

Predictors of Partner Notification for *C. trachomatis* and *N. gonorrhoeae*: An Examination of Social Cognitive and Psychological Factors

Rebecca M. Schwartz, Edmond S. Malka, Michael Augenbraun, Steven Rubin, Matthew Hogben, Nicole Liddon, William M. McCormack, and Tracey E. Wilson

ABSTRACT Efforts to control chlamydial and gonococcal infections include notifying eligible sexual partners of possible infection, primarily by asking the diagnosed patient to notify their partners. This approach, known as patient referral, is widely used but poorly understood. The current study examined psychosocial and cognitive factors associated with patient referral among an urban, minority sample of 168 participants recently diagnosed with *Chlamydia trachomatis* or *Neisseria gonorrhoeae*. At a follow-up interview 1-month from diagnosis, participants were more likely to have notified all eligible partners if they had greater intention to notify at baseline (OR = 3.72; 95% CI = 1.34, 10.30) and if they had only one partner at baseline (OR = 4.08; 95% CI = 1.61, 10.31). There were also gender differences as well as differences based on type of partner (i.e., regular, casual, one-time). The implications of these findings for the design of programs to promote patient referral for sexually transmitted infections are discussed.

KEYWORDS Partner notification, Patient referral, STI.

INTRODUCTION

Chlamydia trachomatis and *Neisseria gonorrhoeae* are the most commonly reported notifiable diseases in the United States, with over 877,000 and 335,000 cases, respectively, reported in 2003.¹ Sequelae of these diseases include pelvic inflammatory disease (PID), infertility, ectopic pregnancy, and chronic pelvic pain, and they can facilitate the transmission of HIV infection.^{1,2} Control strategies for these infections include notification of infected persons' sex partners and referral of these partners for evaluation and treatment. Reviews indicate that referral of partners via trained public health staff is most effective in producing partners at clinics for examination and/or treatment,³⁻⁶ but this method is generally too labor-intensive to be applied to such common sexually transmitted infection (STI)⁷ and may be particularly unacceptable to some ethnic groups.⁸ The typical alternative is to ask infected patients to notify and refer their partners, a practice known as STI

Schwartz, Malka, Augenbraun, McCormack, and Wilson are with the State University of New York, Downstate Medical Center, Brooklyn, NY, USA; Rubin is with the New York City Department of Health, Bureau of STD Control, New York, NY, USA; Rubin, Hogben, and Liddon are with the Centers for Disease Control and Prevention, Atlanta, GA, USA; Schwartz is with the Department of Preventive Medicine and Community Health, SUNY Downstate Medical Center, Box 1240, 450 Clarkson Avenue, Brooklyn, NY 11203, USA.

Correspondence: Rebecca M. Schwartz, PhD, Department of Preventive Medicine and Community Health, SUNY Downstate Medical Center, Box 1240, 450 Clarkson Avenue, Brooklyn, NY 11203, USA. (E-mail: Rebecca.Schwartz@downstate.edu)

patient referral. Although a common approach, little is known about what factors are most closely associated with successful STI patient referral.

The current study utilizes variables from a social cognitive framework, the Theory of Planned Behavior,^{9,10} to explore factors related to patient-based partner notification following a diagnosis with chlamydia or gonorrhea. Specifically, we explored the relationships between behavioral intentions to notify partners and subsequent notification behaviors and assessed how factors such as confidence or self-efficacy for notification and attitudes toward notification impact on behavioral intentions to notify sex partners. In addition, various mental health factors, such as depression, may also play a role in promoting and/or preventing partner notification. Depression has been sparsely studied in terms of its effect on notification for chlamydia and gonorrhea. Empirical studies have found that mental health factors contribute to STI acquisition^{11,12} whereby individuals who have greater psychological distress are more likely to engage in behaviors by which they acquire STIs.¹³ Thus, one can hypothesize that if individuals with STIs are more likely to have psychological difficulties, then these same difficulties may hinder their ability to notify their partners.

Another important psychosocial factor that influences notification may be substance use. Studies have found a relationship between substance abuse and both greater number of partners^{14,15} and greater number of casual partners, specifically.¹⁶ Further, there is support in the literature of an association between both a greater number of partners overall and a greater number of casual partners and decreased STI notification.¹⁴ Therefore, one can hypothesize that substance abuse may have both a direct influence on notification rates and indirect influence on notification rates via its relationship to number and type of partner.

The current study seeks to describe rates of partner notification among a sample of patients presenting for care at urban STI clinics serving predominantly minority patients and to examine the relationship of notification intentions, self-efficacy and attitudes, substance use, depression and number and type of sexual partners eligible for notification (i.e., regular, casual or one-time) on patient referral rates. An understanding of these factors can inform interventions aimed at increasing the effectiveness of patient referral practices.

MATERIALS AND METHODS

Participants

The sample consists of 168 participants (52% male) ranging from 18 to 56 years old ($M = 25.15$, $SD = 7.04$). Approximately 52% self-identified as being of Afro-Caribbean descent, 43% identified as African American, and approximately 5% identified as "other." Fifty percent of the sample earned \$12,000 or less in 1 year (not including other household members' income). Approximately 34% had a baseline diagnosis of gonorrhea only, 53% chlamydia, only and 13% had a diagnosis of both. Fifty-five percent had more than one sexual partner.

Procedure

All participants in the current study presented for care at one of two STI treatment centers in Brooklyn, NY, and were diagnosed as having *C. trachomatis* or *N. gonorrhoeae* genital infection by a provider. All diagnoses with chlamydia were

confirmed by NAAT testing, including LCR tests and BD Probetec. Gonorrhea cases were confirmed via NAAT testing for most cases, although in 13 (8%) cases confirmation was via gram stain, and three (2%) cases were confirmed by culture.

All patients diagnosed with gonorrhea or chlamydia were referred to independent study staff stationed at the clinics, and all data collection was conducted in confidential interview rooms at the sites of recruitment. Participant enrollment occurred between January 2002 and October 2004. Patients were excluded if they were (1) 17 years of age or younger, (2) did not report being diagnosed by a provider with probable chlamydia or gonorrhea, (3) reported having no sexual activity in the 2 months preceding diagnosis, or (4) reported plans to move out of the geographic area prior to the end of the study data collection period. There was a 70% enrollment rate among participants who were screened and deemed eligible. Ninety-six percent of participants completed the 1 month follow-up interview; however, 65% completed the interview within the designated 1 month window period. The data of those 65% are used for the current study. Participants received \$10 for their baseline visit and \$30 for each follow-up visit.

Measures

The data for this study were gathered in the context of a larger study evaluating the efficacy of a randomized behavioral intervention designed to increase the rate and effectiveness of patient referral approaches to partner notification. For the current study, only baseline and follow-up data from the control group were used. Data were collected from participants at baseline and then at a follow-up at 4 weeks after baseline. Standardized measures were administered by trained interviewers, who read them to participants. To capture the maximum number of partners eligible for notification within the recommended 60-day window,¹⁷ assessments were conducted on a partner-specific level for the five most recent sexual partners in the 90 days prior to diagnosis. Approval for all measures and procedures was obtained from participating clinics' IRBs and at the Centers for Disease Control and Prevention.

Social Cognitive Variables Measurements of social cognitive variables were derived using standard approaches to item development for each of these constructs.¹⁸ All variables were captured on seven-point scales but thereafter dichotomized at the midpoint (due to the distribution of responses). Items with an "unsure" response were not included in the analyses. Notification self-efficacy was assessed by asking participants to state how confident they felt about convincing each partner to get an STI check-up. Attitudes were assessed by asking participants to state how favorable they felt about talking to their specific partners about getting STI check-ups. Intentions to notify partners were assessed by asking participants to state how likely they were to notify their specific partners about an STI check-up.

Substance Use Substance use over the preceding 90 days was assessed based on the Addiction Severity Index.¹⁹ Given the relatively infrequent use of substances other than marijuana and alcohol, only these two substances were analyzed in the current study. For marijuana and alcohol consumption, participants responded on a seven-point scale, ranging from 0 = *Never* to 6 = *Three or more times a day*, but were dichotomized into those who had not drunk/smoked in the last 90 days versus those who had done so at least once a month.

Depressive Symptoms Participants were administered the Center for Epidemiological Studies-Depression Scale (CES-D).²⁰ The CES-D consists of 20 items about how participants may have felt or behaved in the past week. Participants' scores ranged from 20 to 74 ($M = 36.74$, $SD = 10.96$; Cronbach's $\alpha = 0.85$). Previous research has indicated that a cutoff score of 36 effectively divides those who are experiencing moderate to serious depressive symptoms from those who are experiencing mild or no depressive symptoms.²¹

Number and Type of Partners Participants reported the number of partners that they had sex with in the past 90 days. Given the distribution of the variable, this item was dichotomized into one partner and more than one partner. Participants also reported whether they considered each specific partner a regular partner, casual partner or one-time partner. Regular partners were defined as those partners with whom the participant was involved in an ongoing relationship, such as a spouse, lover, boyfriend or girlfriend. A casual partner was defined as someone with whom the participant has sex with occasionally, and a one-time partner was defined as someone who the participant had sex with one time and does not plan to have sex with again.

Partner Notification At 1-month follow-up, participants reported whether or not they had notified all partners by reporting the number of partners that they did not notify. From that information, a dichotomous variable was formed in which "0" = *Notified all eligible partners* and "1" = *Did not notify at least one eligible partner*.

Analyses

The current study was prospective and longitudinal in that predictor measures were collected at baseline and 1 month. Partner notification was modeled using unconditional logistic regression methods with adjustment for clustering (i.e., correlated data from participants with multiple partners) via generalized estimating equations (GEE).²² In addition, GEE modeling was used to analyze differences among the variables by type of partner (i.e., regular, casual, or one-time), as well as the effects of gender, age, and race/ethnicity differences within the sample (no site differences were found).

RESULTS

Descriptive Analyses

The participants in the study generally had more than one sexual partner during the time period in which they could have transmitted their STI ($M = 2.2$, $SD = 1.65$). Analysis of variance revealed that those with two diagnoses (i.e., chlamydia and gonorrhea) at baseline ($M = 2.97$, $SD = 3.09$) had a greater number of partners than those with only one diagnosis at baseline ($M = 2.11$, $SD = 1.56$), $F(1, 256) = 6.60$, $p < 0.05$. Approximately 50% (95% CI: 44.4, 54.8) of participants' partners were regular partners. Thirty-two percent (95% CI = 27.5, 37.3) of participants' partners were casual partners, and 18% (95% CI = 14.5, 22.6) of participants' partners were one-time partners. Approximately 26% (95% CI = 20.1, 33.3) of patients reported smoking marijuana several times a week or more, and approximately 8% (95% CI = 5.0, 13.5) reported drinking alcohol several times a week or more. Forty-two percent (95% CI = 34.7, 49.5) of patients exceeded the clinical cutoff score for mild-moderate levels of depressive symptoms.

TABLE 1. Differences in sample based on notification status

	Notified all partners (%)	Did not notify all partners (%)	<i>p</i> value*
Gender			0.22
Males	76.14	23.86	
Females	83.75	16.25	
Ethnicity			0.81
African American	79.41	20.59	
Caribbean American	80.95	19.05	
Age			0.13
Under 25	83.49	16.51	
25 and over	73.85	26.15	
Number of partners			0.00
one partner	90.14	9.86	
two or more partners	72.16	27.84	
Marijuana use			0.81
No use in past 3 months	80.41	19.59	
Used > few times/months	78.87	21.13	
Alcohol use			0.03
Drinks < 1×/week	87.67	12.33	
Drinks > 1×/week	73.68	26.32	
Depression			0.77
Mild symptoms	80.41	19.59	
Moderate–severe	77.46	22.54	

*Chi-square analyses conducted to determine *p* value for differences based on notification status.

Approximately 80% of participants indicated that they notified all of the partners whom they felt were eligible. Descriptive analyses also indicated that participants generally had high levels of self-efficacy, positive attitudes, and indicated strong intentions around convincing their partners to get STI check-ups. That is, approximately 92% (95% CI = 89.2, 94.8) of participants felt slightly to extremely confident that they could convince their partners to get an STI check-up, 92% (95% CI = 88.9, 94.6) felt slightly to extremely favorable about talking to their partners about STI check-ups, and 93% (95% CI = 90.3, 95.6) felt it was slightly to extremely likely that they would notify their partners about getting an STI check-up.

Table 1 presents descriptive statistics for the sample by notification status. Those who did not notify all partners had greater levels of alcohol use (χ^2 (1, *N* = 168) = 5.0, *p* < 0.05) and were more likely to have more than one partner (χ^2 (1, *N* = 168) = 8.2, *p* < 0.05) than those who did notify all partners. There were no other differences.

The relationships between social cognitive variables (i.e., self-efficacy, attitudes, intentions) and partner notification behaviors were analyzed using GEE modeling (Table 2). As would be predicted by the Theory of Planned Behavior, a positive

TABLE 2. Social cognitive predictors of notification (univariate results)*

Variable	Odds ratio	95% confidence interval	<i>p</i> value
Self-efficacy	1.91	0.69–5.29	0.21
Attitudes	1.77	0.57–5.45	0.32
Intentions	4.34	1.56–12.09	0.00

*Odds ratios are modeled on probability of notifying all partners as levels of social cognitive variables increase.

behavioral intention to notify partners about getting a check-up was a significant predictor of notification (OR=4.34, 95% CI=1.56, 12.09, $p < 0.01$). That is, greater intention to notify was associated with a greater likelihood of notifying all partners. Theoretical relationships between self-efficacy, attitudes, and behavioral intentions were also confirmed; higher levels of self-efficacy and more positive attitudes about notification were associated with greater intention to notify all partners ($p < 0.01$).

Alcohol use and depression were associated with self-efficacy such that higher degrees of self-efficacy were associated with lower levels of alcohol use (OR = 3.84, 95% CI = 1.27, 11.60, $p = 0.02$) and lower levels of depression (OR = 3.10, 95% CI = 1.23, 7.81, $p = 0.02$). Similarly, more positive attitudes about notification were associated with less alcohol use (OR = 3.03, 95% CI = 1.02, 9.01, $p = 0.045$), and greater intention to notify was associated with fewer depressive symptoms (OR = 3.96, 95% CI = 1.30, 12.08, $p = 0.02$).

Analyses revealed a number of gender differences. Men ($M = 2.65$, $SD = 1.85$) had significantly greater numbers of partners than women ($M = 1.71$, $SD = 1.23$), $F(1,167) = 14.61$, $p < 0.05$. In addition, men ($M = 2.08$, $SD = 1.10$) drank alcohol more frequently than women ($M = 2.08$, $SD = 1.10$), $F(1,167) = 9.40$, $p < 0.05$, and men ($M = 2.58$, $SD = 2.38$) smoked marijuana more frequently than women ($M = 1.29$, $SD = 1.89$), $F(1,167) = 15.01$, $p < 0.05$. Women ($M = 39.65$, $SD = 12.04$) reported significantly greater levels of depressive symptoms than did men ($M = 34.06$, $SD = 9.15$), $F(1,166) = 11.53$, $p < 0.05$. Also, 18.3% of women had two diagnoses while 9.8% of men did $\chi^2(df = 1) = 3.90$, $p < 0.05$. There were no significant differences based on age or racial/ethnic identification.

Individuals diagnosed with gonorrhea only had a greater number of partners ($M = 2.41$, $SD = 1.84$) than individuals diagnosed with chlamydia only ($M = 1.93$, $SD = 1.34$), $F(1,221) = 5.08$, $p < 0.05$. Chi square analysis indicated that 52.3% of those diagnosed with gonorrhea only were in the more frequent marijuana use group as compared to 36.5% of those diagnosed with chlamydia only, $\chi^2(df=1) = 5.41$, $p < 0.05$.

Modeling Predictors of Notification

Consistent with hypotheses, participants were more likely to have notified all partners if they had greater intention to notify at baseline (OR = 3.72; 95% CI = 1.34, 10.30, $p < 0.05$) and if they had only one partner (OR = 4.08; 95% CI = 1.61, 10.31, $p < 0.05$). Those who did not drink alcohol regularly were more likely to notify all partners, but this difference was not statistically significant (OR = 1.91, 95% CI = 0.74, 4.95, $p = 0.18$). Depression, marijuana use, notification self-efficacy, diagnosis, number of diagnoses, age, gender, and ethnicity did not meaningfully contribute to the best fitting model. Analyses examining the moderating influence of alcohol use and number of partners on the relationship between intentions and notification were not statistically significant.

Analyses by Type of Partner

Participants with casual partners were more likely to be male than participants with regular partners (OR = 1.98, 95% CI = 1.16, 3.37, $p = 0.01$). Results that approached significance indicated that participants with one-time partners were more likely to use marijuana than those with regular partners (OR = 1.94, 95% CI = 0.95, 3.98, $p = 0.07$). Similarly, participants with casual partners were more likely to use alcohol than participants with regular partners (OR = 1.62, 95% CI = 0.98, 2.67, $p = 0.06$). Participants with one-time partners were somewhat, but not sig-

TABLE 3. Differences in social cognitive variables by partner type*

Variable/type of partner	Odds ratio	95% confidence interval	<i>p</i> value
Self-efficacy			
Casual vs. one-time	2.41	0.80–7.21	0.12
Casual vs. regular	0.62	0.21–1.80	0.37
One-time vs. regular	0.26	0.09–0.72	0.01
Attitudes			
Casual vs. one-time	0.81	0.22–3.01	0.75
Casual vs. regular	0.36	0.12–1.15	0.09
One-time vs. regular	0.45	0.13–1.56	0.21
Intentions			
Casual vs. one-time	1.62	0.54–4.83	0.39
Casual vs. regular	0.41	0.15–1.13	0.09
One-time vs. regular	0.25	0.08–0.83	0.02

*Odds ratios are modeled on probability of higher levels of self-efficacy, more positive attitudes and higher levels of intentions.

nificantly, more likely to be male than those with regular partners (OR = 2.02, 95% CI = 0.91, 4.46, $p = 0.08$).

There were a number of differences in social cognitive variables by partner type (Table 3). In general, participants had greater self-efficacy around convincing partners to get STI check-ups, had more favorable attitudes about speaking to their partners about check-ups, and had greater intention of notifying their partners about their STIs when those partners were regular partners as compared to casual or one-time partners or if those partners were casual as compared to one-time.

DISCUSSION

The current study is one of the first to examine behavioral and psychosocial predictors of patient referral for chlamydia and gonorrhea. In this study we found that the majority of patients indicated that they notified all of their partners about going to get a STI check-up but that those with greater alcohol use and more sexual partners were less likely to have reported notifying all eligible partners. In addition, we found that cognitive variables such as behavioral intentions, attitudes, and self-efficacy were significantly associated with partner notification.

Social cognitive theories indicate that factors such as self-efficacy, attitudes and intentions play vital roles in determining behavior.¹⁸ Consistent with these theories, behavioral intentions in our study were correlated with higher self-efficacy for partner notification and more positive attitudes toward notification. These stronger behavioral intentions to notify partners, in turn, resulted in higher rates of notification. These findings suggest that behavior change programs targeting partner notification may benefit from the consideration of intrapersonal variables. We did not consider the role of normative influences in this study, but future research would benefit from inclusion of the role of subjective norms concerning partner notification behaviors.

We found that a number of factors were associated either directly with partner notification rates or were associated with cognitive factors surrounding partner notification. For instance, participants generally had higher self-efficacy, had more positive attitudes, or had greater intention to notify when referring to regular

partners as opposed to casual or one-time and when referring to casual partners as opposed to one-time. In addition, alcohol use was greater among participants with casual partners as opposed to regular partners. These findings suggest that partner notification strategies might be tailored to characteristics of the diagnosed patient. For instance, in cases where there are higher degrees of alcohol use or significant numbers of “one-time” or anonymous partners, alternate strategies, such as provider-based notification may be more effective than patient-based referral. Future research might be useful to explore ways to conduct cost-effective notification utilizing combinations of patient and provider-based referral. Further, it might be necessary to come up with alternative ways of speaking with and locating one-time partners given the patient’s possible feelings of limited efficacy and little intention with one-time partners. Role playing discussions specific to type of partner could help to build the patient’s self-efficacy and intention around notifying that partner.

Our outcome variable was defined as the index patient’s perception that he or she had notified all eligible partners, and our estimates of notification were therefore higher than what has been reported in other studies of patient referral.³ The differences in estimates are likely attributable to variations in how this variable has been defined across studies. We were interested in the social cognitive predictors of having engaged in what participants viewed as being the ‘correct’ behavior in terms of notification, so it was more appropriate from a theoretical standpoint to use *perceived* versus *actual* indices of partner notification behavior. So a partner who notified only 1 of 3 actually eligible partners would score the same on our notification variable as one who notified 1 of 1 actually eligible partners if they both thought, for instance, that only their most recent partner is eligible for notification. A future direction for research would be to assess how perceptions of partner eligibility differ from actual eligibility and the factors that might impact these relationships.

There are a couple of other hypotheses that might also explain this high rate of self-reported notification. It is possible that since these patients are seeking treatment themselves and have agreed to participate in a study concerning “STI partner services,” there is a self-selection bias such that these patients will be more likely to notify partners as opposed to those who do not agree to be in the study and those who do not seek treatment in general. Alternatively, there may have been social desirability in the participants’ responses. They were interviewed face-to-face by female interviewers, and they may have been embarrassed to admit that they had not notified all of their partners. In addition, these patients reflected a select sample—those who returned for a study visit 4 weeks after their diagnosis. These patients may be more likely to be more compliant with health recommendations.

Although gender was not a significant predictor of notification status in the current study, there were numerous gender differences among the predictor variables within this study sample of predominately African American and Afro-Caribbean individuals. The gender differences in substance use and depression highlight the need for intervention programming to also place greater emphasis on the psychological difficulties that are more prevalent among men or among women. Further, since alcohol use (which was higher among men than women in the sample) and depression (which was greater among women than men in the sample) were related to some of the social cognitive variables (i.e., self-efficacy, attitudes and intentions); a focus on how depression impacts women’s motivation and ability to notify partners and a focus on how alcohol use impacts men’s motivation and ability to notify partners would be particularly useful in intervention planning.

Results of the current study indicate the need to further elucidate the barriers to patient referral and to the social, cultural, and clinical factors that may account for variations in notification behaviors. This is particularly important given recent attention to the issue of partner-delivered, or “expedited”, treatment for chlamydia and gonorrhea.^{23–25} Policy and guidelines surrounding patient-delivered medication need to account for partner notification behaviors as a necessary but not sufficient condition for partner treatment and develop programs that will maximize the likelihood that sexual contacts are treated, receive counseling, and ideally present for medical care.

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