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Factors associated with pharyngeal gonorrhea in young people: Implications for prevention

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Abstract

Background—The objective of this study was to examine the proportion of missed infections and correlates of pharyngeal gonorrhea among young people attending public STD clinics.

Methods—We conducted a case control study of 245 young men and women between April 2012 and May 2014. Participants were eligible for inclusion if they were: (1) age 15 – 29 years, (2) reported giving oral sex to a partner of the opposite sex, in the past 90 days, and (3) attended one of twelve public STD clinics in Los Angeles County. Computer assisted self-interviews were used to collect information on sexual behaviors and tests were conducted for pharyngeal and urogenital gonorrhea.

Results—The majority of participants were less than 25 years of age (69%) and more than half were female (56%). We identified a total of 64 cases (27%) of gonorrhea of which 29 (45%) were a urogenital only infection, 18 (28%) were a pharyngeal only, and 17 (27%) were dually infected at both sites. Pharyngeal testing increased case finding by 39% from 46 cases to 64 cases. After adjusting for age, gender, and number of sex partners, those who reported consistent pharyngeal exposure to ejaculate/vaginal fluids were three times as likely to have pharyngeal gonorrhea as compared to those without this exposure (adjusted odds ratio=3.1; 95% CI: 1.3-7.5).

Conclusion—A large proportion of gonorrhea cases among young people would be missed in the absence of pharyngeal testing. These results have implications for those who provide medical care to clients at STD clinics and highlight the need for pharyngeal screening recommendations and counseling messages related to strategies to reduce exposure to infected fluids.

Keywords

gonorrhea; oral sex; young people

Introduction

Infections with *Neisseria gonorrhoeae* are a significant public health problem and represent the second most common reportable disease in the United States. In 2016 over 460,000 cases of gonorrhea were reported, which represents a 19% increase since 2015.¹ Additionally,

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gonorrhea infections disproportionately affect young people, with 20-24 year-old men and women highest rates of gonorrhea in 2016 (616.8 and 595.5 per 100,000 respectively).¹ Gonorrhea can cause substantial morbidity and serious health complications, particularly in women, including ectopic pregnancy, chronic pelvic pain, infertility and can increase the risk of transmission and acquisition of HIV.²⁻⁴

Most reported cases of gonorrhea are based on urogenital testing and information on the epidemiological significance of pharyngeal infections is limited. Among men who report sex with men (MSM), pharyngeal gonorrhea is well documented with the prevalence ranging from 2-11%.⁵⁻⁷ Data among heterosexuals are limited, however, pharyngeal gonorrhea has been noted in 3-7% of heterosexual men and 2-10% of women.¹⁰⁻¹⁴ Although the majority of women and heterosexual men report oral sex, most clinics do not routinely offer screening of the oropharynx. In fact, current screening guidelines recommend screening for pharyngeal gonorrhea among MSM who report receptive oral sex, though no such recommendations are in place for non-MSM populations.¹⁵

Transmission of gonorrhea to the pharynx is thought to be more efficient through oral-penile contact than oral-vaginal contact.¹⁶ Furthermore, there is increasing evidence of pharynx to genital transmission of gonorrhea.¹⁷⁻²⁰ In one study, the prevalence of pharyngeal gonorrhea among men whose only urethral exposure was receiving oral sex from women was 3.1%, which was comparable to the 4.1% prevalence noted among MSM seen at the same clinic.²⁰ These data suggest that pharyngeal infections may serve as an important reservoir and source of urethral gonorrhea, and that oral sex may be contributing to the ongoing transmission of gonorrhea between men and their female sex partners. Moreover, gonococcal infections in the pharynx are more difficult to eradicate than infections at urogenital sites.²¹ Consequently, gonorrhea infections of the pharynx require a different treatment strategy further stressing the importance of the pharynx as a reservoir for continual transmission of gonorrhea and a potential source of drug resistant strains of gonorrhea.

Very little is known about the epidemiology of pharyngeal gonorrhea among young people. Understanding factors that place young people at increased risk for pharyngeal gonorrhea is not only critical to understanding the contribution of these infections to the maintenance of high endemic rates of gonorrhea among young people, but will also help us develop more appropriate STI risk reduction messages and interventions. Therefore, we sought to investigate the correlates of pharyngeal gonorrhea among young people attending public STD clinics, including individual and partnership level behaviors, knowledge, and attitude.

Methods

Study setting and participants

This was a case control study of young men and women visiting public STD clinics in Los Angeles County between April 2012 and May 2014. Those presenting to the clinics for Chlamydia/gonorrhea testing were informed of the study by clinic staff and potentially eligible participants were then referred to study staff located at the clinic. Recruitment of study participants was based on a consecutive sample of those who met the eligibility criteria. Participants were eligible for inclusion in the study if they were: (1) age 15 – 29

years, (2) reported giving oral sex to a partner of the opposite sex, in the past 90 days, and (3) attended one of twelve public STD clinics in Los Angeles County. All participants provided written consent for screening procedures which included verification of eligibility criteria as well as screening for pharyngeal gonorrhea. Given that pharyngeal gonorrhea screening was not routine practice in the clinics, we conducted active screening in order to identify participants with and without pharyngeal gonorrhea. By design we aimed to recruit individuals that were pharyngeal gonorrhea positive (cases) as well as those who were negative (controls). Those who were eligible and interested in participating also completed a self-administered questionnaire on sexual risk behaviors. Participants provided written informed consent and received \$25 for their time. The study was approved by the Institutional Review Board at the University of California Los Angeles and the Los Angeles County Department of Public Health.

Data collection

The study survey was administered using a web-based, computer assisted self-interview and took approximately 45 minutes to complete. The questionnaire collected information on demographics, sexual practices and risk behaviors, and attitudes and behaviors surrounding oral sex. In answering questions regarding oral sex, participants were asked to consider oral sex as mouth contact with vagina, penis, or anus. Participants were asked how they would rate the intimacy of oral sex using a 5-point likert scale ranging from not at all intimate to extremely intimate; they were also asked to describe partnerships they would feel comfortable giving oral sex including a main partner, a casual partner, one-time partner, or trade partner. In order to assess exposure to vaginal fluids and/or semen during oral sex, participants were asked “In the past 3-months when you have given oral sex, on how many of these occasions did your partner cum (ejaculate or squirt) in your mouth?” This question was followed by “In the past 3 months when you have given oral sex, on how many of these occasions did you swallow the cum (ejaculate or squirt)?” In order to assess concurrent partnerships, participants were asked to think about their sex partners in the past 6 months and they were presented with the following definition of concurrency: “Sometimes two people in a sexual relationship have sex with each other and do not have sex with anyone else outside of the relationship. Other times one or both people in a sexual relationship also have sex with other people. For example, during the first three weeks in January, Jamie and Alex had sex with each other on a number of different occasions. During these same three weeks, Jamie also had sex with two other people. Alex had sex with one other person during this same time.” Participants were then asked during the time they were sexually active with each of their last three partners (in the past 6 months), how many other people did they have sex with. Transactional sex was assessed by asking participants how many times they had been paid to have sex in the past 12 months. Substance use with sex was measured by providing a list of drugs including Marijuana, methamphetamine, cocaine, ecstasy, etc. and asking which, if any of the drugs were used during sexual acting in the past 12 months.

All study participants were tested for pharyngeal gonorrhea and urogenital Chlamydia and gonorrhea using nucleic acid amplification testing with Gen-Probe Aptima Combo 2[®] test (San Diego, CA). All laboratory tests were conducted by the Los Angeles County Public

Health Laboratory, which has validated the use of Gen-Probe Aptima Combo 2[®] test for detecting *N. gonorrhoeae* in pharyngeal swabs.

Statistical Analysis—Descriptive statistics including mean, range, and frequency distributions were performed for all demographic and risk behavior characteristics. Differences between groups were evaluated using t-tests, chi-square methods, and Fisher's exact test as appropriate. Logistic regression analysis was used to investigate the associations between pharyngeal gonorrhea and other factors including demographic characteristics, substance use, and other risk behaviors. Variables tested for inclusion in the multivariable models were based on bivariate analyses or specified *a priori* as risk factors based on the existing literature. Given the correlated nature of some of our covariates of interest, collinearity was assessed using correlation coefficients and variance inflation factor and multivariable models were developed in such a way as to limit multi collinearity. All analyses were conducted using SAS version 9.4 (SAS Institute, Cary NC).

Results

Characteristics of study population

Among the 245 participants enrolled in the study, the majority were less than 25 years of age (69%), slightly more than half identified as female (56%), and African Americans comprised the largest race/ethnicity group (50%), followed by Hispanics (35%) (Table 1). We identified a total of 64 cases (27%) of gonorrhea of which 29 (45%) were a urogenital only infection, 18 (28%) were a pharyngeal only infection, and the remaining 17 (27%) were dually infected at both urogenital and pharyngeal sites (Table 1). In the absence of pharyngeal gonorrhea testing 18 out of the 64 cases (28%) would have been missed.

Practices and behaviors surrounding oral sex

Given our inclusion criteria all participants reported having oral sex in the past 3 months. The majority of participants (88%) reported never using condoms or dental dams for oral sex (Table 2). Slightly more than half reported that they felt that giving oral sex was extremely or very intimate, with few reporting that they felt comfortable giving oral sex in casual or one-time partnerships (28% and 7% respectively). Attitudes around oral sex were comparable for men and women with the exception of partnership type with fewer women feeling comfortable giving oral sex to a casual partner as compared to men (19% vs. 40%; *p* value <.01; data not shown).

Prevalence of demographic and sexual risk behaviors by pharyngeal gonorrhea status

While age distribution and gender did not vary by pharyngeal gonorrhea status, a greater proportion of those who reported same sex partners had pharyngeal gonorrhea (Figure 1). Being incarcerated was not associated with pharyngeal gonorrhea. However, among those with pharyngeal gonorrhea, the proportion who reported having a sex partner who was incarcerated in the past 12 months was higher (24%) when compared to those without pharyngeal gonorrhea (14%; *p* value=0.04). While other factors such as homelessness, transactional sex, and concurrent partnerships were higher among those with pharyngeal

gonorrhea as compared to non-pharyngeal gonorrhea controls, these differences were not statistically meaningful (Figure 1).

Given that none of the participants reported consistent use of condoms or barrier methods for oral sex acts in the past three months, we explored potential pharyngeal exposure to seminal and vaginal fluids. We found that a higher proportion of those with pharyngeal gonorrhea reported having a partner (male or female) ejaculate in their mouth as compared to those without pharyngeal gonorrhea (35% vs. 19%; p value=0.01)(Figure 1). Furthermore, a higher proportion of those who reported swallowing ejaculate/vaginal fluids had pharyngeal gonorrhea as compared to those who did not report swallowing (29% vs. 15% respectively; p value=0.01).

Factors associated with pharyngeal gonorrhea

Based on multivariable analyses and after adjusting for age and gender, the number of oral sex partners was independently associated with pharyngeal gonorrhea with those who reported 5 or more oral sex partners having a nearly 6-fold increased odds of pharyngeal gonorrhea as compared to those with 1 oral sex partner (adjusted odds ratio [AOR]=5.7; 95% confidence interval [CI]:1.3-25.6)(Table 3). Those who reported consistent exposure to ejaculate/vaginal fluids (as a result of oral sex) were three times as likely to have pharyngeal gonorrhea as compared to those without this exposure (AOR=3.1; 95% CI: 1.3-7.5).

Discussion

Oral sex is a widely practiced behavior, yet there is a dearth of research about behaviors associated with infections of the pharynx among men and women who report opposite sex, sex partners. Increased availability of pharyngeal testing for STIs and the recent spike in the prevalence of STIs in the US highlights the need for a better understanding of the risks for pharyngeal infections. Findings from our study indicate that pharyngeal gonorrhea in the absence of a concomitant urogenital infection is relatively common among young people attending public STD clinics, with up to 28% of infections being missed in the absence of pharyngeal testing. Moreover, we find that factors independently associated with pharyngeal gonorrhea include the number of oral sex partners, the level of oral exposure to vaginal/seminal fluids, and a concomitant urogenital infection with gonorrhea. This provides important evidence for the need to broaden counseling and education about risks for STIs to include oral sex, the need for providers to ask about specific sex acts during risk assessment especially among those with urogenital gonorrhea,¹⁵ and reinforces that oral sex exposure *IS* sexual exposure.

Prior studies have demonstrated the importance of extra-genital testing among MSM, with evidence indicating that one-third of gonorrhea infections would be missed in the absence of pharyngeal testing.^{5,6} Evidence indicative of missed infections, along with the high disease burden has resulted in guidelines for extragenital testing among MSM,²⁴ though no such recommendations exist for other high risk non-MSM populations. Findings from our study suggest that pharyngeal testing in other high risk non-MSM populations, such as young people seeking care at STD clinics may be warranted. A limited number of studies have explored the utility of pharyngeal screening, particularly among women and note that testing

women may not be cost-effective with the number of patients needed to test to diagnose a single extra-genital infection being 6- to 10-fold higher among women when compared to MSM.²⁵ However, overall morbidity in this study population was lower than that noted in our study with a prevalence of 2.8% and 4.3% for genital gonorrhea among women and men respectively.²⁵ Our study design precluded us from estimating the prevalence of gonorrhea, however, morbidity reporting data from the same clinics this study population was recruited suggest that the prevalence of gonorrhea among young people served in these clinics is high with a prevalence of 6.9% among women and 10.3% among men.²⁶ This along with our data showing that the proportion of infections missed suggest that the utility of pharyngeal screening is likely to be higher and may be essential in this population in order to disrupt ongoing transmission and the high endemic rates of gonorrhea among young people.

Oral sex, which is only defined as having “had sex” by a minority of young people,²⁷ is also a commonly practiced behavior,²³ particularly among those in serious relationships (more so for women than men), suggesting a need to be more inclusive in our dialogue about oral sex as a sexual health issue. Additionally, our findings support other studies that show condom/barrier method use with this behavior was rare.²³ This may partly reflect the fact that most reported feeling comfortable giving oral sex in the context of main partnerships, where condom use in general was likely to be lower. Our results also extend the limited data on factors associated with pharyngeal infections and we find that the level of exposure to vaginal/seminal fluids is important with the odds of pharyngeal gonorrhea increased for those who report increased exposure to vaginal/seminal fluids including swallowing. Together, these data suggest that prevention strategies and counseling messages that include a discussion about limiting exposure to these fluids that go beyond the use of condoms/barrier methods may be useful. Young people and those most at risk for these infections could be made aware of the potential heightened risk for gonorrhea from swallowing vaginal/seminal fluids and there could be utility in counseling patients to spit more than they swallow. Furthermore, recent evidence of the preliminary efficacy and acceptability of the use of antiseptic mouthwash for the prevention of pharyngeal gonorrhea provides yet another potential option for a non-condom based prevention strategy.^{28,29}

Our findings should be interpreted in light of some of the limitations of this study. Assessment of oral sex and other sexual behaviors was based on self-report. Although this information was collected using self-interviews, data on socially stigmatized or illicit activities may suffer from reliability and validity issues resulting in response bias and potential underestimation of these behaviors.^{30,31} Given that we defined oral sex to include genital and anal contact, it precludes us from disentangling differences in pharyngeal gonorrhea between those oral and penile/vagina contact as compared to oral-anal contact (i.e. rimming). While other STIs with similar epidemiology – namely chlamydia – may be transmitted through oral sex, this study only assessed pharyngeal gonorrhea given the lack of a validated and approved test for pharyngeal chlamydia during the time this study was conducted. Consequently, it is likely that our study underestimates and misclassifies the true extent of pharyngeal infections. Finally, the participants in this study were based on a convenience sample of those attending public STD clinics who reported oral sex as an exposure, and may not be representative of all young people attending sexual health clinics.

Our results highlight the fact that a relatively large number of infections in this population would be missed in the absence of pharyngeal testing. This along with other data demonstrating that once a pharyngeal infection is established bacterial loads in the pharynxes and the saliva are high enough that gonorrhea can be transmitted via sexual practices involving exposure to saliva, suggests that these infections may contribute to ongoing high endemic rates among young people.³² These results have implications for those who provide medical care to clients at STD clinics and highlight the need for pharyngeal screening recommendations for young people, specific patient counseling messages related to strategies to reduce exposure to infected fluids, and the potential for transmission of STIs with oral sex.

Acknowledgments

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Summary

A study of young people attending public STD clinics found a large proportion of gonorrhea cases would be missed in the absence of pharyngeal testing and factors associated with pharyngeal gonorrhea suggest the potential for continued transmission/ acquisition of these infections.

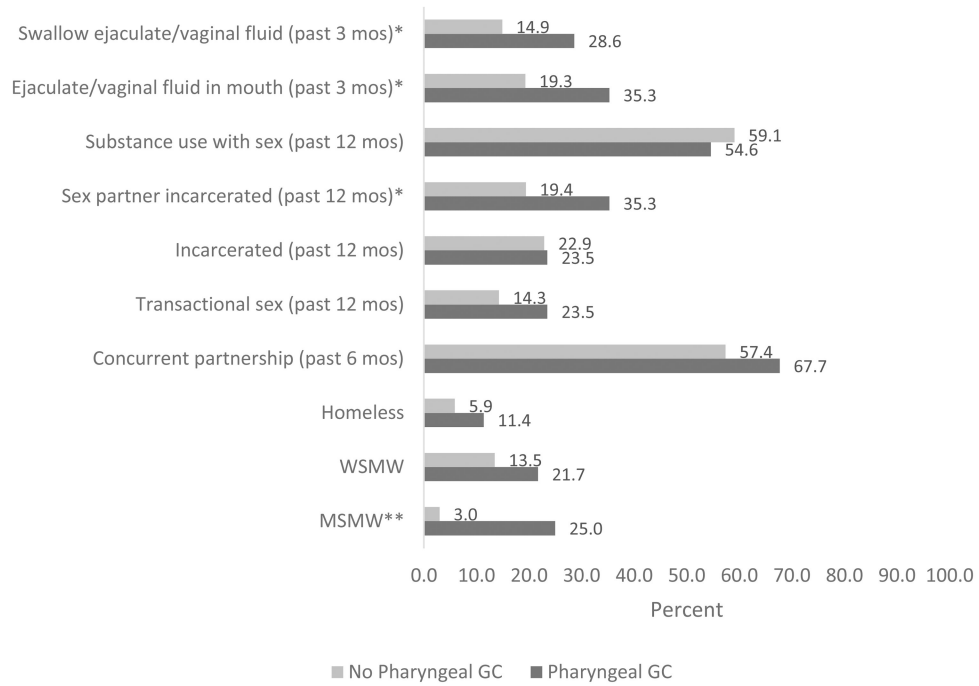


Figure 1. Prevalence of risk behaviors by pharyngeal gonorrhea status among participants in the pharyngeal gonorrhea study, April 2012 - May 2014 (n=245)

*p <.05; **p<.01

Abbreviations. Mos=Months; MSMW=Men who have sex with men and women;

WSMW=Women who have sex with men and women, Homelessness reflects housing status at the time the study questionnaire was completed

Table 1
Demographic and sexual risk behavior characteristics of participants enrolled in the pharyngeal gonorrhea study, April 2012 - May 2014 (n=245)

	n	%
<i>Sociodemographic Characteristics</i>		
Age, years		
15-19	52	21.2
20-24	118	48.2
25-29	75	30.6
Female	138	56.3
Race/Ethnicity		
African American	123	50.2
Hispanic	85	34.7
White	21	8.6
Other	16	6.5
Gender of Sex Partners, by gender		
MSW	101	43.7
MSMW	6	2.4
WSM	118	48.2
WSMW	20	8.2
<i>Sexual Risk Behaviors</i>		
Age at first sex [^]	16	(14-17)
Number of sexual partners, lifetime [^]	11	(6-23)
Number of sexual partners, past 3 months [^]	2	(1-3)
Concurrent partnerships, past 6 months	134	58.1
Partner with concurrent partnership, past 6 months	115	51.8
Transactional sex, past 12 months	34	15.3
Incarcerated, past 12 months	50	22.7
Sex partner incarcerated, past 12 months	49	22.2
Never or rarely uses condoms for vaginal intercourse, past 3 months	114	47.0
Substance use with sexual activity, past 12 months	128	57.9
Cocaine	22	10.0
Ecstasy	20	9.1
Marijuana	117	52.9
Methamphetamine	14	6.3
Synthetic marijuana (K2/spice)	8	3.7
<i>Laboratory confirmed STI, by anatomical site</i>		
Urogenital Chlamydia	34	14.2
Gonorrhea	64	27.4
Pharyngeal gonorrhea only	18/64	28.1
Urogenital gonorrhea only	29/64	45.3
Pharyngeal and urogenital gonorrhea	17/64	26.5

Abbreviations. MSW=Men who have sex with women; MSMW=men who have sex with men and women; WSM=women who have sex with men; WSMW=women who have sex with men and women

^ data represent median and interquartile range (IQR)

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Table 2
Practices and attitudes surrounding oral sex, among participants in the pharyngeal gonorrhea study, April 2012 - May 2014 (n=245)

	n	%
Number of oral sex partners, past 3 months [^]	1	(1-2)
Number of times given oral sex, past 3 months [^]	4	(2-10)
Never or rarely use condoms/dental dams for oral sex, past 3 months	215	88.1
Intimacy of oral sex, extremely/very intimate	136	58.1
Type of relationship comfortable giving oral sex		
Main partner	206	84.7
Casual partner	68	28.0
One time partner	17	7.0
Trade partner	4	1.7
Reasons for giving oral sex [*]		
Feels good for you, the giver	108	44.4
Feels good for your partner, the receiver	179	73.7
To have power over partner	46	18.9
Convenience	26	10.7
To avoid other sexual activities	14	5.8
To avoid risk of pregnancy	10	4.2
To avoid STIs	2	0.8
Knowledge of STIs you can get from giving oral sex		
Chlamydia	143	64.7
Gonorrhea	186	80.5
Herpes	188	84.7
HIV	118	57.8
HPV	114	56.1
Syphilis	120	56.6

[^] data represent median and interquartile range (IQR)

^{*} Proportion exceeds 100% because participants could select all reasons that apply

Table 3
Factors associated with pharyngeal gonorrhea among participants in the pharyngeal gonorrhea study, April 2012 - May 2014 (n=245)

	OR	(95% CI)	Adjusted OR	(95% CI)
<i>Sociodemographic Characteristics</i>				
Age, years				
15-19	2.2	(0.8-6.2)	2.1	(0.7-6.9)
20-24	1.7	(0.7-4.3)	1.6	(0.6-4.4)
25-29	1.0	Reference	1.0	Reference
Female	1.6	(0.8-3.4)	1.2	(0.6-2.8)
Race/Ethnicity				
African American	1.8	(0.4-8.5)	--	--
Hispanic	1.7	(0.4-8.4)	--	--
Other	0.7	(0.1-8.2)	--	--
White	1.0	Reference	--	--
Homeless [^]	2.1	(0.6-6.8)	--	--
<i>Gender of Sex Partners</i>				
MSMW	9.9	(1.7-56.4)	--	--
MSW	1.0	Reference	--	--
WSMW	1.8	(0.6-5.5)	--	--
WSM	1.0	Reference	--	--
<i>Sexual Risk Behaviors</i>				
Number of sex partners, past 3 months				
1	1.0	Reference	--	--
2-4	1.9	(0.8-4.1)	--	--
5+	2.0	(0.6-6.2)	--	--
Number of oral sex partners, past 3 months				
1	1.0	Reference	1.0	Reference
2-4	2.5	(1.2-5.5)	3.3	(1.4-7.8)
5+	4.1	(1.1-15.1)	5.7	(1.3-24.6)
Concurrent partnerships, past 6 months ^{^^}	1.6	(0.7-3.4)	--	--
Partner with concurrent partnerships, past 6 months ^{^^}				
Yes	1.4	(0.5-3.9)	--	--
Don't Know	0.6	(0.2-2.2)	--	--
No	1.0	Reference	--	--
Transactional sex, past 12 months ^{^^^}	1.8	(0.8-4.5)	--	--
Incarcerated, past 12 months	1.0	(0.4-2.3)	--	--
Sex partner incarcerated, past 12 months	2.3	(1.1-5.0)	--	--
Partner ejaculates in mouth, all of the time, past 3 months [*]	3.6	(1.2-10.5)	3.1	(1.3-7.5)
Swallows ejaculate/vaginal fluids, all of the time, past 3 months [*]	2.3	(1.0-5.3)	2.5	(1.1-6.3)
Substance use with sexual activity, past 12 months				

Any drugs	0.8	(0.4-1.8)	--	--
Marijuana	1.1	(0.5-2.2)	--	--
Ecstasy	1.0	(0.3-3.6)	--	--
Methamphetamine	1.5	(0.4-5.9)	--	--
Cocaine	0.9	(0.2-3.1)	--	--
Laboratory confirmed STI				
Urogenital gonorrhea	5.7	(2.6-12.4)	6.2	(2.6-14.3)
Urogenital Chlamydia	0.7	(0.2-2.2)	--	--

Abbreviations. MSW=men who have sex with women; MSMW=men who have sex with men and women WSM=women who have sex with men; WSMW=women who have sex with men and women; OR=Odds ratio;CI=Confidence Interval

^ Homelessness reflects housing status at the time the study questionnaire was completed

^^ Concurrency defined as sexual partnerships that overlap in time

^^ Transactional sex defined as receiving money for sex

* given the highly correlated nature of exposure to and swallowing of ejaculate/vaginal fluid two separate models were developed with each model adjusting for one and not the other factor as well as all other variables listed

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