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## Social Network Influences on Male and Female Condom Use among Women Attending Family Planning Clinics in the U.S.

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### Abstract

**Background**—Research has shown that social networks play an important role in determining health behaviors. However, little is known about their influence on male and female condom use among women.

**Methods**—We analyzed data obtained from 157 sexually-active women who enrolled in the Female Condom Intervention Trial (FEMIT) from June 2003 to November 2004 in Northern California and completed an audio computer-assisted self interview at baseline and three-months.

**Results**—At the 3-month assessment, the mean number of male and female “conversation” network members (i.e., non-spouse/sex partner people with whom respondents had discussed male and female condoms in the past three months) was 1.62 and 1.03, respectively. Results of multiple logistic regression analyses showed that male and female condom use was higher among women with at least one network member who encouraged using the male condom (OR, 3.39; 95% CI, 1.52, 7.56) and the female condom (OR, 6.03; 95% CI, 1.95, 18.61), respectively. Female condom use was also associated with having “dense” female condom conversation networks (i.e., at least two of respondents’ network members knew one another; OR, 8.42; 95% CI, 3.05, 23.29).

**Conclusions**—The significant association between conversation network characteristics and male and female condom use suggests that more research is needed to better understand the role of conversation networks in affecting condom use among women.

### Introduction

Globally, women account for almost half of 33 million people now living with HIV.<sup>1</sup> In the United States, women represented 27% of the estimated 544,749 adults and adolescents living with HIV/AIDS by the end of 2007. Heterosexual contact was responsible for 72% of the estimated U.S. female cases.<sup>2</sup> A majority of infected U.S. women (82%) were ethnic minorities. In addition, U.S. women accounted for 75% of the 1,105,997 Chlamydia infections and 53% of the 355,279 gonorrhea cases reported to the Centers for Disease Control and Prevention in 2007.<sup>3</sup> Ethnic minority women comprised 69% and 77% of reported Chlamydia and gonorrhea cases, respectively.

Sexual abstinence aside, the male condom and the female condom, provide women the best methods to prevent sexual transmission of HIV. Reviews of condom use studies have shown that the male condom can reduce the risk of acquiring HIV by 80–95% if used correctly and

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#### Summary

A study of women attending family planning clinics in Northern California found that male and female condom conversation networks affect device usage.

consistently.<sup>4–6</sup> Estimates made based on pregnancy prevention studies indicate that the correct and consistent use of the female condom can reduce the risk of HIV infection by 94–97%.<sup>7</sup> A recent use-effectiveness study of the female versus male condom in preventing STDs among women found no significant difference between these two barrier methods.<sup>8</sup> An STD incidence rate per 100 women-months was 6.8 for women who were instructed to use only the female condom and 8.5 for women who were instructed to use only the male condom.

“Social networks” (i.e., groups of individuals linked through social ties) can influence condom use by diffusing information about condoms and reinforcing condom use norms through interpersonal communication. Empirical studies have demonstrated the impact of social networks on condom and other contraceptive use.<sup>9–11</sup> In a study of U.S. injection drug users, consistent condom use during vaginal sex with main partners was higher among those who had more friends talking about and using condoms and consistent condom use during vaginal sex with casual partners was higher among those who had more friends encouraging condom use.<sup>11</sup> In a sample of Cameroonian women, contraceptive use was higher among respondents with social network members who encouraged them to use contraception.<sup>9</sup> A study of Kenyan women found a significant positive association between respondents’ increased use of contraception and the larger proportion of contraception users within respondents’ social networks.<sup>10</sup> However, these studies did not identify network-level factors uniquely associated with male and female condom use. We investigated social network influences separately for male and female condom use among U.S. women attending family planning clinics.

## Methods

### Data Collection

Data came from baseline and 3-month follow-up surveys of women who were assigned to a comparison group in the Female Condom Intervention Trial (FEMIT). FEMIT was a randomized controlled intervention study that evaluated the efficacy of female condom skills training in increasing female condom use. Details of this study are described elsewhere.<sup>12</sup> Briefly, study participants were recruited from three family planning clinics in the San Francisco Bay Area from June 2003 to November 2004. Recruitment flyers were posted at the clinics and three trained female recruiters approached women at the study sites to determine eligibility to participate. Women were eligible for the study if they self-identified as African American, Asian, Latina, or White; were 18–39 years of age; had more than one male sex partner in the previous year; had no known allergies to polyurethane, latex, or lubricants; were HIV negative; had no plan to get pregnant within the subsequent 6 months; and were English speakers.

Eligible participants provided written informed consent if they were willing to participate in the study. The consented participants then completed a standardized baseline questionnaire using an audio computer-assisted self-administered interview (ACASI) system and received a \$10 cash incentive. Approximately one week after their baseline visit, the participants returned to the study site to receive their randomly assigned intervention, either the experimental female condom skills training intervention or a comparison intervention that focused on women’s general health issues, such as cancer and heart disease. Three months after finishing intervention sessions, they completed an ACASI-based questionnaire identical to that administered at baseline and received a \$30 cash incentive. Participants, regardless of their intervention assignment, were shown how to use male and female condoms using penis and pelvic models during their first intervention session and received condom supplies during the entire study period.

The Committee for Human Research of the University of California, San Francisco approved the study procedures.

## Measures

The survey instrument included questions about demographic characteristics, social networks, and male and female condom use. Respondents were asked about ethnicity, age, marital status, and education.

To collect information about conversation networks related to male condoms, respondents were first asked how many different people they had talked to about the male condom during the 3 months prior to the follow-up interview (i.e., “male condom conversation networks”). Next, they were asked to name up to five people to whom they had most often talked about the male condom during the same 3-month period. For each network member named, respondents were asked how they were related to the network member (i.e., spouse/sex partner, family member other than a spouse/sex partner, friend, coworker, health care worker), whether they knew that the network member used the male condom, whether the network member encouraged them to use the male condom, and whether the network member discouraged them from using the male condom. The last three questions were used to measure two types of social norms related to male condom use: “descriptive” (i.e., what significant others are doing) and “injunctive” (i.e., what significant others say a person should do).<sup>13</sup> We operationalized descriptive norms as respondents’ knowledge of their network members’ use of male condoms, whereas we operationalized injunctive norms as encouragement or discouragement of male condom use by respondents’ network members. All network member-specific variables were summarized to create respondent-level variables (e.g., a binary indicator of any network member encouraging male condom use). Also, respondents were asked which of the (up to 5) members of their male condom conversation network knew one another. The density of each network was calculated as the number of (non-respondent) network member pairs who knew one another, divided by the total number of network member pairs (possible range: 0–1). Because the preponderance of conversation networks had zero density, prior to inclusion in regression models, the density variable was dichotomized (0 and >0). The same series of questions were asked about “female condom conversation networks.”

At the 3-month assessment, respondents described sexual behaviors with each of their most recent male sex partners. Starting with their most recent partner (“partner 1”), they were asked about their relationship (i.e., spouse, boyfriend, friend, acquaintance, stranger, other), the number of times they had vaginal and anal intercourse with this partner during the prior 3 months, and the number of times they used male and female condoms. These questions were repeated up to 10 times depending on the number of partners reported by respondents. We summarized the partner-level responses to create two respondent-level condom use variables: binary indicators of male condom use (i.e., using male condoms at least once during vaginal or anal intercourse in the past 3 months) and female condom use (i.e., using female condoms at least once during vaginal or anal intercourse in the past 3 months).

## Data Analysis

We report means, medians, and percentages to profile the demographic, sexual behavior, and condom conversation network characteristics of sample members. Separate logistic regression models were fit for binary indicators of male and female condom use during the three month period prior to the 3-month interview. Regression models estimated both unadjusted and adjusted effects of respondent and conversation network characteristics on condom use. Multivariate models employed stepwise selection to include and retain effects with p-values <0.20. As noted in Table 3, because of a sparse data distribution, the regression parameter from one bivariate model could not be estimated by standard methods. Instead, for that model we used Firth's (1993)<sup>14</sup> penalized likelihood approach, which is a method of addressing sparse data and bias of parameter estimates.

## Results

### Sample Characteristics

Of the 196 women who were assigned to a comparison group in the FEMIT study, 169 (86%) returned for follow-up interviews at three months. Among these 169 women, 157 reported having sexual partners during the three months prior to the follow-up interviews. Table 1 shows the sample characteristics of the 157 participants. A majority of these participants attended college (72%), and were White (62%), never married (93%), and under 25 years old (75%; mean = 23 years old). The median number of male sex partners respondents had in the past 3 months was 1. Seventy-nine percent reported having a steady partner (i.e., a spouse or a boyfriend) during this time period. Thirty-two percent had a lifetime history of sexually transmitted infections (STIs). Seventy-two and 19% reported using male and female condoms at least once during vaginal or anal intercourse with their partners, respectively.

### Characteristics of Male and Female Condom Conversation Networks

When calculating the characteristics of women's conversation networks, we excluded data about reported network members designated as spouses or sex partners; those conversations partly may have focused on negotiating condom use with the network member and the success of such negotiations would have direct implications for condom use. Instead we chose to focus on conversation network members who were not sex partners. The mean size of male and female condom conversation networks was 1.62 (median, 1; range, 0 – 5) and 1.03 (median, 0; range, 0 – 5), respectively. Mean density was 0.33 (median, 0; range, 0 – 1) for male condom conversation networks and 0.22 (median, 0; range, 0 – 1) for female condom conversation networks. As Table 2 shows, friends were the most common people to whom respondents had talked about the male and the female condom (54% and 39% had at least one network member who was a friend, respectively), followed by family members other than a spouse or a sex partner (16% and 9%, had at least one network member who was a family member, respectively). More than half of respondents (55%) knew that at least one of their network members used male condoms, whereas 26% knew that at least one network members used female condoms. Forty-nine and 19% reported at least one network member encouraged using male and female condoms, respectively, while 5 and 9% reported at least one network member discouraged using male and female condoms, respectively.

### Influence of Respondent and Network Characteristics on Male and Female Condom Use

Table 3 presents results of bivariate and multivariate logistic regression analyses conducted to examine the associations of respondent and conversation network characteristics with use of male and female condoms. Multivariate results showed that male condom use was higher among respondents who reported two or more male sex partners in the prior 3 months (OR, 6.99; 95% CI, 2.13, 22.90) and at least one network member who encouraged using the male condom (OR, 3.39; 95% CI, 1.52, 7.56). Female condom use was higher among respondents with dense networks (OR, 8.42; 95% CI, 3.05, 23.29) and at least one network member who encouraged using the female condom (OR, 6.03; 95% CI, 1.95, 18.61). Demographic characteristics, partner type, a lifetime history of STIs, network size, network member relationship type, knowledge of network members' male or female condom use, and discouragement of male or female condom use by network members were not associated with both male and female condom use. Number of male sex partners was not associated with female condom use.

## Discussion

Findings from our study show that male and female condoms are discussed within women's social networks. In our sample, almost two thirds and close to half had talked to at least one

person about male and female condoms in the past three months, respectively. Significant proportions of women had three to five people with whom they discussed male (32%) and female condoms (13%) during the same 3-month period. The most frequently mentioned types of male and female condom conversation networks members were friends, followed by family members. Condom discussion with health care workers was rare. Because we did not collect data on whether study participants had seen their health care providers during a three-month recall period for our follow-up survey, we do not know what proportion of women who had sought health care during that period had discussed condoms with their providers. Thus, it is possible that the low level of condom discussion with health care workers might reflect a low rate of participants seeking health care during that recall period.

We found that more than half of respondents reported being encouraged by at least one network member to use the male condom, whereas 12% reported being encouraged by at least one network member to use the female condom. Some respondents, though smaller in number, reported being discouraged by at least one network member to use male (5%) and female condoms (9%). These results suggest that network members' advice giving on condom use is common and that their advice on condom use can be both positive and negative.

Our study identified common as well as unique network-level factors associated with male and female condom use. Encouragement of condom use by network members was associated with both male and female condom use. Network density, on the other hand, was associated only with female condom use. Network-level factors that had no influence on either male or female condom use included network size, relation type of network members, respondent knowledge of network members' condom use, and discouragement of condom use by network members.

Inconsistent with prior research,<sup>11</sup> we found that descriptive norms had no influence on condom use. Respondents' own use of male and female condoms was not associated with their network members' use of these barrier methods. By contrast, injunctive norms, played a role in determining condom use. Male and female condom use were higher among women with at least one network member who encouraged using a respective device. These findings suggest that women do not adopt male and female condom use simply by knowing whether others use condoms, but do so only with urging from people with whom they interact.

We found that density of male condom conversation networks was not associated with male condom use. However, density of female condom conversation networks was an independent factor associated with female condom use. Women with dense female condom conversation networks were more likely to use the female condom. These varying influences of network characteristics on male and female condom use may have resulted because the female condom is relatively novel and less popular than the male condom. The male condom has been available to women since the beginning of the HIV epidemic in this country and is a more accepted and routine part of many women's sexual practices. By contrast, the female condom conversation networks might play an influential role in affecting female condom use because the female condom is new to most women and those networks might have women who are willing to try out the device when they learn about it from other network members.

We acknowledge four shortcomings of our study. First, findings from our study may have limited generalizability because a non-random sample of women was recruited from family planning clinics and a majority of participants were White and attended college. Second, because our data came from a clinical trial that was advertized as a study to promote women's general health including sexual health and the female condom, our sample might have been overrepresented by women who are motivated to learn about female-initiated barrier methods. Third, we were not able to identify other types of social network members (e.g., "best" friends from peer networks) who might be equally or more influential than members of condom

conversation networks (e.g., health care workers), which was the focus of our study. Fourth, the cross-sectional nature of our data limits our ability to infer causality regarding the associations between social network characteristics and male and female condom use. Future research should use a longitudinal survey design to examine the temporal orderings of these associations with a more representative sample of women recruited from the general public.

A number of efficacious interventions have been developed to increase male and female condoms among women.<sup>15–19</sup> Although network-based interventions have been successful in modifying various health risk behaviors including HIV-related sexual risk and injection drug use,<sup>20–27</sup> few HIV prevention strategies have targeted women's social networks. Our study found the significant association between social network characteristics and male and female condom use among women. This result suggests that future studies should investigate the possibility of targeting conversation networks to facilitate increased use of male and female condoms among women and in turn help prevent HIV infections in this risk population.

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**Table 1**

Sample Characteristics of Women Recruited from Family Planning Clinics in the U.S. in 2003–2004 (N=157)

	%	(N)
Ethnicity		
African American	10	(16)
Asian American	9	(14)
Latina	19	(30)
White	62	(97)
Age (mean = 23 years)		
18 – 20	34	(53)
21 – 24	41	(64)
25 – 29	16	(26)
30 – 40	9	(14)
Marital status		
Never married	93	(145)
Married	3	(5)
Separated/Divorced/Widowed	4	(6)
Education		
Less than high school	4	(6)
High school	24	(38)
Some college	57	(89)
College graduate	15	(23)
Number of male sexual partners in the past three months (median=1)		
1	74	(115)
2	16	(25)
3+	10	(16)
Had a steady male sexual partner in the past three months	79	(123)
Had a lifetime history of STIs	32	(50)
Used a male condom during vaginal sex in the past three months	72	(111)
Used a female condom during vaginal sex in the past three months	19	(30)



**Table 2**

Characteristics of Male and Female Condom Conversation Networks of Women Recruited from Family Planning Clinics in the U.S. in 2003–2004 (N=157)

	Male Condom Conversation Networks (%)		Female Condom Conversation Networks (%)	
	%	N	%	N
Number of network members				
0	40	62	51	81
1	15	24	18	28
2	15	24	18	28
3	12	19	5	8
4	10	15	4	6
5	8	13	4	6
Network density				
0	62	98	78	122
>0 but <1	11	17	2	3
1	27	42	20	32
Network member being a friend	53	83	40	62
Network member being a family member	16	25	9	14
Network member being a co-worker	3	4	4	6
Network member being a health care worker	2	3	4	6
Respondent knowing network member's male condom use	53	83	NA	NA
Respondent knowing network member's female condom use	NA	NA	13	20
Network member encouraging using male condoms	47	74	NA	NA
Network member encouraging using female condoms	NA	NA	19	29
Network member discouraging using male condoms	4	7	NA	NA
Network member discouraging using female condoms	NA	NA	9	14

NA, not applicable

**Table 3**

Associations of Respondent and Network Characteristics with Male and Female Condom Use among Women Recruited from Family Planning Clinics in the U.S. in 2003–2004: Results of Bivariate and Multivariate Analyses<sup>†</sup> (N=157)

	Male Condom Use		Female Condom Use	
	Odds Ratio (95% CI)	Adjusted Odds Ratio (95% CI) <sup>±</sup>	Odds Ratio (95% CI)	Adjusted Odds Ratio (95% CI) <sup>±</sup>
<b>Respondent Characteristics:</b>				
Ethnicity		---		---
African American	0.53 (0.17, 1.63)		0.77 (0.16, 3.74)	
Asian American	0.63 (0.19, 2.07)		1.36 (0.34, 5.45)	
Latina	0.97 (0.38, 2.45)		2.14 (0.83, 5.53)	
White	Reference		Reference	
Age		---		---
18 – 20	Reference		Reference	Reference
21 – 24	0.91 (0.41, 2.04)		0.99 (0.40, 2.45)	1.31 (0.43, 4.00)
25 – 29	1.25 (0.42, 3.74)		0.33 (0.07, 1.63)	0.23 (0.04, 1.52)
30 – 40	0.99 (0.27, 3.64)		1.53 (0.41, 5.81)	4.09 (0.80, 21.01)
Education		---		---
Less than high school or high school	Reference	Reference	Reference	
Some college	1.28 (0.57, 2.86)	1.13 (0.48, 2.69)	1.84 (0.68, 4.96)	
College graduate +	0.61 (0.21, 1.76)	0.34 (0.10, 1.14)	1.41 (0.35, 5.62)	
Had 2+ male sexual partners in the past 3 months	4.80 (1.60, 14.45)**	6.99 (2.13, 22.90)**	0.67 (0.25, 1.78)	---
Had a steady partner in the past 3 months	0.65 (0.26, 1.64)	---	1.05 (0.39, 2.84)	---
Had a lifetime history of STIs	1.26 (0.58, 2.73)	---	1.19 (0.51, 2.80)	---
<b>Network Characteristics:</b>				
Number of network members		---		---
3 – 5	2.12 (0.89, 5.07)		11.25 (3.30, 38.33)***	
1 – 2	1.93 (0.83, 4.51)		4.69 (1.69, 13.02)**	
0	Reference		Reference	
Network density >0	1.69 (0.80, 3.57)		9.53 (3.91, 23.24)***	8.42 (3.05, 23.29)***
Network member being a friend	1.73 (0.85, 3.50)	---	6.06 (2.48, 14.81)*	---
Network member being a family member	2.33 (0.75, 7.24)	---	3.66 (1.16, 11.50)*	---
Network member being a co-worker	3.72 (0.14, 99.44) <sup>‡</sup>	---	0.83 (0.09, 7.36)	---
Network member being a health care worker	0.79 (0.07, 8.93)	---	0.83 (0.09, 7.36)	---
Respondent knowing network member's male condom use	1.97 (0.97, 4.00)	---	NA	NA
Respondent knowing network member's female condom use	NA	NA	3.42 (1.25, 9.35)*	---
Network member encouraging using male condoms	2.81 (1.33, 5.92)**	3.39 (1.52, 7.56)**	NA	NA
Network member encouraging using female condoms	NA	NA	6.84 (2.77, 16.94)***	6.03 (1.95, 18.61)**
Network member discouraging using male condoms	2.46 (0.29, 21.02)	---	NA	NA
Network member discouraging using female condoms	NA	NA	1.20 (0.31, 4.59)	---

OR, odds ratio; AOR, adjusted odds ratio; CI, confidence interval; NA, not applicable; ---, eliminated in the final multivariate model

\* p < 0.05

\*\* p < 0.01

\*\*\* p < 0.001

<sup>†</sup> Multivariate models used stepwise selection to include effects with p-values < 0.20

<sup>±</sup> The numbers of observations included in the final multivariate models were 153 and 152 for male and female condom use outcomes, respectively.

<sup>‡</sup> Firth's (1993)<sup>14</sup> bias reduction method used because of sparse data