these items, we defined the dyad-level behavior outcome to capture inconsistent condom use over time. We dichotomized the permutation of responses from two partners using discordant responses to condom use at last sex as non-use: at least one partner reported condom non-use at last sex, or both partners reported using condom at last sex. The recorded dyad-level condom non-use at last sex was used as the positive outcome in this analysis, which indicated couples' inconsistent

condom use over a short period of time. The dyad-level outcome was compared among the 3 types of relationship. Frequency of condom use in the past three months was dichotomized to indicate couples' inconsistent condom use with the same principle of recoding. The analysis was repeated to validate the result using the dichotomized dyad-level condom non-use in the past three months to capturer the inconsistent condom use over a longer period of time.

Odds ratios (ORs) of dyad-level condom use and robust standard errors were estimated after controlling for clustering of reciprocal dyads in male adolescents. The ORs were compared in three logistic regression models to examine the robustness of results; unadjusted, adjusted for all covariates, and adjusted for parsimonious set of covariates selected by backward stepwise reduction.

Covariates were selected that are known to potentially confound the association between perceived partner-types and condom use at last sex; self-reported age (years old), reported length of relationship (<1 month, 1 - 3 months, 4 - 6 months, 7 - 12 months, and > 12 months), frequency of sex in the past 3 months (fewer than a few times /month, a few times/month, 1-2 times /week, everyday), perceived pregnancy wantingness (want pregnancy with this partner, or otherwise), and missing in partner-specific perceived pregnancy wantingness (missing, or otherwise). Responses in covariates were partner-specific, except respondents' self-reported age.

This study is one of rare exploratory studies that focused on reciprocal dyads in the analysis. The sample size of reciprocal dyads was relatively small, and main-concordant group was found to be very small (n=5); thus, we used p-value of 0.2 to determine statistical significance of the results and provided 80% confidence intervals for relevant statistics. STATA

Version 9.0 SE (Stata Corporation, College Station, Texas) statistical analysis software was used for the analyses.

Results:

A total of 332 unique chains of sexual relationships constituted by 182 females and 154 males were identified. There were 29 unique patterns of local sexual networks. (Figure 2) The baseline characteristics of individuals in the identified local sexual networks are shown in Table 1a. One third (110) of all chains of sexual relationships were reciprocal dyads reported by 109 females and 99 males. Table 1b shows the baseline characteristics of individuals in the reciprocal dyads. The characteristics of individuals formed the 110 reciprocal dyads were relatively similar to the entire sample.

Table 2 shows number of individuals that constituted the types of reported chains of sexual relationships, all unique individuals who were in the three positions of each chain. Concurrent relationships were commonly observed among those who reported reciprocal dyad(s): 45.9 (50/109) % of females and 46.5 (46/99) % of males who reported reciprocal dyad also reported a triad(s). Few reciprocal dyads were nested in the same friend clusters: 11 out of 110 reciprocal dyads were found to be belonged to 5 unique friend clusters. The average number of reciprocal dyads per friend cluster was 1.3.

Table 3 shows reports of partner-types identified by female and male respondents and their opposite-sex partners. Among the reciprocal dyads in which females identified their sex partners as their main partners, most (89.4 %) of the males identified the female as a casual partner. Among the reciprocal dyads in which females identified their sex partners as casual partners, about half (50.8 %) of the males also reported the female as a casual partner, but the

other half (49.2 %) reported the female as a main partner. Similarly, among the reciprocal dyads in which males identified their sex partners as their main partners, most (86.1 %) of the females identified the male as a casual partner. Among the reciprocal dyads in which males identified their sex partners as casual partners, more than half (56.8 %) of the females also reported the male as a casual partner, but the rest (43%) reported the male as a main partner. The two partners agreed on their partner-type as main in less than 15 % of reciprocal dyads. The kappa statistics testing the null hypothesis that there was no more agreement between partner-types reported by females and males than might occur by chance was -0.40, indicating that the agreement was lower than expected by chance alone.

As shown in Table 4, there was a weak positive trend between relationship-types characterized by commitment level and dyad-level inconsistent condom use (p=0.20). The ORs for dyad-level inconsistent condom use by relationship-types are shown in Table 5. Main-concordant showed a significant association with dyad-level inconsistent condom use using relationships in which both partners considered the others as casual partners (casual-concordant) as the reference. The adjusted odds of inconsistent condom use for main-concordant was 6.7 (80% CI: 0.67, 66.7), significantly higher than both the reference group, casual-concordant (p=0.10), and the discordant group (p=0.13) (Model 1). Results persisted with adjustment for potential confounders (Model 2).

Table 6 shows comparison of ORs of dyad-level inconsistent condom use for main partner-type perceived by females and males. Using univariate logistic regressions, the association between dyad-level inconsistent condom use and perceived main partner-type was compared to casual; ORs were 2.2 (80% CI: 1.3, 3.8, p=0.06) for females, and 1.1 (80% CI: 0.60, 1.9, p=0.90) for males. When partners' perceived partner-types were controlled in the model,

ORs of dyad-level inconsistent condom use were 2.7 (80% CI: 1.5, 4.8, p=0.03) for females'

perception of main-partner and 1.6 (80% CI: 0.86, 3.0 p=0.33) for males'. These two ORs did

not differ significantly (p=0.33). Multivariate logistic regression consistently showed that ORs

of dyad-level inconsistent condom use by only females' perceived main-partner was marginally

significant; however, the ORs between females' and males' perceived main-partner were

consistently found to be equivalent (p=0.59 in Model 1, and 0.34 in Model 2).

The analyses were repeated with the recoded dyad-level inconsistent condom use in a

longer recall period, the past three months. (Appendix Table 7-9) Results were consistent with

the ones using recorded dyad-level condom non-use at last sex as the outcome (Table 4-6). The

only difference between two analyses using different outcome variable was observed in the

multivariate logistic regression testing the gender difference of effects of partner-types (Table 9,

Model 1 and 2). When we examined the longer recall period (the past three months vs. last sex),

ORs of dyad-level inconsistent condom use by males' (2.6 in Model 1, and 2.1 in Model 2) in

addition to females' (2.3 in Model 1 and 2) perceived main partner were found to be significant.

Multivariate logistic regression consistently showed that ORs of dyad-level inconsistent condom

use in the past three months by perceived main-partner did not differ between females and males

(p=0.79 in Model 1, and 0.97 in Model 2).

Discussion:

Traditional surveys collect information from one member of a social network and

attempt to describe shared behaviors in each network. This approach uses proximate information

about other members in the network reported by interviewed individuals. Our study utilized

network data, and focused on reciprocally nominated heterosexual dyads in the analysis. This

innovative approach can more accurately reveal the ambivalent nature of sexual relationships among adolescents and young peoples. Only 1/3 of identified sexual relationships were reciprocally acknowledged by both partners. It was highly common that an adolescent and their recent sex partner(s) did not agree on who the other partner was in their sexual relationship. It is striking that when one's sex partner was separately interviewed and given the opportunity of listing up to 6 sex partners in the past 3 months, this sex partner did not even nominate the root individual of the chain of sexual relationships, who initially referred her/him to the study. This phenomenon was more frequently observed among male sex partners who were referred by the female root individuals. Self-selections in our sample of reciprocal dyads may have occurred at the participation into the Bayview Network Study (about 65 % response rate of the seed individuals), at partner-nominations by root individuals, at partners' participation, and partner-nominations by the partners. This finding, however, suggests that the studies using traditional survey approach replying on egocentric data potentially may include up to 2/3 of unconfirmed sexual relationships.

Triads of unconfirmed sexual relationships by members of the chains of sexual relationships were excluded to estimate the measure of associations between relationship-types/partner-types and condom use. Information about dyad-level behaviors among triads collected from root individuals who were not acknowledged by their partners may introduce bias. In other words, studies using egocentric data may reply on inflated denominator and numerator data in estimating risks or measure of associations; this could alter implications of the results of studies using traditional surveys.

Adolescents' sexual relationships overlap in time, and concurrent relationships among adolescents are commonly observed in the past research using egocentric data [11] [12] [13] [14] [15] [16]. Our

study confirmed this observation even within reciprocal dyads; the concurrency rate was estimated in over 45%. Over 85 % of partner-types identified by female and male partners of reciprocal dyads were discordant in which the two partners did not agree on whether their partner was main or casual. This corresponded to kappa -0.40 (33.6 % agreement) suggesting poor agreement between two persons' perceived partner-types. The proportion reporting main-partner was higher in females compared to males (42.7 % vs. 32.7%, p=0.13). The two partners agreed on their partner-type as main in only 11-14% of reciprocal dyad, among females and males alike. This result suggests potential reasons for difficulties encountered in couple interventions of STI counseling or treatment for adolescent and young couples: both partners must participate in these interventions and they may also require both people to perceive the other as their main partner.

There were a few limitations in this study. The dyad-sample size for the multivariate logistic regression was small (n=105) due to missing among covariates; however, the results were robust in various models after controlling for potential confounding factors. Our analysis was limited to the baseline sample that included reciprocally nominated heterosexual relationships, and the role of stability of sexual relationship on condom use at last sex was examined by a proxy measure, the length of the relationship reported by both partners. Nevertheless, because a small number of males reported sexual relationships with more than one of the females in our sample, we also addressed concurrent relationships.

Our investigation was innovative and had several strengths: it used sociometric network data and strictly examined partners in reciprocally acknowledged sexual relationships, the outcome variable (dyad-level inconsistent condom use at two recall periods: at last sex, and in the past three months) was partner-specific and coded positive when at least one of partner reported condom non-use to indicate the inconsistency of condom use over time, the explanatory

variables were not only perceptions about sex partner-types but also relationship-types, informing concordance of perceived partner-types by two partners in a dyad, and adjusting for both females' and males' covariates in the analyses. These data were available by matching responses of two partners in a dyad through series of snowballing sampling data collection.

Multivariate logistic regression showed no difference in odds of dyad-level inconsistent condom use between main-partner perceived by females and males. Combined with the results of the effect of concordance in main partner-type, gender differences in the effect of perceived partner-type were not suggested. If we only had responses from female adolescents, we would have only observed that females' perception of main partner put them at risk of inconsistent condom use (corresponds to univariate regression results for main-partner perceived by female in Table 6), and would not be able to compare the magnitude of effects of perceived partner-types between female and male.

Multivariate logistic regression using the recoded binary outcome of dyad-level inconsistent condom use in the past three months suggested that male's perceived main-partner had a significantly positive association with dyad-level inconsistent condom use in the past three months. This may reflect the change in condom practices due to the increased relationship length, and the male's perception of partner-type may exert its potent effect on couple's behaviors in the long run. It could also reflect measurement errors potentially introduced by type of questions asked (i.e. recall period that the behavior was asked was a single occasion, at last sex, vs. continued period, in the past three months).

Some studies suggested that the risk of STIs appears to be higher with main partners than with casual partners[17][18]. In our reciprocal-dyad sample, there was no difference between STIs prevalence by partner-types (main vs. casual: 18.4 % vs.14.0% for females (p=0.58), 6.0%

vs. 13.1% for males (p=0.28), results not shown), nor relationship-types (main-concordant vs. others: 20.0% vs. 16.0% for females (p=0.80), 0% vs. 11.1% for males (p=0.44), results not shown). Our findings suggest that the condom practices among reciprocal dyads appeared to be relationship-type specific; however, the risk of STIs may not be.

The pattern of discordance in reported partner-types was similar among females and males adolescents in our sample. Females, however, were more likely to report their male partner as main compared to males when they disagreed on reports of partner-types (57.5 % vs. 42.2 %, p=0.07, n=73, result not shown), and females were more likely to report non-use compared to males when they disagreed on reports of condom use at last sex (62.5 % vs. 39.3 %, p=0.07, n=33, result not shown). This result was consistent for dichotomized dyad-level condom use in the past three months (60.0 % vs. 40.0 %, p=0.10, n=35, result not shown). Our findings support females' misperception about their relationship quality and partner's risk behaviors.

Conclusions:

The sexual relationships reported by adolescents were often not reciprocally acknowledged. Adolescents' perceptions of whether their sexual relationship were main or casual relationships were largely discordant with their sexual partners'. Female adolescents, however, were somewhat more likely to consider their partner as main partner than male adolescents. Adolescents were at increased risk of inconsistent condom use when they considered their sex partners as main partners, but only when their sex partners also considered them as main partners (i.e. main-concordant). When at least one of partners considered the other as casual (i.e. discordant), the risk of inconsistent condom use was equivalent to when both partners considered the other as casual (i.e. casual-concordant).

This study challenges fundamental assumptions of couple interventions for STI treatment. STI interventions must acknowledge that female and male adolescents in a sexual relationship may not be in agreement about their main partners, and that concordance in main partnership perceived by both partners increases the risk for not using condom. Perception of a casual partner reported by one partner in a dyad could work equally as a protective factor for STIs as when both partners considered each other as casuals. This finding has important implications for counseling, testing, and treatment among adolescent and young couples.

Figure 1. Examples of local sexual networks and partner nomination

Local Sexual Networks [†]			Types of reported chains of sexual relationships (count)	
Initial Cohort	→ Sex partner(s)	→ Sex partner(s) of Sex partner(s)		
Jane (♀)	→ Mark (♂)	→ Mary (♀)	Triad (1)	**Triad only**
Bob (♂)	→ Alice (♀)	→ David (♂)	Triad (1)	
		↘ Chris (♂)	Triad (1)	
		↘ John (♂)	Triad (1)	
Jane (♀)	→ Mark (♂)	→ Jane (♀)	Reciprocal dyad (1)	**Reciprocal Dyad only**
Michael(♂)	→ Kate (♀)	→ Michael(♂)	Reciprocal dyad (1)	
	↘ Cathy (♀) →	Michael(♂)	Reciprocal dyad (1)	
Jane (♀)	→ Mark (♂)	→ Jane (♀)	Reciprocal dyad (1)	**Both**
		↖ Mary (♀)	Triad (1)	
Jane (♀)	→ Mark (♂)	→ Jane (♀)	Reciprocal dyad (1)	
		↘ Mary (♀)	Triad (1)	
	↘ John (♂)	→ Jane (♀)	Reciprocal dyad (1)	
		↘ Amanda (♀)	Triad (1)	

†: Individuals in the initial cohort or 1st generation sex partner could serve as a root a directed walk of length 2 (i.e. a chain of sexual relationships). Partner nomination could start from an individual in the initial cohort (initial individual → 1st generation sex partner→ 2nd generation sex partner) or 1st generation sex partners (1st generation sex partner→ 2nd generation sex partner→3rd generation sex partner).

Figure 2. 29 Local Sexual Networks (n) at baseline survey of the Bayview Network Study
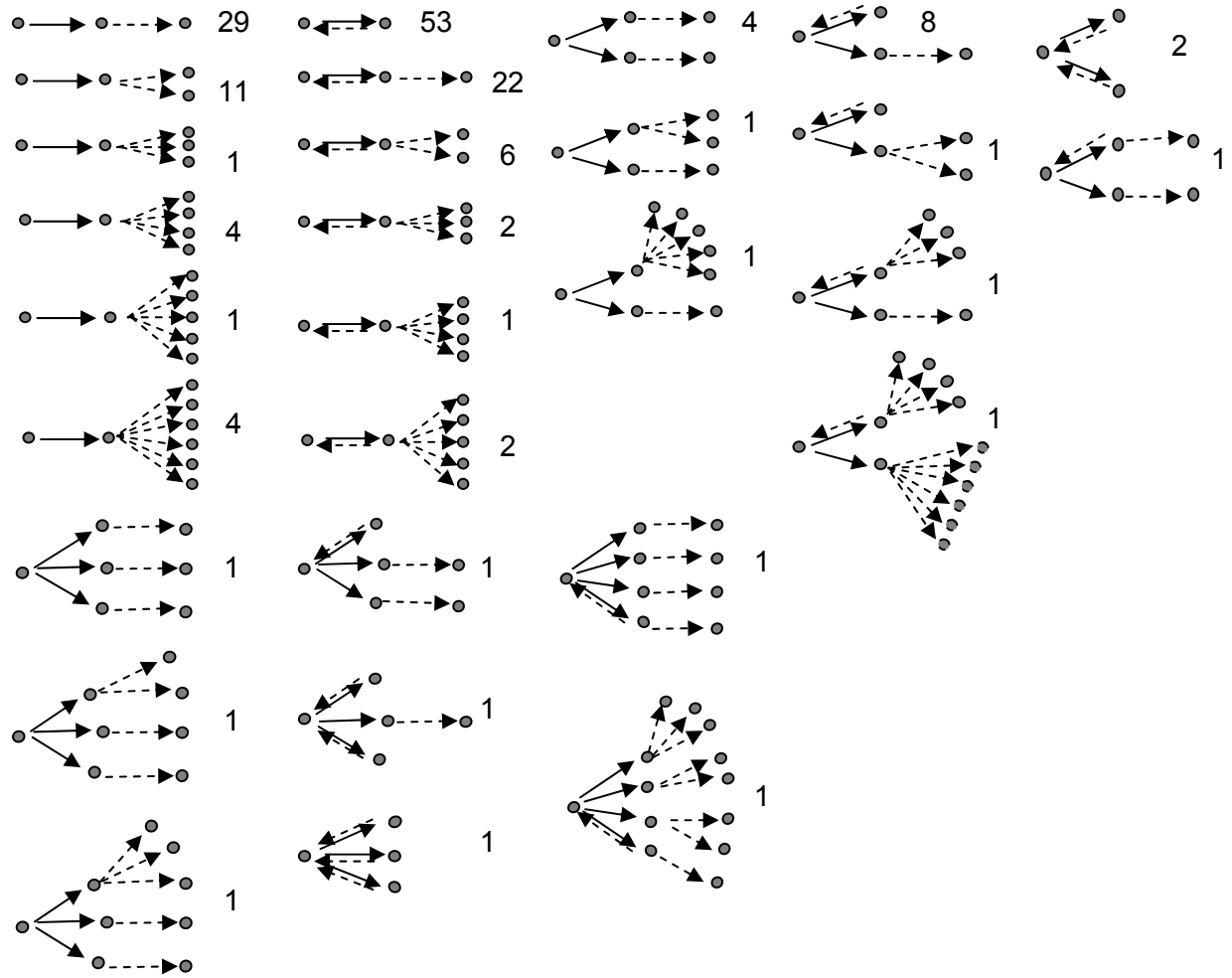
Table 1 a. Baseline description of the individuals who constituted 332 chains of sexual relationships

	Female	% (n=182)		Male	% (n= 154)	
Race/ethnicity						
African American	134	73.6		131	85.1	
White	6	3.3		3	2.0	
Latino	7	3.9		1	0.7	
Pacific Islander	2	1.1		6	3.9	
Asian	3	1.7		2	1.3	
Mixed	30	16.5		11	7.1	
	Mean(SD)	Median (IQR)	Range	Mean(SD)	Median (IQR)	Range
Age **	17.9 (2.6)	18 (3)	14-33	19.8 (3.3)	19 (3)	15-33
Age at first sex **	15.0 (1.5)	15 (2)	11-20	14.3 (2.1)	14 (3)	9-19
Total # of partners in life time **	3.7 (2.9)	3 (4)	1-11	8.1 (3.3)	10 (6)	1-11
# of partners in past 3 months **	1.3 (0.7)	1 (0)	1-6	2.3 (1.8)	2 (2)	1-11
	Prevalence[†]		%	Prevalence[†]		%
Chlamydia	22	15.1	(n=146)	15	11.4	(n=132)
Gonorrhea *	6	4.1	(n=146)	1	0.8	(n=132)
Ever pregnant *	78	42.9	(n=182)	80	52.0	(n=154)
Currently pregnant	18	9.9	(n=182)	NA	NA	-

*: statistically significant at <0.10 level, ** : at <0.001 level
†: confirmed by test result except having ever pregnant

Table 1 b. Baseline description of the individuals who constituted 110 reciprocal dyads

	Female	% (n=109)		Male	% (n= 99)	
Race/ethnicity						
African American	78	71.6		77	77.8	
White	5	4.6		3	3.0	
Latino	4	3.7		5	5.1	
Native American/ Alaskan	0	0		1	1.0	
Pacific Islander	0	0		2	2.0	
Asian	3	2.7		0	0	
Mixed	19	17.4		11	11.1	

	Mean(SD)	Median (IQR)	Range	Mean(SD)	Median (IQR)	Range
Age **	18.1(2.8)	18(3)	14-33	19.9(3.29)	19(47)	15-33
Age at first sex *	15.0 (1.5)	15(2)	12-20	14.5 (2.16)	14(3)	9-19
Total # of partners in life time **	3.5(2.8)	3(4)	1-11	7.8(6.52)	10(6)	1-11
# of partners in past 3 months **	1.2 (0.6)	1(0)	1-5	2.1 (1.82)	2(1)	1-11

	Prevalence[†]	%		Prevalence[†]	%	
Chlamydia	11	12.6	(n=87)	7	8.3	(n=84)
Gonorrhea	5	5.8	(n=87)	1	1.2	(n=84)
Ever pregnant	43	39.5	(n=109)	53	54.1	(n=98)
Currently pregnant	10	11.6	(n=86)	NA	NA	-

*: statistically significant at <0.10 level, **: at <0.001 level
†: confirmed by test result except having ever pregnant

Table 2. Females and Males who contributed to 332 unique sexual relationships[1]

Type of reported chains of sexual relationships (count)	Female	Male
Triad only (**128**)	70	60
Reciprocal Dyad only (**60**)	60	56
Both (**144**: 94 triads and 50 reciprocal dyads)	71	52
Total (332)	**201***	**168****

1) : Included females and males who appeared in 322 chains of sexual relationships, both as root individuals and as someone's partners)

*   : 201 females included 19 females who were counted twice; nominated as someone's sex partners and served as a root of a different chain of sexual relationships. Thus, this study included 182 (=201-19) unique females.

** : 168 males included 14 males who were counted twice; nominated as someone's sex partners and served as a root of a different chain of sexual relationships. Thus, this study included 154 (=168-14) unique males.

Table 3. Partner-types identified by respondents' gender among 110 reciprocal dyads

Female respondents' perception	Their male partner's perception		Total (%)
	Main	Casual	
Main	5 (10.6)	42 (89.4)	47 (100.0)
Casual	31 (49.2)	32 (50.8)	63 (100.0)

Male respondents' perception	Their female partner's perception		Total (%)
	Main	Casual	
Main	5 (13.9)	31 (86.1)	36 (100.0)
Casual	42 (56.8)	32 (43.2)	74 (100.0)

Table 4. Dyad-level inconsistent condom [1)] by relationship-types (N=110)

Relationship-types	Number of reciprocal dyads (%)[*]	
	Inconsistent use	Consistent use
Main - Concordant (n=5)	4 (80.0)	1 (20.0)
Discordant (n=73)	51 (69.9)	22 (30.1)
Casual - Concordant (n=32)	17 (53.1)	15 (46.9)
Total (N= 110)	72 (65.5)	38 (34.5)

*: p = 0.197 (df=3)

1) The recall period was 'at last sex'. Inconsistent condom use was dichotomized as 1: at least one partner reported condom non-use at last sex, 0: both partner reported using condom at last sex (i.e. consistent use).

Table 5. Odds Ratios (80 % CI) for dyad-level inconsistent condom use [1] by relationship-types

Relationship-types	Multivariate (n=105)		
	Unadjusted	Model 1[2]	Model 2[3]
Main Concordant	4.0 (4.7) (0.90, 18)	6.7 (7.9) ** (1.5, 30)	4.9 (4.7) † (1.4, 17)
Discordant	2.2 (0.96)* (1.2, 3.8)	1.2 (0.69) (0.54, 2.5)	1.3 (0.75) (0.67, 2.6)
Casual Concordant	1	1	1
R^2	0.03	0.21	0.16
Log Likelihood ratio	-66.9	-54.5	-57.8

*: p=0.08, **: p=0.10, †: p=0.16
1)   The recall period was 'at last sex'.
2)   Model 1: Adjusted for Females' age, Females' perceived length of the relationship, Females' frequency of sex, Females' wanting-ness of pregnancy with this partner, missing in Females' wanting-ness of pregnancy with this partner, Males' age, Males' perceived length of the relationship, Males' frequency of sex, and Males' wanting-ness of pregnancy with this partner, missing in Males' wanting-ness of pregnancy with this partner
3)   Model 2: Parsimonious model reducing variables from Model 1 by backward stepwise estimation (at p=0.2) forcing relationship type variables in the model.

Table 6. Odds Ratios (80 % CI) of dyad-level inconsistent condom use[1] by perceived partner-type

Partner-types	Univariate (n=105)	Multivariate (n=105)		
		Unadjusted	Model 1[2]	Model 2[3]
Main partner perceived by female	2.2 (0.94) * (1.3, 3.8)	2.7 (1.2)** (1.5, 4.8)	1.9 (0.98) † (1.0, 3.7)	2.1 (0.99) †† (1.1, 3.8)
Main partner perceived by male	1.1 (0.47) (0.60, 1.9)	1.6 (0.78) (0.86, 3.0)	1.4 (0.73) (0.72, 2.7)	1.2 (0.59) (0.63, 2.3)
R^2		0.03	0.20	0.16
Log Likelihood ratio		-66.3	-55.1	-57.6

* : p=0.06, **: p=0.03, †:0.20, ††: 0.13

1)   The recall period was 'at last sex'.
2)   Model 1: Adjusted for Females' age, Females' perceived length of the relationship, Females' frequency of sex, Females' wanting-ness of pregnancy with this partner, missing in Females' wanting-ness of pregnancy with this partner, Males' age, Males' perceived length of the relationship, Males' frequency of sex, and Males' wanting-ness of pregnancy with this partner, missing in Males' wanting-ness of pregnancy with this partner
3)   Model 2: Parsimonious model reducing variables from Model 1 by backward stepwise estimation (at p=0.2) forcing relationship type variables in the model.

Appendix:

Table 7. Dyad-level inconsistent condom use [1] by relationship-types (N=105)

Relationship-type	Number of dyads (%)*	
	Inconsistent use	Consistent use
Main - Concordant (n=5)	3 (46.0)	2 (40.0)
Discordant (n=73)	34 (48.6)	36 (51.4)
Casual - Concordant (n=32)	8 (26.7)	22 (73.3)
Total (N= 110)	45 (42.9)	60 (57.2)

*: p = 0.147 (df=3)

1)   The recall period was 'in the past three months'. Inconsistent condom use in the past three months
     was dichotomized as 1: at least one partner reported never using condom in the past last sex, 0: both
     partner reported any use of condom in the past three months (i.e. consistent use)

Table 8. Odds Ratios (80 % CI) for dyad-level inconsistent condom use [1] by relationship-types

Relationship-types	Multivariate (n=105)		
	Unadjusted	Model 1[2]	Model 2 [3]
Main Concordant	4.1 (4.2) (1.1, 15)	10 (11) ** (2.5, 41)	5.5 (6.2) † (1.3, 23)
Discordant	2.6 (1.2) * (1.4, 4.8)	1.8 (1.1) (0.89, 3.8)	1.7 (0.92) (0.87, 3.4)
Casual Concordant	1	1	1
R^2	0.03	0.21	0.17
Log Likelihood ratio	-69.3	-56.4	-59.4

*: p=0.05, **: p=0.04, †: p=0.07

1)The recall period was 'in the past three months'. Inconsistent condom use in the past three months was dichotomized as 1: at least one partner reported never using condom in the past last sex, 0: both partner reported any use of condom in the past three months (i.e. consistent use)
2)Model 1: Adjusted for Females' age, Females' perceived length of the relationship, Females' frequency of sex, Females' wanting-ness of pregnancy with this partner, missing in Females' wanting-ness of pregnancy with this partner, Males' age, Males' perceived length of the relationship, Males' frequency of sex, and Males' wanting-ness of pregnancy with this partner, missing in Males' wanting-ness of pregnancy with this partner.
3)Model 2: Parsimonious model reducing variables from Model 1 by backward stepwise estimation (at p=0.2) forcing relationship type variables in the model.

Table 9. Odds Ratios (80 % CI) of dyad-level inconsistent condom use[1] by perceived partner-type

Partner-types	Univariate (n=105)	Multivariate (n=105)		
		Unadjusted	Model 1[2]	Model 2 [3]
Main partner perceived by female	1.7 (0.69) (0.99, 2.9)	2.4 (1.1)* (1.3, 4.4)	2.3 (1.3) † (1.1, 4.8)	2.3 (1.2) ‡ (1.1, 4.5)
Main partner perceived by male	1.5 (0.64) (0.90, 2.6)	2.3 (1.1) ** (1.2, 4.3)	2.6 (1.5) †† (1.3, 5.4)	2.1 (1.1) ‡‡ (1.1, 4.0)
R^2		0.03	0.21	0.19
Log Likelihood ratio		-69.3	-56.7	-58.1

*: p=0.07, **: 0.09, †: 0.15, ††: 0.08, ‡:0.13, ‡‡: 0.17
1)The recall period was 'in the past three months'. Inconsistent condom use in the past three months was dichotomized as 1: at least one partner reported never using condom in the past last sex, 0: both partner reported any use of condom in the past three months (i.e. consistent use)
2)Model 1: Adjusted for Females' age, Females' perceived length of the relationship, Females' frequency of sex, Females' wanting-ness of pregnancy with this partner, missing in Females' wanting-ness of pregnancy with this partner, Males' age, Males' perceived length of the relationship, Males' frequency of sex, and Males' wanting-ness of pregnancy with this partner, missing in Males' wanting-ness of pregnancy with this partner.
3)Model 2: Parsimonious model reducing variables from Model 1 by backward stepwise estimation (at p=0.2) forcing relationship type variables in the model.

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