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Long-Term Effects of Community-based STI Screening and Mass Media HIV Prevention Messages on Sexual Risk Behaviors of African American Adolescents

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Abstract

We examined the long-term effects of two interventions designed to reduce sexual risk behavior among African American adolescents. African American adolescents (N=1383, ages 14-17) were recruited from community-based organizations over a period of 15 months in two northeastern and two southeastern mid-sized U.S. cities with high rates of sexually transmitted infection (STI). Participants were screened for three STIs (gonorrhea, chlamydia, and trichomoniasis) and completed an audio computer-assisted attitude, intention, and behavior self-interview. Youth who tested positive for an STI (8.3%) received treatment and risk reduction counseling. In addition, television and radio HIV-prevention messages were delivered during the recruitment period and 18 months of follow-up in one randomly selected city in each region. Analyses determined effects of the media program for those receiving a positive versus negative STI test result on number of sexual partners and occurrence of unprotected sex. Adolescents who tested STI-positive reduced their number of vaginal sex partners and the probability of unprotected sex over the first 6 months. However, in the absence of the mass media program, adolescents returned to their previously high levels of sexual risk behavior after 6 months. Adolescents who tested positive for STI and received the mass media program showed more stable reductions in unprotected sex. Community-based STI treatment and counseling can achieve significant, but short-lived reductions in sexual risk behavior among STI-positive youth. A culturally sensitive mass media program has the potential to achieve more stable reductions in sexual risk behavior and can help to optimize the effects of community-based STI screening.

Keywords

community-based STI screening; mass media interventions; STI/HIV prevention; African American adolescent

INTRODUCTION

Sexually transmitted infections (STI) disproportionately affect poor African American adolescents (1, 2), placing this group at elevated risk for acquiring and transmitting HIV as well as increasing their vulnerability to infertility, unfavorable pregnancy outcomes, and cervical cancer. Public health efforts to reduce STI transmission have depended on clinic-based testing for patients who present with symptoms. Research has found that in addition to curing disease, STI treatment and counseling in clinical settings promotes safer sexual behavior in those who test STI-positive (3-6); receiving a positive STI diagnosis may also allow for a “teachable moment” in which health care providers can counsel patients regarding sexual risk behavior.

Despite these benefits of STI detection and treatment in clinical settings, the public health impact is limited because adolescents with infections are often asymptomatic and, therefore, do not seek treatment. Furthermore, low-income youth at greatest risk for infection, especially African American youth, do not have ready access to routine health care (7). Improved access to STI screening and treatment for vulnerable youth, and African American adolescents in particular, could be a crucial component of an STI/HIV prevention strategy (7, 8).

Advances in diagnostic technology have resulted in a new generation of STI tests including rapid and reliable point-of-care STI testing technology (9). As these technologies become increasingly accessible, community-based STI screening will become feasible. Screening sponsored by culturally-sensitive community-based organizations might enhance detection and treatment of STIs among asymptomatic individuals who would otherwise not seek services (10). Furthermore, similar to what has been found in clinical samples (3-6), communitybased STI screening and counseling can promote safer sexual practices in those who test STI-positive (8).

Previous studies of the effects of STI screening have been limited to the use of short follow-ups, mostly 3 months (4-6, 11, 12). In a previous study, we examined the effects of STI screening on sexual risk behavior over a 6 month follow-up period (8). Results indicated that adolescents who tested STI-positive and received risk reduction counseling subsequently reduced their number of vaginal sex partners and unprotected sexual intercourse contacts. Although a 6 month follow-up period is longer than what has been studied previously (4-6, 11, 12), it does not address the question as to whether STI detection, treatment, and counseling lead to a sustainable reduction in sexual risk behavior. It may be that booster interventions are needed to sustain longer-term safer sexual practices initially produced by STI screening.

In this paper, we extend our previous study for observing effects of STI screening from 6 to 18 months. We also examine the effects of an ongoing radio and television media campaign that could extend effects of STI screening beyond a 6-month period. By repeatedly reminding at-risk youth of their vulnerability to STIs and the best ways to reduce the risk, the media intervention was designed to serve as a booster that maintains safer behavior over time (13). Indeed, the media intervention, which ran throughout the recruitment period of the study, reduced unprotected sex in adolescents who tested STI-positive at recruitment before they were told their test results (14, 15). Furthermore, adolescents who tested STI-negative displayed media effects, including reduced sexual risk taking, that lasted throughout an 18-month follow-up period (15). However, longer-term effects of the media program on adolescents who initially tested STI-positive have not been examined.

Based on the favorable effects of the media program, we hypothesized that the program may have maintained effects on STI-positive youth beyond 6 months because the messages

repeatedly prompted adolescents to practice safer sexual behavior. Furthermore, culturally and developmentally sensitive media messages have the potential to promote risk reduction norms and reduce sexual risk behavior in the entire adolescent community (14, 15). In this study, we pursued the question of whether or not exposure to an effective media program can sustain the STI screening and treatment effects of reducing unprotected sex for STI-positive youth to a greater degree than for similar youth who did not receive the media program.

In addition to examining the impact of the screening and the media program on unprotected sex, we also examined longer-term effects of the STI-screening program on number of vaginal intercourse partners. Although the media program did not influence this risk behavior during the recruitment period (14), testing positive did result in a decline in number of partners over the 6-month follow-up period (8). Thus, we were also interested in determining whether this STI test effect persisted or declined over time and whether this depended on the media program. Because the media program did not influence partner turnover, it was less likely that it would maintain this effect than the effect on unprotected sex.

METHODS

Study Design

A detailed description of the recruitment procedure is provided in previous publications (14, 16). Briefly, 1710 African American adolescents were recruited at a constant monthly rate from community-based organizations (CBOs), street outreach, and through peer nomination and respondent driven sampling in two northeast U. S. cities (Providence, RI and Syracuse, NY) that were matched by size and adolescent STI/HIV rates with two southeast cities (Columbia, SC and Macon, GA). Because this paper focuses on changes in sexual behavior, we only include youth who reported lifetime sexual experience (vaginal, oral, or anal intercourse) before or during the trial ($N=1383$). Following informed assent and consent by respondents and their parent(s)/guardian(s), participants completed assessments using audio, computer-assisted self-interviews (ACASI) at recruitment and 3, 6, 12 and 18 months after recruitment. Youth received \$30 for completing the initial assessment with gradual monetary increases for subsequent assessments.

Syracuse and Macon were randomly assigned to receive the media campaign with Columbia and Providence serving as controls. Throughout the recruitment and follow-up periods, media messages were placed on mass media channels (TV and radio) that were popular among African American adolescents. The media messages were developed using a culture-centered approach to identify arguments that could counteract dominant cultural narratives that impede successful adoption of risk-reducing behaviors (14). We identified these arguments from in-depth interviews that probed how youth conceptualize barriers to safer sexual behavior, as well as strategies for resisting pressures to engage in unsafe practices (17). The messages were presented as mini-dramas that showed African American adolescents resolving dilemmas regarding sexual risk behavior and modeling appropriate responses to such problems. Use of such dramas, rather than didactic public health messages, has been shown to be effective in international settings (18) and is consistent with theories that emphasize modeling (13) and drama as effective change strategies (19).

Messages varied in content and appeal to keep the content fresh and engaging over the entire period of intervention (34 months). Nine different TV ads and 13 different radio ads were aired over the 34-month study period (see <http://www.annenbergpublicpolicycenter.org/ShowPage.aspx?myID=62>). The ads were aired such that the average adolescent audience member would be exposed to 3 TV ads and

3 radio ads per month. For more information about the development and the content of the media messages, see Horner et al. (17).

As reported previously, the media program achieved high exposure during the recruitment and follow-up periods (14) with nearly all youth recognizing a program ad at follow-up and low rates of false recognition in non-media cities. Thus, the media intervention reached the intended target audience despite the presence of other messages that potentially originated from national sources, such as MTV (there were no local media STI/HIV prevention campaigns in any city).

All participants provided urine specimens at recruitment and 6, 12 and 18 month follow-up to assess the presence of three STIs: gonorrhea, chlamydia, and trichomoniasis. Chlamydia and gonorrhea were tested using Strand Displacement Amplification (20), whereas trichomoniasis was tested using a real-time PCR assay (21). Specimens were stored in refrigerators until packed in approved biospecimen boxes and shipped via overnight courier to the Emory University Microbiology Laboratory.

Participants testing negative received no further intervention. Adolescents who tested STI-positive were referred to a clinician who provided a single dose, orally-administered antimicrobial therapy and sexual risk behavior counseling according to guidelines from the Centers for Disease Control and Prevention (CDC) (22). The CDC guidelines encourage health practitioners to promote abstinence, or long-term mutually monogamous relationships with an uninfected partner, and correct and consistent condom use for all sexual contacts.

In addition to the media intervention and counseling for STI-positive youth, participants were randomly assigned to either a small-group HIV-prevention or a general health promotion intervention. Analyses showed that there were no differences in these two interventions except for HIV knowledge (unpublished observations). Therefore, we do not focus on this small-group intervention component in this report.

The study was approved by the Institutional Review Boards of the participating universities.

Primary Outcomes

Unprotected sexual contacts were measured by summing three items that asked youth how many times they had vaginal, oral or anal sex without a condom in the last three months, a recall period found reliable in previous studies (23, 24). Oral sex was included because research shows that STIs can be transmitted by unprotected oral sex (25, 26). Sexual behavior count data were extremely skewed; therefore, we conducted the analysis using a dichotomous indicator, with 0 = no unprotected sex and 1 = one or more unprotected sex contacts. Only respondents who reported having at least one sexual partner (vaginal, oral or anal) at any assessment were included ($N=1229$), and respondents reporting no sexual partner at any specific assessment were coded as 0.

Number of sex partners was measured by assessing respondents' number of vaginal sexual intercourse partners in the last three months. For respondents with lifetime sexual experience but who had not had sex in the last three months, number of partners was coded as 0. Responses ranged from 0-28 (30 extreme outliers (0.46%) were coded as missing).

Predictors

Demographics—Respondent age (14-15 vs. 16-17) and gender were included in analyses.

STI screening and media effects—Respondents were coded for residence in media cities (1 = yes; 0 = no) and whether or not they tested positive for one or more STIs at

recruitment (0=STI-negative and 1=STI-positive). Furthermore, an interaction between exposure to the media program and STI diagnosis was included in all models.

Data Analysis

Unadjusted logistic regressions were used to identify differences between STI-positive versus STI-negative adolescents at recruitment. We then graphed sexual risk behaviors by STI status at recruitment, media city, and time of assessment. Next, we tested for change in unprotected sex and number of sex partners over time using logistic and negative binomial Generalized Estimating Equations (GEE), which calculate unbiased estimates for correlated data. Models were estimated using an independent working correlation matrix.

To test the hypothesis that youth who tested positive in the media cities would continue to display lower rates of unprotected sex compared to the STI-positive youth in the non-media cities, we examined two GEE models with different planned interaction contrasts. The first planned contrast tested the prediction that the effect of STI screening and treatment for STI-positive youth in the non-media cities would decay over time. For the STI-positive adolescents in the non-media cities, the contrast predicted a relatively high level of risk behavior at recruitment followed by a reduction after STI treatment but a return to higher levels of risk behavior after 6 months. In contrast, STI-negative adolescents in the media and non-media cities and the STI-positive adolescents in the media cities would start at relatively lower level of risk behavior and exhibit increased risk-taking over the study period (due to normal maturation processes (2)). The second planned contrast tested the same hypothesized pattern as just described, except that the effect of screening and treatment for the STI-positive youth in the non-media cities would remain at a relatively low level of risk rather than return to elevated risk behavior after 6 months.

The media program focused primarily on condom use with additional messages encouraging delay of sexual initiation with new partners. However, the messages had no effects on partner acquisition [14] and so we did not expect a media effect on this outcome. Thus, the planned contrasts for number of vaginal partners predicted that, regardless of media condition, STI-positive adolescents would exhibit a relatively high risk level at recruitment, a reduction in risk after STI screening and treatment (as reported at 6 months (8)), and a return to higher levels of risk behavior reported at 12 and 18 months. For STI-negative youth, we predicted that number of partners would increase over time due to maturation (2). The alternative contrast predicted the same pattern just described except that STI-positive youth would retain lower levels of risk behavior over time.

We used a “quasi-likelihood under the independence model criterion” (QIC) to determine which planned contrasts fit the data better. QIC is an extension of Akaike's information criterion (AIC) developed specifically for model fit comparisons in GEE (27). Like AIC, the model that minimizes QIC is regarded as the most appropriate among the fitted models. All analyses were conducted using Stata 10 (28).

Participants in the trial were also screened for incident STIs at 6 and 12 month follow-ups. To test whether there was an effect of receiving an STI test result at these times, we tested models with and without indicators for STI results. However, rates of new infections at follow-up were too small (4% and 3.8% respectively) to yield enough power to detect significant effects. Leaving the post-recruitment STI test result out of the models did not change any of our results, and therefore we did not include them in the final models.

A total of 132 youth did not complete any follow-up assessments and an additional 252 participants completed at least one but not all follow-up assessments. Analyses indicated that males and adolescents from Providence were more likely to drop out of the study. GEE

is robust for managing missing data (29). Thus, we report results that included participants completing at least one follow-up assessment.

The small number of cities makes it possible that observed media campaign effects are biased by pre-existing city differences. The equivalence among cities was increased by adjustment of potentially uncontrolled background factors using a propensity score approach (30, 31) to construct inverse probability weights for individual observations (see Romer et al., (14) for further details). The *pweight* Stata command was used for all multivariate analyses.

RESULTS

Demography and sexual behavior

Participants' ages ranged from 14 to 17 ($M = 15.2$, $SD = 1.06$; 57% female). At recruitment, 115 adolescents (8.3%) tested positive for at least one STI. The entire sample exhibited considerable risk behavior: at recruitment 19% of the adolescents reported multiple recent vaginal sex partners and 32% reported unprotected vaginal, oral and/or anal sex in the last three months. Table 1 shows that STI-positive adolescents were more likely ($p < .01$) to report multiple vaginal sex partners and unprotected sexual intercourse and females were more likely than males to test STI-positive.

We have reported previously that there were no differences between adolescents in the media cities and the non-media cities in terms of gender and sexual experience (14). Proportionally more adolescents in Macon did, however, test positive for an STI, and participants in Columbia and Syracuse were slightly younger than in the other two cities.

STI screening and media effects

The unadjusted probabilities of unprotected sex are shown in Figure 1. They indicate that after 6 months, STI-positive adolescents that were not exposed to the media program returned to levels of risk behavior that were comparable to or higher than what was observed at recruitment. In addition, the results indicate that youth in the media cities continued to exhibit lower sexual risk taking over time than their counterparts in the non-media cities. This was confirmed when comparing the fit of our models with the two alternative planned contrasts. Table 2 shows that when predicting changes in unprotected sex contacts, the model with the first planned contrast fit the data better than the model that predicted continued reduction in risk behavior in the non-media cities. The full model, which is presented in Table 3 (model 1), shows that this contrast was also significant.

Initial plots of the results for number of partners indicated no differential effect of the media program. Moreover, as seen in Figure 2, the initial effect of STI testing disappeared after 6 months. This pattern was also confirmed when comparing model fits of the planned contrasts. Table 2 shows that for sexual partners, the model with the third planned contrast fit the data better than the model that predicted that the effect of receiving an STI positive test result would remain over time. The full model, which is presented in Table 3 (model 2), shows that the third planned contrast was significant.

DISCUSSION

With the advent of rapid and mobile STI testing technologies, community-based screening will become increasingly feasible. Community-based STI screening and counseling has the potential to address structural barriers that African American youth confront in accessing health care and might also serve to detect (and avert the spread of) asymptomatic STIs (5). From an individual's perspective, a STI-positive diagnosis with subsequent medical care and

counseling can be a powerful intervention reinforcing the need for protective behavior while also treating infection.

This study builds on previous findings that adolescents who tested positive for an STI in a community-based STI-screening program and received CDC-compliant treatment and counseling reduced their number of sexual intercourse partners and unprotected sex over a 6-month period (8). The current study extends our understanding by showing that behavioral risk reduction achieved through community-based STI screening was relatively short lived and that without additional effective interventions adolescents resume risk behaviors after 6 months from the time of STI test result.

In contrast to the effects of screening and counseling in the non-media cities, youth who tested positive in the media cities retained the initial effects of the media intervention on unprotected sex. That is, their rates of unprotected sex remained lower than or statistically equal to those of youth who only received the screening intervention. Although previous analysis had shown that the media program had no effect on number of sexual partners, it did reduce unprotected sex contacts among the STI-positive adolescents even before the community-based STI screening had taken place (14). This is not totally surprising. While the STI screening intervention only occurred in a one-to-one meeting with the health care provider at the time of testing and treatment, the media program ran throughout the entire recruitment and follow-up period during which new media messages were aired over time. Therefore, the media program had more opportunity to achieve prolonged effects than the STI screening program alone. Nevertheless, the STI screening program did succeed in reducing subsequent number of partners in those who tested positive for at least 6 months.

It has been noted previously that the impact of STI/HIV interventions may decay over time, and that periodical booster sessions may be required to maintain the impact of interventions (32). Although there are evidence-based individual and group based STI/HIV prevention programs that can be used for this purpose (33), it may be challenging for CBOs to retain STI-positive youth for these programs. Thus, mass media messages may be a more feasible approach to maintaining the beneficial effects of community-based STI screening.

It is often assumed that “face-to-face” interventions will influence sexual risk behaviors more than mass media campaigns (34). This assumption reflects the view that mass media is a less engaging and interactive intervention modality (35). In contrast, Reardon and Rogers have argued that the distinction between mass media and interpersonal communication may be a “false dichotomy” (36). Similarly, Horton and Wohl originally described the relationship between media characters and audience as para-social, in that the audience forms a relationship with a performer that is perceived as analogous to the interpersonal relationship of people in face-to-face interaction (37).

The mass media messages used in the present study were designed to do more than just inform the audience. They contained dramatic depictions of youth confronting their risks of STI and HIV in a culturally and developmentally sensitive manner. The characters resolved their uncertainties regarding sexual risk reduction using persuasive arguments that had been identified in formative research (14, 17). These depictions were intended to engage the audience to assume the role of the media characters and use the media messages to guide their own decisions and protective behaviors. Hence, the results presented here support the contention that mass media messages have the potential to be as engaging and effective as face-to-face interventions. This study showed that the media messages reduced unprotected sexual contacts among high risk youth to a rate similar to what was achieved through community-based STI testing in which infected adolescents were treated and counseled by health care providers.

Limitations and directions for future studies

Several limitations need to be acknowledged. In regard to the STI screening program, we do not have data regarding the quality of counseling provided to STI-positive youth. We did, however, select health care providers who were experienced and well-respected in the community for treating STIs in African American adolescents. We also contacted the health care providers after they completed the STI treatments and verified that counseling had been delivered according to CDC guidelines. We found strong effects of receiving an STI test suggesting that, even in an uncontrolled setting in which counseling was not monitored, it was efficacious. In addition, our findings were robust across geographical regions. However, quality of service delivery should be confirmed in future research. We also did not examine the effects of testing and counseling separately; this is difficult to do owing to the ethical and clinical mandates associated with public health practice.

Because of the absence of a follow-up incidence rate among youth who were not screened, we could not identify screening effects on overall STI incidence in our sample. This would be challenging, however, because a design with a control arm in which persons are not tested at recruitment does not allow for a true test of reduction in STI incidence, that is, it only permits a comparison between an incidence rate (screening arm) and a prevalence rate (control arm).

In addition to the elapse of time, the observed return to risk behavior at 6 months post diagnosis may be partly due to repeat STI testing. In addition to STI screening at recruitment, adolescents were screened at 6, 12 and 18 months follow-ups. At each subsequent follow-up, approximately 82% of the adolescents who tested STI-positive at recruitment now tested STI negative. Thus, for the vast majority of adolescents who initially tested STI-positive, repeat STI screening may have functioned as a confirmation that they were no longer at risk which in turn may have led to behavioral disinhibition (8). Unfortunately, we were unable to test this dynamic directly because we did not have a control group that did not participate in repeat testing. Furthermore, comparing adolescents who were re-infected to those who did not re-infect at follow-up was not feasible because of the small number of adolescents who were re-infected. In a previous study we showed that receipt of a negative STI test result (without repeat testing) did not lead to increased sexual risk behavior over and above what can be expected due to maturation (8). It is, however, possible that behavioral disinhibition occurs with repeat testing of initially STI-positive adolescents and this dynamic should be investigated further in future research.

With regard to the media program, we did not assess adolescents prior to the media campaign and we observed only four cities, making it difficult to control random effects. However, we compensated by using propensity score weighting. Furthermore, in previous studies we examined risk behavior and expectancies not directly linked to the media campaign (a type of discriminant evidence of efficacy). These analyses indicated that the differences in condom use behavior can be attributed to the media campaign and not to secular trends (14). Additionally, the cities were selected because they did not have local risk reduction campaigns and pilot work indicated that youth were similarly sexually experienced in the four cities (corroborated in the trial). Thus, it seems unlikely that the differences we found predate the media intervention.

The use of self-report introduces the possibility of memory or motivational biases; however, use of ACASIs helped to minimize such biases (38, 39). Finally, it should also be noted that we were unable to disentangle the effects of screening from the media intervention. We know that the media program was effective without the STI screening (14) and that STI screening was effective without the media (8), but we cannot determine whether the

observed prolonged media effects for STI-positive youth are partly attributable to the STI treatment and counseling that occurred at recruitment.

CONCLUSIONS

Testing positive for an STI through community-based screening and receiving standard of care treatment and counseling can lead to a reduction in number of sexual intercourse partners and reduction in unprotected sex. Without further intervention, screening effects may decay after a 6-month period. Thus, it appears that the success of community-based STI screening programs hinges on additional booster strategies that encourage high-risk youth to maintain sexual risk reduction behaviors. Mass media messages are one method to reduce sexual risk taking behavior among high risk adolescents as they can reach the entire community over time. Media benefits were limited to reducing unprotected sexual contacts, suggesting that different interventions may be needed to reduce turnover in sexual partners. Nevertheless, these results suggest promising new approaches for feasible, community-based prevention strategies to serve vulnerable yet hard to access adolescents.

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Fig. 1.
Unadjusted probability of unprotected vaginal, oral or anal sex by STI test result and months since recruitment (Rec)

Fig. 2.
Unadjusted mean number of vaginal sexual partners by STI test result and months since recruitment (Rec)

Table 1

Number (%) of youth with STI-positive screening result by gender, age, and sexual risk behavior at recruitment

	STI-positive (n=115) n (%)	Total (n=1383) n	P value ^a
Gender			
Male	22 (3.7)	592	
Female	93 (11.8)	791	<0.001
Age			
14-15	54 (6.3)	864	
16-17	61 (11.8)	519	<0.001
Number of vaginal sex partners in the last 3 months			
0 ^b	28 (3.7)	755	
1	49 (13.5)	363	<0.001
2+	38 (14.3)	265	<0.001
Unprotected vaginal, oral or anal sex in the last 3 months			
No	52 (5.5)	944	
Yes	63 (14.4)	439	<0.001

^aP values are from unadjusted logistic regressions predicting STI diagnosis

^bDenotes referent category.

Table 2

QIC for model selection

	Unprotected vaginal, oral or anal sex contacts	# of vaginal sex partners
Planned contrasts	QIC	QIC
#1- Media effect at recruitment and throughout the trial for STI positive, STI testing effect disappears after 6 months	9604.17	
#2- Media effect at recruitment and throughout the trial for STI positive, STI testing effects remains	9606.98	
#3- No media effect, STI testing effect disappears after 6 months		8381.51
#4- No media effect, STI testing effect remains		8382.51

Table 3

Final models: weighted GEE analyses of vaginal sex partners and unprotected vaginal and anal sex contacts among sexually experienced adolescents

Predictors	Model 1 ^a : unprotected anal, oral or vaginal sex contacts, N=1228		Model 2 ^b : number of vaginal sex partners, N=1383	
	OR	P value	Coef	P value
Female	0.69	<0.001	-0.402	<0.001
Age	1.327	<0.001	0.031	0.16
Media City	0.912	0.27	0.074	0.276
STI-positive at recruitment	1.589	0.025	0.206	<0.001
STI-positive * media city	0.876	0.579	-0.085	0.328
Planned contrast 1	1.148	<0.001		
Planned contrast 3			0.039	0.004

Abbreviations: CI, confidence interval; Coef, Coefficient; OR, Odds Ratio.

^aUnprotected anal, oral or vaginal sex contacts is a bivariate variable and was estimated using Generalized Estimation Equation with a probit link function.

^bNumber of vaginal sexual partners is a continuous variable and was estimated using Generalized Estimation Equation with a negative binomial link function.