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Identifying Predictors of Human Papillomavirus Acquisition Using the Theory of Gender and Power

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Abstract

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Objectives: This paper seeks to identify behavioral and psychosocial predictors of Human Papillomavirus (HPV) acquisition in a cohort of single, African American women ages 18 to 29. The Theory of Gender and Power was used to select variables and structure analyses.

Methods: This investigation uses secondary analysis of existing data from a behavioral Randomized Control Trial focused on reducing sexual risk behavior and incidence of sexually transmitted infections (STIs) in a cohort of 18-29 year-old African American women using services at three Kaiser Permamente clinics in Atlanta, GA. The Theory of Gender and Power (TGP) was used to select predictor variables and structure analyses, and HPV acquisition over the 12 month follow-up was used as the outcome variable. Potential predictor variables were analyzed using chi-square and t-tests, and variables significant at $p<.300$ were considered for inclusion in multivariate regressions. Selected variables were assigned to one of the three theoretical constructs or a fourth behavioral category. Significant variables from the first series of regression models were included in a final multivariate logistic regression. Age and experimental condition were controlled for in all regression analyses.

Results: Several variables significantly predicted HPV acquisition in multivariate analysis including consistent condom use, relative partner salary, workplace experiences of sexual harassment, and educational attainment. In the final regression, only consistent condom use significantly predicted HPV acquisition, with consistent condom users being more likely to acquire HPV.

Conclusions: This analysis suggests that TGP is a useful model for considering HPV acquisition. A number of results were contrary to what was expected based on the literature. Substance use, smoking behavior, and partner risk factors did not predict HPV acquisition in this sample, despite strong evidence in the literature linking these factors to HPV infection.

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I. INTRODUCTION

Human Papillomavirus (HPV) is the most common sexually transmitted disease in the United States (US) with a prevalence of 42.5% in females aged 15-49.(1) HPV is a necessary cause of cervical cancer and contributes to the formation of several other anogenital and oropharyngeal cancers.(2) Of the 40 strains of HPV known to infect the anogenital track, 13 have been shown to be oncogenic, and the prevalence of these high-risk strains is 23%.(1) HPV causes around 12,000 cases of cervical cancer in the US each year, as well as around 15,900 cases of other types of cancer.(3)

African American women are at an increased risk for cervical cancer compared to most other races. Cervical cancer incidence among African American women is 11.4 per 100,000 and death rates for cervical cancer among this group are 4.9 per 100,000.(4) In comparison, the rate of cervical cancer incidence among white women is 8.5, and the death rate is 2.3.(4) According to the National Cancer Institute, the disproportionate burden of cervical cancer among African American women is likely due to a lack of consistent screening and generally unequal access to healthcare.(5)

Because HPV is associated with a number of potentially life-threatening cancers, preventing HPV infection has become a public health priority. Condom use can lower the risk of HPV infection, but because HPV can infect areas that are not covered by a condom, even using a condom correctly, every time, cannot completely prevent HPV infection.(6) Similarly, while limiting the number of sexual partners one takes or engaging in monogamous relationships may decrease the risk of infection, HPV is so common that nearly every sexually active person will contract it at some point, and it may not always be possible to tell if someone is currently infected.(6)

The best method of preventing HPV infection is vaccination. Two vaccines have been developed against specific strains of HPV. Gardisil is a quadrivalent vaccine, which prevents oncogenic strains 16 and 18 as well as genital-wart causing strains 6 and 11.(3) Cervarix, a bivalent vaccine, protects against strains 16 and 18.(3) These two high-risk strains are believed to cause 76.6% of all cases of invasive cervical cancer.(3) Widespread use of these vaccines could significantly decrease the burden of disease associated with HPV.

Currently, the CDC recommends that 11 and 12 year-old girls receive either Cervarix or Gardisil and that 11 and 12 year-old boys receive Gardisil.(7-10) Men and women as old as 26 can receive the appropriate vaccine if they did not receive it when they were younger.(7-10) As of the 2012 National Immunization Survey, however, only 53.8% of 13-17 year-old girls had received the first dose of the three-dose series, and of those who had adequate time to complete the series, one-third did not receive all three doses.(11) Coverage among boys in the same age group is significantly worse with only 20.8% receiving at least one dose and less than half of those who had adequate time to complete the series receiving all three doses.(11)

African Americans also experience disparities in HPV vaccination coverage, particularly African American girls. Only 50.1% of African American girls aged 13-17 have started the HPV vaccine series, and of those who had time to receive all three doses, only 63.7% have done so.(12) Comparatively, among white girls in the same age group, 51.1% have begun the vaccine series, and 71.8% of those who had time to receive all three doses have done so.(12) These gaps are particularly concerning considering the

increased morbidity and mortality due to cervical experienced by African American women.

Because vaccination rates have remained so low and because preventing HPV infection is so important to lower cancer morbidity and mortality, a great deal of public health research in recent years has focused on issues surrounding HPV vaccination. Researchers have investigated possible correlates and predictors of vaccination, tested various health behavior theories to determine the mechanisms of HPV vaccine decision making, and evaluated interventions aimed at improving vaccine acceptance and increasing vaccine uptake. Other researchers have analyzed demographic and behavioral variables in order to identify those most at risk for acquiring HPV. Results of these studies vary widely, as do the study methodologies themselves. However while a number of vaccine-focused studies have focused on vulnerable populations, few researchers have focused on identifying risk factors for HPV acquisition among African American women, who are at an increased risk for complications from HPV. This is particularly pertinent because in studies that stratified analyses by race, participants of different racial or ethnic backgrounds had different risk factors for HPV.(13, 14)Additionally, few studies have used a theoretical model to guide their investigations. Understanding these risk factors is of particular importance since vaccine coverage rates have remained fairly low. Understanding which women are most at risk for HPV acquisition will allow messages about vaccination to be targeted more specifically to the population most likely to be affected.

This paper seeks to identify behavioral and psychosocial predictors of HPV acquisition in a cohort of single, African American women ages 18 to 29 using the Theory of Gender and Power to select variables and structure analyses.

II. LITERATURE REVIEW

Cross-Sectional Studies

In cross-sectional studies, demographic factors, substance use, sexual behaviors, gynecological history, and characteristics of sexual partners have emerged as correlates of HPV infection.

Demographic Factors

Age is perhaps the most well-established demographic risk factor for HPV infection, with most studies finding significantly higher infection rates in younger women, particularly those in their teens and early twenties.(13, 15-28)In some studies, HPV infection rates are bi-modally distributed when graphed by age with a second, less significant, peak being seen in the late fifties and early sixties.(19, 26)Strong evidence also exists for a relationship between HPV infection and marital or relationship status, with women who were married, co-habiting, or in a stable relationship generally being at lower risk than other women.(18, 23, 26, 29)

Other demographic factors influencing HPV status are less well documented. Evidence suggests that educational achievement may be correlated with HPV incidence, but studies disagree on the nature of this relationship. Some researchers found that higher levels of education served as a protective factor.(13, 16, 23, 30)Others found that educational attainment was associated with higher levels of infection.(18, 22)A few studies noted that the area in which one lives may be a risk factor, but again the evidence

is conflicting. Studies in Portugal, Spain, and China found that women from urban environments are more likely to be HPV infected than their rural counterparts.(22, 23, 26)In contrast, a study in New Delhi found higher infection rates among rural women.(30)Socio-economic indicators may also be important to consider. The Chinese study mentioned above found that women with a higher family income were at decreased risk of infection.(26)Similarly, a study in the Democratic Republic of Congo and the previously mentioned study in New Delhi found that lower standard of living and lower socio-economic status (respectively) were risk factors for HPV positivity.(24, 30)A study comparing two groups of women in Brazil found higher rates of HPV infection among women of low socio-economic status and suggested that socio-economic status may also affect the significance of other risk factors.(25)

Substance Use

The connection between HPV infection and smoking is extremely well documented. Many studies have found significant associations between smoking and HPV infection, although there is some suggestion that only current smoking behavior affects this risk or that the relationship diminishes when controlling for sexual behavior.(13, 17, 20, 22-25, 28, 31-34)In a study comparing patterns of HPV infection in Finland and Cote D'Ivoire, where patterns of tobacco use differ substantially, any type of tobacco use increased HPV risk.(33)Other types of substance use may also increase risk for HPV infection. In the Brazilian study, alcohol use was a risk factor for women in the low socio-economic condition.(25)

Sexual Behaviors

Since HPV is a sexually transmitted infection, it should come as no surprise that the influence of sexual behavior on HPV incidence has been widely studied and that several variables in this category have been consistently associated with increased HPV risk. Lifetime number of sexual partners is the most commonly cited risk factor, with the risk of HPV infection increasing along with the number of partners.(13-15, 19, 21-25, 31, 32, 34)Interestingly, a study conducted among women attending a health center in Sydney found that having *fewer* than 3 lifetime sexual partners was actually associated with increased HPV incidence.(28)The authors of this study suggested that, in the population being studied, women with a higher number of partners might be more consistent about condom use but were not able to test this hypothesis.(28)

Number of recent sexual partners has also been found to be a risk factor for HPV infection among British, American, Tuscan, and Eastern European populations, with increasing numbers of partners again being associated with increasing levels of risk.(14, 15, 27, 32)"Recent" was not consistently defined in these studies, ranging from the last six months up to the last five years. One of these studies (the American population) also analyzed the importance of concurrency, or having multiple sexual partners during overlapping periods.(14)This study found that prevalence of HPV among women with concurrent partners was almost 10% higher than among women who did not report concurrency.(14)

Condom use affected HPV risk in several studies, with more consistent condom use generally serving as a protective factor.(18, 23, 28, 31, 32)However, the significance of this association was often weak and sometimes disappeared in multivariate models.(18, 23, 28, 32)This is not surprising since condoms offer incomplete protection

against HPV infection. Interestingly, Bell et al. found that using a condom at last sex was associated with significantly higher odds of infection in a sample of American Indian women.(13)Non-barrier methods of contraception often showed up as risk factors, particularly oral contraceptives.(15, 18, 22, 24, 25, 28)

Gynecological History

Gynecological history impacts risk of HPV infection in several ways. A number of studies suggest that HPV incidence is higher among women who begin sexual activity at an earlier age, but some authors believe the influence of early sexual debut is actually due to the accumulation of additional partners rather than a biological susceptibility in the developing cervix.(22, 23, 25, 31, 32)A history of other STIs also increases risk for HPV infection, particularly a history of other cervical infections.(13, 14, 22, 23, 25, 27, 32, 34)In a study of young African American women (using the same study as sample as this analysis), Wingood, Seth, DiClemente, and Robinson found that a history of sexual abuse (defined as a male partner making the participant have sex when she did not want it within the past six months) was a risk factor for HPV.(35)

Experiences of pregnancy and abortion also impact HPV incidence. Bennani et al. found that a history of abortion increased HPV risk by almost 4 times that of women with no such history in a cohort of Moroccan women, while Silva et al. found history of abortion to be only a borderline significant risk factor in a cohort of Brazilian women.(25, 36)The impact of pregnancy varies drastically between studies. In a study of British women, Almonte et al. found that ever being pregnant was significantly associated with decreased HPV prevalence, but there was no significant association between the number of live births reported and HPV prevalence.(15)Studies among Tuscan and Somoan

women also suggest that ever being pregnant may be a protective factor.(18, 32)Similarly, in cohorts of Turkish and Malian women, a higher number of pregnancies was protective.(29, 34)In contrast to this, Sun et al. found that having ever giving birth was a risk factor for HPV among Chinese women, and Bell et al. found that number of pregnancies and age at first pregnancy increased risk of HPV infection among American Indian women.(13, 26)

Characteristics of Sexual Partners

Several characteristics of study participants' sexual partner emerged as significant predictors of HPV status. In a study of Tuscan women, women whose partner had a high number of lifetime partners were more likely to be HPV positive than other women.(32)Similarly, Sangwa-Lugoma et al. found that Congolese women whose partners had sex with prostitutes were at higher risk for HPV.(24)Other characteristics that were correlated with higher levels of HPV infection included having a partner who smokes and having a circumcised partner.(22, 27)

Weaknesses

The primary weakness of the studies described above is that they only use cross-sectional data. Without collecting data at multiple time-points, these studies cannot establish a causal relationship between the risk factors they reported and HPV infection. Additionally, none of these studies used a theoretical model in choosing the variables they analyzed or in building their regression models. Using theories that model health behavior or disease acquisition can help researchers identify unexpected associations and give greater depth to interpretation of results. Studies varied in the types of HPV diagnosed as well as the location of infections, which may affect their comparability.

Some studies focused exclusively on high risk forms of HPV, those known or suspected to be oncogenic, while others tested for a broader range of HPV types. Finally, there is some potential for recall bias and reporting bias in all of these studies since they ask participants to describe past behavior around sexual practices, which may be considered highly personal and difficult to disclose.

Longitudinal Studies

Longitudinal studies have identified similar risk factors for HPV acquisition. However, some variables that were significant in cross-sectional analysis were either not tested or not significant in longitudinal analysis. Some of these gaps may be simply due to the lower number of longitudinal studies that have been performed.

Demographic Factors

Several longitudinal studies also identified young age as a risk factor for acquiring HPV.(37-40)One of these studies also found that HPV acquisition was bi-modally distributed when graphed against age with the peaks located at 15-19 years of age and 50-55 years of age, but only for high risk types.(38)Marital status also emerged as a significant predictor of HPV status with married or cohabiting women being less likely to acquire HPV.(39-41)

Substance Use

Smoking continued to be an important predictor of HPV status in these studies, particularly among young women.(39, 42-44)Three studies found that smoking increased the risk of HPV acquisition among college students, and one found that smoking increased the risk of HPV acquisition among Danish women ages 20-29.Kahn et al. also found that using drugs and alcohol in a way that impacts sexual behavior, such as using

substances before engaging in sexual behavior or exchanging sex for drugs or alcohol, also put women at higher risk of becoming HPV positive.(43)

Sexual Behaviors

Number of lifetime partners continued to be a significant risk factor for HPV acquisition in longitudinal analyses.(39, 41-45)A number of studies also identified the number of recent partners as a predictor of HPV status.(38, 40-43, 46)Interestingly, Winer et al. found that sex with a new partner during the last five to eight months made participants three times more likely to become HPV positive during at their next study visit and that non-penetrative sex increased risk of HPV acquisition for virgins.(44)

Longitudinal studies provided less evidence that the type of contraception a woman uses affects her risk of acquiring HPV. Condom use was identified as a protective factor by only two of these studies.(43, 46)Use of oral contraceptive was associated with increased HPV acquisition, as was use of the emergency contraceptive pill.(39, 44, 46)Use of the emergency contraceptive pill was also associated with overall riskier sexual behaviors, however, which may influence the analysis.(46)

Sánchez-Alemán, Uribe-Salas, Lazcano-Ponce, and Conde-Glez found that engaging in multiple risky sexual behaviors may compound risk with participants who had more than two partners and used condoms inconsistently were 3.8 times more likely to become HPV positive.

Gynecological History

Both Collins et al. and Kahn, Rosenthal, Succop, Ho, and Burk found that early age at first sex increased risk of HPV acquisition.(37, 47)Interestingly, both of these studies as well as a study by Syrjanen et al. found that both age at menarche as well as the

length of the period between menarch and initiation of sexual activity were significant predictors of HPV acquisition with early age at menarche and a short period between menarche and coitarche increasing this risk.(37, 47, 48)Women with a history of other STIs were at increased risk for HPV, as were women who reported "coercive sexual experiences."(40, 42, 43, 46)Several studies found that ever having given birth decreased risk of HPV acquisition.(38-40)In contrast, women who became pregnant during a study by Munoz et al. were at increased risk of becoming HPV positive.(38)

Characteristics of Sexual Partners

In longitudinal studies, the most commonly noted risk factor with regards to participants' sexual partners was whether or not that partner was sexually experienced.(43-45, 47)A 2008 study by Winer et al. found that this was true even for a woman's first sex partner.(45)Collins et al. found that reporting an older partner also increased HPV risk.(47)In a 2003 study, Winer et al. found that knowing a new partner for less than eight months before beginning a sexual relationship increased risk of HPV acquisition.(44)

Weaknesses

While the longitudinal nature of these studies is a significant strength, there are some weaknesses. None of these studies used a theoretical model in choosing the variables they analyzed or in building their regression models. Studies varied in the types of HPV diagnosed as well as the location of infections, which may affect their comparability. Some studies focused exclusively on high risk forms of HPV, those known or suspected to be oncogenic, while others tested for a broader range of HPV types. Most studies focused exclusively on cervical HPV infections, but at least one study

included infections of the mouth and genital areas other than the cervix.(45) Studies varied in median follow-up time from 12 to 50 months and in sample sizes from under 150 participants to nearly 7500. Median sample size was around 600. Finally, there is some potential for recall bias and reporting bias in all of these studies since they ask participants to describe past behavior around sexual practices, which may be considered highly personal and difficult to disclose.

Theory of Gender and Power

According to Wingood and DiClemente, the Theory of Gender and Power (TGP) proposes that inequalities in the gendered relationships between men and women impact women's risk of negative health outcomes.(49) These inequalities are described by the three inseparable structures of the theory. The *sexual division of labor* encompasses "economic inequities that favor men" (p. 395).(49) This includes the lower value placed on women's work (the gendering of professions which generally assigns women to lower paying jobs) and the assignment of women to unpaid nurturing work such as childrearing and care for sick or elderly family members. The *sexual division of power* encompasses "inequities and abuses of authority and control in relationships and institutions that favor men" (p. 395).(49) This includes experiences of abuse, risky partners, substance use, personal skills, and feelings of empowerment. The *structure of cathexis* is also known as the *structure of social norms and affective attachments*. It describes how socio-cultural expectations constrain women's experiences of their own sexuality. This includes gender stereotypes, behavioral norms, and ideas of purity and morality, as well as "the emotional and sexual attachments women form with men" (p. 400).(49) According to TGP, women who experience economic hardship, power disparities within relationships or social

infrastructure, and pressure to ascribe to conservative norms regarding sexuality are at increased risk for negative sexual health outcomes.(49) TGP was selected for use in this analysis because it attempts to take into account a woman's environment (including relationships, cultural beliefs, and social context) when attempting to identify risk factors for negative health outcomes. Using TGP to understand risk factors for HPV will help to broaden the scope of our current understanding of what affects transmission of this disease.

In this study, TGP shaped the formation of the data collection instrument, the selection of variables from that instrument, and the structure of the analysis. The author selected variables from an existing baseline data set for analysis as potential predictors and used HPV status at twelve month follow-up as an outcome. The relationship between predictor and outcome variables was analyzed using bivariate analyses first, followed by a series of multivariate logistic regressions.

III. MATERIALS AND METHODS

Recruitment

This study focuses on secondary analysis of data collected as part of an HIV/STI randomized controlled behavioral trial that randomly recruited848 eligible participants from October 2002 through March 2006 from the 3 local Kaiser Permanente Centers in Atlanta, GA, having the greatest number of African Americans. The primary investigator for this study was Dr. Gina Wingood. Eligibility criteria included being an African American female, 18 to 29 years of age, unmarried, sexually active in the prior 6 months and provided informed consent. However, HPV specimen collection was initiated 5-months after the trial began. Thus, all analyses in this report are based on baseline survey

data and all biological data derived from the 665 participants who provided HPV specimens. It should also be noted that this study took place before the HPV vaccine was released, so the sample was entirely unvaccinated. Participants were compensated$50 for their time and effort. The Emory University Institutional Review Board approved the study protocol before implementation.

Data Collection

Data collection occurred at baseline, 6- and 12-monthsfollow-up. At each assessment, participants completed a 40-minute Audio Computer-Assisted Survey Interview which assessed sociodemographic characteristics, history of abuse, substance use, oral contraceptive use, and HPV-associated sexual behaviors, and provided self-collected swab specimens that were tested for 3 non-viral sexually transmitted pathogens (*Neisseria gonorrhoeae*, *Chlamydia trachomatis*, and *Trichomonas vaginalis*). At the baseline participants provided a vaginal swab specimen that was assayed for 19 oncogenic HPV strains, and at the 12-month follow-up assessment participants who were HPV- at baseline provided another vaginal swab specimen that was assayed for HPV.

Intervention Methods

The HIV/STI intervention consisted of two 4-hour group sessions, with an average of 10 participants per session, implemented on consecutive Saturdays, and facilitated by 2 trained African American female health educators. The general health condition consisted of one 4-hour group session that emphasized nutrition and exercise. The HIV/STI intervention applied Social Cognitive Theory and the Theory of Gender and Power to enhance HIV/STI knowledge, condom use, negotiation skills, and norms supportive of healthy relationships. (49, 50) In addition to these skills, the intervention

sought to reduce STI acquisition by emphasizing the importance of enhancing condom use, abstaining from sex until completion of STI therapy, reducing number of male sexual partners, and encouraging STI treatment for male partners.(51, 52)

Measures

Behavioral Variables

Consistent condom use in the last 30 days was computed using several questions. Frequency of sex with main partner and casual partners was assessed by asking "In the last 30 days, how often have you had vaginal sex?" Participants entered a number in response to these questions. The frequency of sex values for main and casual partners were added together to obtain a total frequency of sex value. Frequency of condom use with main partner and casual partners was assessed by asking "In the last 30 days, how often have you used condoms when you had vaginal sex?" Participants entered a number in response to these questions. The frequency of condom use values for main and casual partners were added together to obtain a total frequency of condom use value. The frequency of condom use value was divided by the frequency of sex value to obtain a ratio that represented relative frequency of condom use. This was recoded into a dichotomous variable in which participants who reported 100% condom use in the last 30 days received a score of 1, and participants who reported less than 100% condom use received a score of 0. This variable can be considered an adequate proxy for general condom use behavior as, in the control group, chi square tests showed that consistent condom use behavior was significantly associated across different time points ($\chi2=17.71$, $df=1$, $p<.001$; $\chi2=14.71$, $df=1$, $p<.001$).

Sex with a casual partner was assessed by asking "In the past six months, have you had sex with a casual partner?" with a casual partner being defined as "someone other than your current boyfriend, someone you occasionally have sex with and this is NOT a committed relationship." Participants selected "yes" or "no" in answer to this question.

Number of partners in the last year was assessed by asking "In the past year (12 months), how many guys have you had vaginal sex with?" Participants entered a number in response to this questions.

Participants provided biological samples, which were tested for gonorrhea, chlamydia, and trichomoniasis. One swab was tested for *Neisseria gonorrhoeae* (GC) and *Chlamydia trachomatis* (CT) using the Becton Dickinson Probe Tec ET C. trachomatis and N. gonorrhoeae Amplified DNA Assay. A second swab was tested for *Trichomonas vaginalis* (TV) using Taq-Man PCR.20. A single, dichotomous variable was created to indicate whether participants tested positive for one or more of these non-viral STIs at 6 or 12 month follow up. Women testing STI positive were provided directly observable single-dose treatment and received appropriate counseling per CDC recommendations. This treatment meant that all women were negative for these STIs after baseline, so testing positive at 6 or12 month follow up indicated acquisition of the STI during the follow-up period.

Oral contraceptive use was assessed by asking participants "Are you on the pill?" to which they could answer "yes" or "no."

Structure of Cathexis (Social Norms and Affective Attachments)

Monogamy in the last year was assessed by asking "Do you have a main partner?" and "In the past six months, have you had sex with a casual partner?"Participants who responded "yes" to both questions were considered non-monogamous. Participants who reported having a main partner but did not report sex with a casual partner were considered monogamous. All other participants were classified as missing.

Length of relationship with main partner was assessed by asking "How long have you been in this relationship?" Participants responded by entering a number of months.

Participants' conceptions of peer norms regarding masturbation were assessed using a 2-item scale. For each of these items, women were asked to state how many women their age (out of ten) they thought were doing the behaviors described. The two behaviors included were feeling comfortable stimulating themselves sexually to have an orgasm, and feeling comfortable stimulating their vagina. Scores could range from 0 to 20, with higher scores indicating a perceived higher level of acceptance of the behavior among peers. Cronbach's alpha for this scale was 0.94, suggesting high internal consistency of scale items.

Participants' expectations about the future of their relationship were assessed using the statement "I see myself marrying my current main partner." Participants were asked to rate their response to this statement with answer options ranging from (1) "strongly disagree" to (4) "strongly agree." In order to dichotomize this question for use in the regression model, answer categories were collapsed. The choices "strongly disagree" and "disagree" became one category. The choices "strongly agree" and "agree" became the second category.

Sexual Division of Labor

Participant's educational attainment was assessed by asking "What is the last grade that you completed in school?" with responses ranging from "sixth grade" to "completed four years of college." To limit the number of categories for this variable, answers were collapsed into four categories:"less than high school diploma," "graduated high school," "1-2 years of college," and "3-4 years of college."

Relative partner salary was assessed by asking "Does your main partner make 3000 or more dollars than you?"Participants were asked to select "yes" or "no."

Employment was assessed by asking "Do you have a job for which you earn money?" to which participants could answer "yes" or "no."

Sexual Division of Power

Frequency of partner communication was assessed using a 12 item scale. Participants were asked to respond to each item by entering the number of times they had engaged in that type of communication during the past six months. Sample items include "During the past six months, how many times did you ask your partner to use a condom immediately before sex?" and "During the past six months, how many times do you say NO to having sex with a partner who wanted to have unsafe sex?" The total scale was computed by summing the responses to all 12 items. The minimum possible score for the scale was 0, but because participants could enter any number, there was no maximum possible score for this scale. Cronbach's alpha for this scale was 0.72, suggesting good internal consistency of scale items.

Condom self-efficacy was assessed using a 7-item scale with answer options ranging from (1) "a lot" to (5) "none." Sample items include "How much of a problem would it be for you to put a condom on a hard penis?" and "How much of a problem

would it be for you to take a condom off without spilling the semen?"The total scale score was computed by summing the responses to all 7 items. Scores could range from 7 to 35, with higher scores indicating a high level of self-efficacy. Cronbach's alpha for this scale was 0.90, suggesting high internal consistency of scale items.

Experience of workplace sexual harassment was assessed using a 13-item scale with answer options (1) "yes" and (0) "no." Sample items include "Has a male coworker ever made crude sexual remarks to you?" and "Has a male coworker ever attempted to establish a sexual relationship with you?" Scores could range from 0 to 13, with higher scores indicating more experiences of harassment. Cronbach's alpha for this scale was 0.72, suggesting good internal consistency of scale items.

Sex with a recently incarcerated partner was assessed by asking "In the past 6 months, have you had vaginal sex with a guy who you know has just been released from a jail, prison, or detention center?" Participants responded by selecting "yes," "no," or "don't know."

Experience of sexual abuse in the last six months was assessed by asking "In the past six months, has your current partner ever made you have vaginal sex when you didn't want to?" Participants were asked to select "yes" or "no."

Alcohol use was assessed by asking participants "How many times did you use alcohol in the past 30 days?" Participants entered a number of times. This variable was dichotomized by categorizing participants as either users (the participant entered a number greater than 0) or non-users (the participant entered 0).

Table I - Variables included in regression analysis by p-value and theoretical structure				
Variable Label	**p value**	**Degrees of Freedom**	**Test Statistic**	**Theoretical Structure**
Consistent Condom Use	0.015			Behavior
Casual Partner (last 6 months)	0.027	1	4.86	Behavior
Number of partners (last 12months)	0.048	66.94	-2.02	Behavior
Non-viral STI acquisition	0.081	1	3.05	Behavior
Oral Contraceptive Use	0.082	1	3.03	Behavior
Monogamous	0.002	2	4.06	Cathexis
Length of relationship (main partner)	0.080	132.74	1.76	Cathexis
Peer norms – masturbation	0.104	92.98	-1.64	Cathexis
Expectation of marriage	0.131	3	5.64	Cathexis
Educational attainment	0.016	3	10.37	Labor
Partner's relative salary	0.059	1	3.56	Labor
Employment	0.182	1	1.78	Labor
Partner communication frequency	0.053	211	-0.39	Power
Condom self-efficacy	0.057	211	1.92	Power
Workplace sexual harassment	0.061	91.57	-1.90	Power
Incarcerated partner	0.184	1	1.77	Power
Sexual abuse (last 6 months)	0.199	1	2.21	Power
Alcohol use	0.276	1	1.19	Power

Outcome Variable

Incident high-risk (cancer associated) HPV infection was defined as a laboratory-confirmed test for a high-risk HPV type at the 12-month follow-up assessment after testing HPV-negative at baseline assessment. Participants provided a vaginal swab specimen at baseline that was assayed for HPV. Those testing negative for HPV at

baseline were rescreened on all types at the 12-month follow-up assessment (HPV was not assessed at the 6-month follow-up assessment). If at 12-month follow-up those who were negative at the initial (baseline) assessment were positive at the 12-month assessment, then these individuals were identified as having an incident HPV infection. Swabs were tested by polymerase chain reaction/reverse blot strip assay (Roche Diagnostics, Indianapolis, IN). This assay uses non-degenerate primer pairs to amplify 19 oncogenic HPV types (Types 16, 18,26, 31, 33, 35, 39, 45, 51, 52, 55, 56, 58, 59, 68, 73, 82, 83, and 84). Testing was limited to high-risk types due to restrictions on study resources. In absence of the resources to test for all known strains, it seemed important to focus on the strains with the most serious associated health outcomes. All women who tested positive for high-risk HPV types were referred to their primary care provider at Kaiser Permanente for further counseling and follow-up.

Analysis

Based on the review of the literature and guided by the theoretical model, the author initially selected or created 92 variables from the baseline survey and the 6 and 12-month STI testing data for bivariate analysis. The data set was limited to participants who were HPV negative at baseline (N=409) and submitted a vaginal swab for HPV testing at 12-month follow-up. Categorical variables were analyzed using chi-square tests, with HPV status at 12 months follow up as the dependent variable. Continuous variables were analyzed using independent sample t-tests, with HPV status at 12 months follow up as the grouping variable. All variables significant at $p \leq .300$ were assigned to one of the three discreet structures of the TGP model or to a fourth, behavioral category. This significance level was used instead of the more standard $p \leq .200$ in order to allow for

inclusion of theoretically important variables with marginally significant p-values. Only these variables were considered for inclusion in the regression models. Some variables were further altered or excluded at that point in order to create the most robust model. The final set of variables included in the regression models along with their bivariate p-values and the construct or category to which they were assigned can be seen above in Table I.

A logistic regression model was run for each theoretical structure and the behavior category, including variables that seemed the most statistically or theoretically significant. Age and experimental condition were controlled for in all regression models. In building regression models, if multiple variables seemed to be measuring the same or very similar things, only the most statistically significant variable was included. Similarly, if no variables from a particular category that was theoretically important were adequately significant, the most significant variable was included in the model. Finally, variables that appeared to be interfering with each other in the model were checked for mediation, and mediated variables were discarded. Variables that predicted HPV acquisition in these models at $p \leq .050$ were included in a final logistic regression model. For the Structure of Cathexis, no variables were significant at $p \leq .050$, so the most significant variable from this structure was included in the final regression model.

IV. RESULTS

Sample Description

The total sample consisted of 848 participants. Of those, 409 were HPV negative at baseline. At 12 month follow up, 155 of those participants remained HPV negative, 60

were HPV positive, and 194 were lost to follow-up leaving 215 participants. (See Figure 1.)

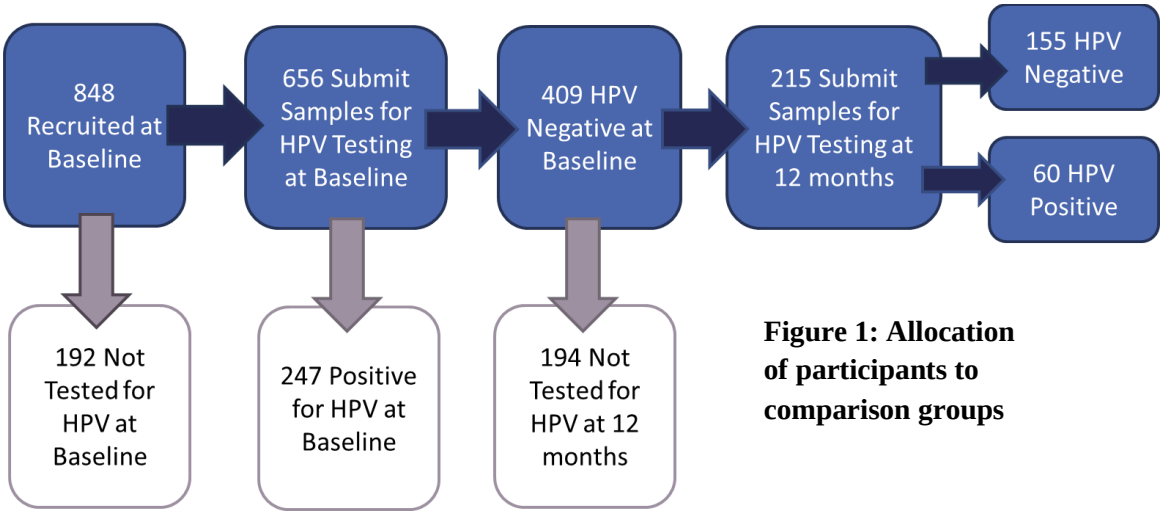

Figure 1: Allocation of participants to comparison groups

Among these 215 participants, the mean age was 23 (sd=3.84), and 92.4% had either graduated high school or completed at least one year of college with 22.5% completing four years of college. The majority of the sample was employed, with 80.8% reporting that they had a job for which they received money. Participants worked a mean of 36.21 hours per week (sd=10.99) and earned a mean of $12.47 per hour (sd=7.79). Most participants lived alone (24.7%) or with one or both parents (48.4%), and only 7.0% lived with their boyfriend. They were generally not on the pill (72.6%), and had not used a condom the last time they had sex with their main partner (60.3%). They reported a mean of 2.42 partners in the last 12 months (sd=2.83). Most participants did not smoke (92.5%) or use marijuana (81.4%), but a majority did consume alcohol (62.4%). (See Table II.)

Table II – Description of the Sample					
Variable	**%**	**N**	**Variable**	**%**	**N**
Age			*Use of Oral Contraceptives*		
18-24	60.6	129	Yes	26.5	57
25-29	39.4	84	No	72.6	156
Employed			*Condom Use at last sex*		
Yes	80.8	172	Main Partner - Yes	36.2	63
No	19.2	41	Main Partner - No	63.8	111
Living Situation			Casual Partner – Yes	48.5	80
Alone	24.9	53	Casual Partner - No	51.5	85
Parents/Relative	51.7	110	*Smoker*		
Partner	7.0	15	Yes	7.4	16
Roommate	10.3	22	No	91.6	197
Other	6.0	13	*Alcohol Use*		
Level of Education			Yes	61.9	80
Less than HS diploma	7.6	15	No	37.2	133
High school diploma	24.2	48	*Marijuana Use*		
College, 1-2 years	31.8	63	Yes	17.8	38
College, 3-4 years	36.4	72	No	82.2	175

Variable	**Mean**	**Standard Deviation**
Age	23.00	3.84
Salary (dollars per hour)	12.47	7.79
Number of partners (last 12 months)	2.42	2.83

Sexual Behavior Variables

Results of multivariate binary logistic regression on behavioral variables suggest that those who practiced consistent condom use were almost 3 times more likely to acquire HPV than those who did not practice consistent condom use (AOR=2.821; 95%CI=1.112,; p=.029). No other variables in this category significantly predicted HPV acquisition. (See Table III.)

Table III – Sexual Behavior Regression Results* (N=103)				
Variable Label	**p value**	**Exp(B)**	**Lower CI**	**Upper CI**
Consistent condom use	0.029	2.821	1.112	7.155
Casual partner (6 months)	0.108	2.687	0.806	8.958
Number of partners (12months)	0.314	0.836	0.589	1.185
Non-viral STI acquisition	0.471	1.599	0.446	5.738
Oral contraceptive use	0.354	0.599	0.203	1.768

*controlling for age and experimental condition

Sexual Division of Power Variables

Results of binary logistic regression on variables assigned to the power construct suggest that for each additional experience of workplace sexual harassment participants' risk of acquiring HPV increased by 10% (AOR=1.10; 95%CI=1.01, 1.20; p=.037). No other variables in this structure significantly predicted HPV acquisition. (See Table IV.)

Table IV – Sexual Division of Power Regression Results* (N=213)				
Variable Label	**p value**	**Exp(B)**	**Lower CI**	**Upper CI**
Partner communication frequency	0.085	0.085	0.981	1.001
Condom self-efficacy	0.150	0.150	0.900	1.016
Workplace sexual harassment	0.037	1.101	1.006	1.203
Incarcerated partner	0.238	0.238	0.617	6.995
Sexual abuse (6 months)	0.373	0.373	0.492	6.613
Alcohol user	0.216	0.216	0.331	1.284

*controlling for age and experimental condition

Sexual Division of Labor Variables

Results of binary logistic regression on variables assigned to the labor structure suggest that participants who have completed one to two years of college were 96% less likely to acquire HPV than the reference group, participants who did not graduate from high school, (AOR=0.135; 95%CI=0.02, 0.77; p=.026). Partner's relative salary was also marginally significant and, thus, included in the final model. Participants whose main

partner's annual salary exceeded theirs by at least $3000 were 2.33 times more likely to acquire HPV than other participants (AOR=2.33; 95%CI=0.56, 6.83; p=.056). No other variables from within this structure significantly predicted HPV acquisition. (See Table V.)

Table V – Sexual Division of Labor Regression Results* (N=137)				
Variable Label	**p value**	**Exp(B)**	**Lower CI**	**Upper CI**
High school graduate	0.065	0.180	0.029	1.114
College, 1-2 years	0.026	0.135	0.023	0.786
College, 3-4 years	0.182	0.300	0.051	1.758
Partner's relative salary	0.056	2.333	0.978	5.565
Employed	0.296	1.951	0.557	6.831

*controlling for age and experimental condition

Structure of Cathexis Variables

No variables in the Structure of Cathexis predicted HPV acquisition at p≤.050. The most highly significant variable was monogamy. Results of this regression suggest that participants reporting only a main partner are approximately 53% less likely to acquire HPV than participants who reported both main and casual partners. (See Table VI.)

Table VI – Structure of Cathexis Regression Results* (N=107)				
Variable Label	**p value**	**Exp(B)**	**Lower CI**	**Upper CI**
Monogamous	0.089	0.467	0.194	1.124
Length of relationship (main)	0.984	1.000	0.978	1.023
Peer norms - masturbation	0.908	0.995	0.916	1.081
Expectation of marriage	0.711	0.828	0.306	2.246

*controlling for age and experimental condition

Final Model

Results of binary logistic regression on all previously significant variables suggest that participants who report consistent condom use in the last 30 days are more than 4 times more likely to acquire HPV (AOR=4.624; 95%CI=1.470, 14.454; p=.009). No other variables in this model were significant. (See Table VII.)

Table VII – Final Regression Results* (N=75)

Variable Label	p value	Exp(B)	Lower CI	Upper CI	Theoretical Structure
Consistent condom use	0.009	4.624	1.470	14.545	Behavior
Monogamous	0.213	0.679	0.151	1.524	Cathexis
College, 1-2 years	0.458	0.640	0.197	2.079	Labor
Partner's relative salary	0.738	1.208	0.400	3.652	Labor
Workplace sexual harassment	0.097	1.135	0.978	1.317	Power

*controlling for age and experimental condition

V. DISCUSSION

Conclusions

As this study shows, transmission of HPV is complicated, and may be difficult to predict. While a number of factors were significant in bivariate analysis, many of these variables were not significant in multivariate models. Interestingly, the only significant predictor identified in the final analysis was consistent condom use. However, contrary to expectation, consistent use of condoms actually predicted increased odds of HPV acquisition. There may be several reasons for this. First, this study did not attempt to measure condom skills. If participants used condoms consistently but incorrectly, some protective affect might be lost. Second, participants who use condoms consistently may also be more likely to have concurrent partners or to engage in serial monogamy. Third,

because of the biological mechanism by which HPV is transmitted, condoms, even when used consistently and correctly, do not afford complete protection. Because of this, if there is an association between consistent condom use and number of sexual partners in a particular sample, number of partners may mediate the relationship between condom use and HPV acquisition, making it seem as though condom use increases this risk.

Variables from both the labor and power structures significantly predicted HPV acquisition in multivariate analysis. From the Sexual Division of Labor structure, two variables were significant predictors of HPV acquisition. This suggests that a woman's ability to provide for herself, represented here by her educational attainment and her earning power in comparison to her partner's, impacts her tendency to acquire HPV. It is interesting to note that all three educational levels had an exponent indicating that such attainment decreased the risk of acquiring HPV, even though only one had sufficient power to be reported (See Table V.) It is also interesting to note that a woman's salary in and of itself was not significantly associated with HPV acquisition at the bivariate level (even at the level necessary for consideration in the multivariate model), meaning that women who acquired HPV over the course of the 12 months did not earn significantly more or less money than women who did not acquire HPV. It is only when the woman's income is disproportionate to her partner's that her risk is increased. This fits within our understanding of the TGP model by emphasizing the way that inequality with men affects women's health outcomes.

Within the sexual division of power structure, women's experiences of sexual harassment at work significantly predicted acquisition of HPV. TGP suggests that when women are repeatedly subjected to messages that portray them as sexual objects, they are

at increased risk for negative health outcomes. This idea is borne out by the results presented above. It must be noted that this variable was more important in predicting HPV acquisition than experiences of intimate partner violence, measures of personal empowerment within the relationship, or reported substance use. These results are particularly interesting because none of the studies described above included any such measures, making this a potentially unique finding.

No variables from the structure of cathexis were significant in either of the multivariate analyses. This may be, in part, because it is more difficult to obtain accurate measures of the themes that fall within this structure than those falling within other structures. Additionally, the variables encompassed by other structures may be more proximal to acquisition of HPV and may mediate the relationship between cathexis variables and the outcome, causing the significance of the cathexis variables to disappear in multivariate analysis.

Ultimately, we must remember that the three structures of TGP are considered inseperable by the theory, meaning that these distinct domains may influence one another as well as influencing behavioral and health outcomes. Therefore, while the significance of non-behavioral variables was not maintained in multivariate analysis, this does not mean that the domains of power, labor, social norms and affective attachments do not impact outcomes. It more likely indicates that more complex modeling is required to understand the relationships between these predictor and outcome variables.

Contrary to the literature, smoking was not predictive of HPV acquisition in this sample despite attempts to measure smoking in several different ways. Smoking was analyzed as a dichotomous variable in which participants were classified as smokers or

non-smokers, by frequency of smoking behavior (how many cigarettes per day), by duration of smoking behavior (how many years), and by a total dose variable which combined the frequency and duration measures. None of these variables were even marginally significant in bivariate analysis. (See Appendix I for bivariate p values.) This may be due to the extremely small portion of the sample that reported any smoking (7.4%, N=16) and the generally low frequency and duration of smoking.

Also contrary to the literature, the risk factors of participants' partners were not predictive of HPV acquisition. Several partner risk factors were analyzed including having a recently incarcerated partner, a partner with other partners, and a partner with an STD. Of these, only having an incarcerated partner was significant in bivariate analysis. This variable did not remain significant in multivariate analysis, however (See Table IV.) One reason for this may be that participants are not communicating well about risk factors with their partners and, thus, are not able to accurately report increased risk. Additionally, since only a few strains of HPV have any visible symptoms (those that cause genital warts, which were not tested for in this analysis), it is unlikely that participants would be aware that they needed to discuss potential risk for HPV with their partners.

Strengths and Limitations

The use of biological markers in selecting the sample and determining the outcome variable for this analysis is a particular strength of this study since it does not require the participants to be familiar with HPV or accurately report their HPV status. Additionally, the use of prospective data for the outcome variable allows the researcher to

describe the effects of risk factors on HPV acquisition rather than simply an association between HPV status and behavioral or psychosocial variables.

The study does, of course, have limitations. Because the sample was limited to single, sexually active, African American women in a particular geographic area, the results may not be generalizable to other groups. This analysis may have also been limited because it is secondary analysis of previously collected data. Since the author was not part of the research team that planned and implemented data collection, there is the possibility that she may have misinterpreted some variables, extrapolating meanings other than what was originally intended. Additionally, the author had no control over the variables assessed or the method of assessment. While analyses attempted to control for experimental condition, the sample would have ideally been limited to participants in the control arm since the intervention has been shown to affect sexual risk taking and STI acquisition.(53) Unfortunately, due to the low number of participants submitting biological specimens at follow up, sample size could not be limited in this way.

While TGP was a useful frame for thinking about the inclusion of variables and the structure of the initial series of regressions, the author did not fully consider the relationship between the three TGP structures, sexual behaviors, and disease acquisition in designing her analysis. In retrospect, a mediation model would have been a more appropriate final model and would have better explained the complex relationships between these domains.

Implications and Recommendations

Because of the unexpected relationship between condom use and HPV acquisition found in this analysis, it seems that further research should be done regarding how and

when women use condoms and why this might increase rather than decrease their risk for acquiring some types of STIs. It may also be valuable to explore the condom skills of women in this demographic. Depending on the results of these studies, further health education efforts should be undertaken to address specific barriers identified, raise awareness about how certain types of STIs are transmitted, and improve condom skills among women in this demographic.

Experiences of sexual harassment significantly predicted HPV acquisition, which fits well within the theoretical framework and is supported by similar associations found with experiences of sexual abuse.(35) Unfortunately, the link between experiences of this type of harassment, sexual risk behaviors, and sexual health outcomes are not well explored in the literature, especially when these experiences occur among adults. Further research should be done to more explicitly describe the link between experiences of sexual harassment, sexual risk behavior, and sexual health outcomes, and this research should be used to create resources to support individuals who have experienced such harassment and to more generally address the results of such harassment during other sexual health interventions.

This analysis highlights the importance of including psychosocial variables in addition to behavioral and demographic variables when attempting to identify risk factors. The majority of the previous studies on this topic had not examined psychosocial variables and, thus, had not included many of the variables included in multivariate analysis here as potential risk factors. These variables are particularly important to consider when developing interventions since they may highlight areas of concern that indirectly affect risk behaviors and health outcomes.

This analysis also reinforces that the relationship between psychosocial variables, behavioral variables, and disease acquisition is complex. The lack of significance in the regression model for the structure of cathexis especially seems to point to this, as does the significance of only the behavioral variable in the final, inclusive model. Future research should focus on developing more complex models and analyze the interrelatedness of these various domains.

Future research should also include more explicit analysis of sexual networks, partner concurrency, and partner risk factors. The findings in this analysis regarding intercourse with a risky partner were not expected based on the literature review. Additionally, while the analysis includes a measure of monogamy, this survey did not adequately measure whether women had concurrent partners or were engaging in serial monogamy. Several variables relating to this domain were significant in bivariate analysis, including number of partners in the last 12 months and existence of a casual partner, suggesting that the number of partners a woman has and how she classifies them may influence her risk of acquiring STIs. Since the monogamy measure was also significant in bivariate analysis and since the literature suggests that having concurrent partners may increase the risk of acquiring HPV, it seems that this is an important area for further research.(14)

This study reinforces the necessity of cultural tailoring for interventions. As mentioned above, some of the results of this analysis were not what would have been expected based on the literature review. Very few studies have focused specifically on African American women's risk factors for HPV acquisition, despite the high rates of cervical cancer morbidity and mortality in this population. Studies like this one that focus

on the experiences of a specific population allow for more carefully tailored interventions, which will be more effective in helping participants change behavior.

Additionally, this study highlights the value in allowing theory to guide study design, data collection instruments, and data analysis. The consideration of TGP in this analysis in addition to the literature review resulted in the inclusion of many variables that might not have otherwise been considered important. Considering the results of this analysis through the lens of TGP also allowed for a deeper level of interpretation than might have otherwise been possible.

The results of this analysis support the core idea of TGP, which is that women's health is affected by the inequalities they encounter in a patriarchal society. In order to truly eliminate this threat to women's health, we must continue to work towards equality between men and women at all levels of society. While educating and empowering women is important, we should also work to engage men in creating cultural changes through interventions that address couples or mixed gender groups of single adults.

Finally, the results of this analysis suggest that HPV acquisition is hard to predict and, thus, may be difficult to prevent. With this in mind, it is of immense importance that public health professionals continue to educate the public about the HPV vaccine and encourage young men and women to complete the vaccine series during the suggested time frame in order to decrease cervical cancer morbidity and mortality.

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Appendix I – Results of Bivariate Analysis

Demographics		
Variable Label	**Variable Type**	**p value**
Educational attainment	Categorical	0.016
Employment	Categorical	0.182
Employment (hours/week)	Continuous	0.384
Living situation	Categorical	0.403
Government assistance	Categorical	0.545
Financial independence	Categorical	0.588
Religious Y/N	Categorical	0.666
Religion	Categorical	0.788
Salary	Continuous	0.808

Partner Characteristics		
Variable Label	**Variable Type**	**p value**
Partner's relative salary	Categorical	0.059
Recently incarcerated partner	Categorical	0.184
Partner relative age	Continuous	0.349
Injection drug user partner	Categorical	0.530
Partner number of partners	Continuous	0.537
Typical partner age (general estimate)	Categorical	0.563
Partner w/ STI	Categorical	0.682
Partner w/ multiple partners	Categorical	0.745
Number of partner risks	Categorical	0.867
Risky partner Y/N	Categorical	0.922

Relationship Characteristics		
Variable Label	**Variable Type**	**p value**
Length of relationship (main partner)	Continuous	0.080
Monogamous	Categorical	0.131
Expectation of marriage	Categorical	0.131
Plans to remain in relationship	Categorical	0.145
Partner sexual abuse (6 months)	Categorical	0.199
Partner sexual abuse (ever)	Categorical	0.235
Partner physical abuse (6 months)	Categorical	0.243
Not invested in relationship	Categorical	0.573
Low investment in relationship	Categorical	0.690
Partner verbal abuse (6 month)	Categorical	0.810

Partner physical abuse (ever)	Categorical	0.897
Partner verbal abuse (ever)	Categorical	0.948
Has a main partner	Categorical	0.954
Financial dependence on partner	Categorical	0.966

Sexual Behavior and History		
Variable Label	**Variable Type**	**p value**
Estimated condom use (casual partners)	Categorical	0.002
Frequency of sex (30 days)	Continuous	0.005
Sex with casual partner	Categorical	0.027
Frequency of condom use (30 days)	Continuous	0.027
Number of partners (12 months)	Continuous	0.048
Fequency of sex (6 months)	Continuous	0.056
Frequency of condom use (6 months)	Continuous	0.079
Non-viral STI acquisition	Categorical	0.081
Oral contraceptive use	Categorical	0.082
Number of partners (6 months)	Continuous	0.130
Chlamydia acquisition	Categorical	0.154
Gonorrhea acquisition	Categorical	0.189
Masturbation frequency (30 days)	Continuous	0.243
Trichomoniasis acquisition	Categorical	0.269
Masturbation frequency (6 months)	Continuous	0.450
Female condom (used 6m prior)	Categorical	0.533
Transactional sex	Categorical	0.841
Female condom (discussed 6m prior)	Categorical	0.843
Female condom (plan to try next 6m)	Categorical	0.961

Substance Use		
Variable Label	**Variable Type**	**p value**
Smoking duration	Continuous	0.209
Uses alcohol	Categorical	0.276
Uses marijuana	Categorical	0.361
Uses other drugs	Categorical	0.446
Drug use frequency	Continuous	0.561
Alcohol use frequency	Continuous	0.613
Smoking frequency	Continuous	0.633
Smoker	Categorical	0.770
Marijana use frequency	Continuous	0.792
Smoking frequency (high/low)	Categorical	0.921

Smoking total dose	Categorical	0.974
Smoking duration (high/low)	Categorical	0.985

Psychosocial Variables		
Variable Label	**Variable Type**	**p value**
Partner communication frequency	Continuous	0.053
Condom self-efficacy	Continuous	0.057
Workplace sexual harassment	Continuous	0.061
Peer norms - masturbation	Continuous	0.104
Condom barriers - negative experience	Continuous	0.221
Peer norms - sex	Continuous	0.261
Stressful experiences - passive racism	Continuous	0.387
Stress coping - religious	Continuous	0.449
Condom barriers - STI stigma	Continuous	0.470
Sexual relationship options	Continuous	0.506
Peer norms - STI prevention	Continuous	0.513
Stress coping - substance use	Continuous	0.568
Stressful experiences - role success	Continuous	0.569
Stress coping - positive	Continuous	0.575
Condom barriers - oral sex	Continuous	0.582
Condom barriers - partner attitudes	Continuous	0.604
Stress coping	Continuous	0.616
Peer norms	Continuous	0.688
Self esteem	Continuous	0.699
Stressful experiences - caring for family	Continuous	0.761
Stressful experiences - disparities	Continuous	0.852
Experiences of racism	Continuous	0.864
Condom use barriers	Continuous	0.878
Stressful life experiences	Continuous	0.926
Control	Continuous	0.934
Religiousity	Continuous	0.936
STI knowledge	Continuous	0.970
Stress coping - negative	Continuous	0.978
Condom barriers - masturbation	Continuous	0.990