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Gender differences in risk taking behaviors for *Chlamydia trachomatis*.

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Abstract

Chlamydia Trachomatis (CT) is a global problem. We compared the risk taking behaviors for CT infection between men and women. Adults (2299 females, 5559 males) were administered the Risk Behavior Assessment. In women, CT was associated with candidiasis, in men with gonorrhea, genital warts, and syphilis. Risk factors for both genders were trading sex for money, use of marijuana for women, and use of Ecstasy and Viagra for men. Those with CT had higher risk perception for HIV infection and were more likely to obtain HIV testing. Patient teaching and concurrent testing for HIV and CT are imperative.

Keywords

Chlamydia trachomatis; Ecstasy; Viagra; Candidiasis

Globally, *Chlamydia trachomatis* (CT) infection is the most commonly reported sexually transmitted infection (STI), mainly affecting young individuals between the ages of 15-24 (Centers for Disease Control and Prevention, (CDC) 2017, 2018; Gravningen, Furberg, Simonsen, & Wilsgaard, 2012; Kenyon, Buyze, & Colebunders, 2014). The researchers' purpose in conducting this study was to compare gender differences in risk taking behaviors and factors for CT.

In 2012, more than 1.4 million cases of CT infection were reported to the CDC (2018). The annual cost of treating STIs in the US is about \$16 billion dollars and among the non-viral STIs, CT has the highest annual cost at \$516.7 million (CDC. 2017, 2018). In 2008, the estimated lifetime cost per case of CT infection was \$30 in men and \$364 in women (Owusu-Edusei et al., 2013). CT had the highest incidence of any STI in a study of Female Sex Workers (FSW) in northern Mexico (Bazzi et al., 2015).

High risk behaviors/factors for Chlamydia Trachomatis

Age

Age is a strong predictor of risk for CT infections with the highest rates occurring in young females between the ages of 15-24 (Centers for Disease Control and Prevention, 2018) and young age at first intercourse was found to be a risk for CT infections (Kaestle, Halpern, Miller, & Ford, 2005). The highest prevalence is in adolescents of both genders with a decrease in prevalence for each increasing five-year period in age (Stamm, 1999). Norwegian investigators found that CT prevalence in participants aged 15-19 was 11%, but was only 5% among those 20-24 (Hagemann, Nordbo, Myhre, Ormstad, & Schei, 2014).

The prevalence, risk factors, and sequelae of CT infection is different in women compared to men, so the emphasis in this manuscript is on gender differences. For instance, it is more often diagnosed in adolescent females than in males. CT infections are ten times more prevalent than gonorrhea infections (4.7% vs: 0.4%) in women aged 18-26 (Miller et al., 2004). Also, in 2012 the rate of CT infections in females (6433 cases/100,000) was more than double the rate in males (262.6 cases per 100,000)(CDC, 2018). Although CT infections are mostly asymptomatic when they do occur in women, infection is associated with mucopurulent cervicitis, Bartholinitis, endometritis, salpingitis, and urethritis (Stamm, 1999). In women, 10-20% of untreated infections lead to pelvic inflammatory disease, ectopic pregnancy, and infertility (US Preventive Services Task Force, 2016). When women have CT infection during pregnancy this puts their newborn at risk for infant conjunctivitis and pneumonia (Schachter, 1999).

In men, the most common symptoms are nongonococcal urethritis and postgonococcal urethritis, and in untreated cases, epididymitis, proctitis, conjunctivitis, Reiter's syndrome and reactive arthritis (Stamm, 1999). Risk factors for CT infection in men have not been extensively studied (Stamm, 1999), hence this is another motivation for our approach of examining gender differences.

Co-Infection

The major co-infection for CT is *Neisseria gonorrhoeae* (NG). CT/NG co-infection was a major risk factor for repeat positivity on retesting in a New Zealand study (Rose, Garrett, Stanley, & Pullon, 2017) and 51% of the women in a study in India were co-infected with CT and NG (Sonkar et al., 2017). In a study in Germany 41% of women and 17% of men with NG infection also had CT infection (Abraham, Poehlmann, & Spornraft-Ragaller, 2013), and Greek researchers who did a study of men with CT infection found that 30% were co-infected with GC. This common co-infection is also shown in a study of heterosexual men in Italy which showed that 30.1% of those with CT infection also had NG infection (Donati et al., 2009). Alabama researchers found that female adolescents testing positive for CT were also more likely to be positive for NG (Williams et al., 2002).

There has been some research interest in the co-infection of CT and Human Papillomavirus (HPV) because of the suggestion that the co-infection may play a major role in cervical neoplasia and investigators in Brazil found a co-infection prevalence of 27.4% (da Silva Barros et al., 2012). Hwang, Ma, and Moscicki (2014) studied young women in San

Francisco and found that incident CT was independently associated with previous HPV infection. There have also been reports of CT and HPV coinfection in men in Japan (Shigehara et al., 2011), in Italy (Comar et al., 2017), and in a multisite study of men in the United States, Mexico, and Brazil (Alberts et al., 2013). There has also been some interest in the literature with the co-infection with syphilis. Italian researchers found CT/syphilis infection in 6.8% of heterosexual men with urethritis (Donati, et al., 2009). CT infections of the genital tract can facilitate transmission of human immunodeficiency virus (HIV) (Babinska et al., 2017; and those who were positive for CT infection perceive that their risk for HIV infection was significantly higher than those who did not have CT infection (Leichliter, Williams, & Bland, 2004). There are very few reports in which a cohort had been assessed for both CT and candidiasis, however a Tennessee study which did report both failed to find an association between CT infection and candidiasis among pregnant adolescents (Chokephaibulkit, Patamasucon, List, Moore, & Rodriguez, 1997).

Substance Abuse

Drug and alcohol use, especially binge drinking are strong predictors of engaging in high risk sexual behaviors which increases the chances of contracting STDs and CT (NIH, 2019). Hutton et al. (2008) and NIH (2019) have shown that the earlier a person engages in drug use, the higher the risks for developing serious problems in the brain which can have profound and long lasting effect. The part of the brain that is still developing in the adolescent is the prefrontal cortex. This part of the brain enables a person to assess situations, make sound judgment/decisions and keep emotions and desires under control. Drugs put teenagers at increased risk for making poor decisions such as experimenting with drugs and continuing to take them. Impaired judgment has also been observed in adults who use drugs leading them to practice unprotected sex, which increases the risks of HIV and STD transmission.

The prevalence of STDs among homeless and illicit drug users is not uncommon (Fisher, Reynolds, Creekmur, Johnson, & Deaugustine, 2007; Gravningen, et al., 2012). Marijuana use has been reported to be associated with CT infection (Haar et al., 2013) The association between CT infection and marijuana use holds up even when confirming the marijuana use with urine testing (Liau et al., 2002). Researchers who conducted a clinical trial comparing three different interventions found that those in the sexual-risk-reduction-plus-alcohol-plus-marijuana intervention had lower incidence for CT infection when compared to both sexual-risk-reduction only, and sexual-risk-reduction-plus-alcohol only interventions (Bryan et al., 2018).

There is one report of a study of adolescent women in Alabama who were depressed and took Ecstasy who were likely to have incident CT infection (Jackson, Seth, DiClemente, & Lin, 2015). There have been several reports of methamphetamine use being a risk factor for STIs in general, but a more specific association between methamphetamine and CT has also been reported (Reback and Fletcher, 2018). Alabama investigators showed no association between erectile dysfunction medication and CT (Heudebert, Tamhane, Burkholder, & Dionne-Odom, 2019). We have been unable to find any reports of an association between ecstasy (methylenedioxymethamphetamine MDMA) use and CT infection in men. However,

researchers have reported an association between ecstasy use and use of the erectile dysfunction medication of Viagra (sildenafil) (Wei, Guadamuz, Lim, Huang, & Koe, 2012).

Multiple Sex Partners and Sex Trading

Other risk factors for CT infections include engaging in sexually high risk behaviors of having multiple sex partners, inconsistent condom use, exchanging sex for money or drugs (Clingan et al, 2019). Engaging in group sex was associated with buying sex, condomless vaginal sex, and STI including CT (Buttram, Pagano, & Kurtz, 2018). Both women and men who had four or more sex partners were at significantly more risk for STI treatment in public STD clinics (Leichliter, et al., 2004). Factors associated with female sex workers (FSW) who were positive for CT in Tijuana Mexico were being younger and recent methamphetamine injection (Loza et al., 2010). FSWs who are engaging in survival sex and are also drug users may have difficulty negotiating condom use by their partners (Duff et al., 2013; The highest proportion of positive tests for any STI was for CT among FSWs in Germany (Bremer, Haar, Gassowski, Hamouda, & Nielsen, 2016). Adolescent women who had multiple sex partners were more likely to test positive for CT. CT infection was found to be more common in women with multiple sexual partners (Muzny et al., 2017) than women with one or no sex partners.

Sexual Orientation

Sexual orientation is another factor that must be taken into consideration when examining CT risk. Women who have sex only with women (WSW) are less likely to report prior infection with CT (Molin, De Blasio, & Olsen, 2016). Researchers in STD clinics and sexual health centers have shown CT infection among WSW to be uncommon (Gorgos and Marrazzo, 2011). However, family planning clinics have found WSW and women who have sex with men and women (WSMW) to have higher CT positivity than women who only have sex with men (WSM) (Singh, Fine, & Marrazzo, 2011).

Conceptual Framework

The conceptual framework for this study is a social-behavioral model that asserts that STI “acquisition is a function of exposure to infection, the probability of exposure to infection, the probability of infection if exposed and the probability of disease if infected” (Tanfer, Cubbins, & Billy, 1995, p. 3). The mathematical underpinnings of this conceptual framework are outlined in a discussion of the behavioral component of transmission dynamics of STIs (Anderson, 1991). In our framework, the probability of exposure is a function of the number of new sex partners and the probability that any partner is infected (Hypothesis 1). Our framework also states that the probability of infection after exposure is a function of biological variables (Hypothesis 2). Another aspect dealing with the susceptibility of the host is behavioral factors such as types of sexual behavior, frequency of sexual contact, and preventive health care such as the use of condoms (Hypothesis 3). Research to date focused on CT has been mainly on adolescents and young adults in the general population. The purpose of this study was to investigate the gender differences in behavioral determinants of the most common of all STDs, CT. Our hypotheses were as follows:

H1: CT infection is associated with the number of sex partners and with sex trading.

H2: CT infection is associated with co-infection of other STIs.

H3: CT infection is associated with penile-vaginal intercourse, so we would predict that women who have sex only with women will be less likely to have CT. Also, drug abuse and sex trading will be associated with CT given an associated lack of judgement and lack of power to negotiate condom use.

Method

The research protocol was approved by the California State University, Long Beach, Institutional Review Board and all participants signed the approved informed consent form. Participants ($N=7858$ --2299 females and 5559 males)) were recruited through various programs offered by the Center for Behavioral Research and Services (CBRS) which drew participants from Service Planning Area 8 of Los Angeles County from 2000 through August 2014. CBRS is located in a low-income neighborhood that is between two gang-injunction areas. Participants were compensated \$5 to \$20 depending upon which study they were enrolled in and they had the option of participating in more than one study.

All participants were administered the Risk Behavior Assessment (RBA) which is a structured interview developed by the Community Research Branch of the National Institute on Drug Abuse (NIDA) in collaboration with grantees of the Cooperative Agreement for HIV/AIDS Outreach/Intervention program. In addition to asking questions about demographics, the RBA also collects information about drug use, sexual behavior, and selected items on health history. The reliability of the drug and sex behaviors has been assessed as well as validity of recent drug use (Dowling-Guyer, Johnson, Fisher, & Needle, 1994). The reliability and validity of the HIV, and syphilis has been published (Fisher, Reynolds, Creekmur, et al., 2007; Fisher, Reynolds, Jaffe, & Johnson, 2007), as well as the reliability of the gonorrhea (Paschane, et al., 1998) and *Chlamydia* (Fisher, Reynolds, Neri, Noda, & Kraemer, 2019).

Data Analysis

The multivariate logistic model was constructed using procedures from Hosmer, et al. (Hosmer, Lemeshow, & Sturdivant, 2013). The methods for the logistic regression models include both a plan for selecting variables and a method for assessing adequacy. Model building seeks to have the most parsimonious model that still reflects the outcome. Having a parsimonious model means that the model will be numerically stable, more easily adopted by others, and will have smaller standard errors.

The first step in the Hosmer et al. (2013) purposeful selection method of model building is to start with a careful univariable analysis of each candidate independent variable. Therefore, Tables 1 and 2 show the Pearson Chi-square test results for the categorical variables (acceptable according to Hosmer et al.) and those two tables also show the results of either the Wilcoxon rank-sum test or the two-sample *t*-test for the continuous variables (also acceptable according to Hosmer et al.). The effect sizes given are the Cramer's *V* for the categorical data (Cramer, 1946), the Hedges *g* for the *t*-tests (Hedges and Olkin, 1985), and

the Cohen's d which was calculated from the Z-test used in SAS for the Wilcoxon test (Cohen, 2008).

Step 2 involves fitting the multivariable model and eliminating variables that do not contribute to the model. Step 3 involves adding back to the model any variables that were eliminated in Step 2, but subsequently found to be important because they provide a needed adjustment of those variables that remain in the model. Step 4 is to continue this process of adding and taking out variables until there is a *preliminary main effects model*.

Step 5 is to check assumptions and to make sure that continuous variables are linear in the logit. This step results in the *main effects model*. Step 6 is to check for interactions because an interaction implies that the effect of each variable is not constant over the levels of the other variable. This step results in the *preliminary final model*. Step 7 is to check the model fit using methods such as the Hosmer-Lemeshow goodness-of-fit method (Hosmer et al, 2013).

All analyses were conducted in SAS 9.4 TS1M6 running on a virtual Windows server 2008 R2, except for the effect sizes using Hedges' g and Cohen's d which were run on an online program (Lenhard and Lenhard, 2016).

Results

We present the data separately for each gender as in keeping with the theme of the paper of gender differences. Table 1 shows the bivariate associations with CT infection only for the men in the study. The top of the table shows the variables that are also significant for women. Among the variables that are in common with women, several stand out. The co-infections of gonorrhea, syphilis, and genital warts (HPV), are important, along with ever having been tested for HIV. The use of ecstasy is significant on the bivariate basis for both men and women. Also, for both men and women, younger age is associated with CT positivity. Men with CT had a mean age of 38.4 years, whereas those who did not have CT had a mean age of 40.0 years. For the variables that were significant for men only, the use of Viagra is important along with several of the sex partner variables such as the number of people had sex with (this includes both men and women), the number of sex partners who used drugs, and the number of female sex partners.

Table 2 shows the bivariate results for the women. The variables in common with the men that appear to be important are ever had gonorrhea, ever given sex to get money, ever given sex to get drugs, ever had genital warts, and ever had a blood test for HIV. The variables that are unique to women include having a yeast infection and ever use marijuana/hashish. It is interesting that the drug most associated with CT infection for the men was ecstasy, whereas for the women it was marijuana. Times used amphetamines with sex in the last 30 days and times used methadone with sex in the last 30 days also show up, along with days used marijuana/hashish. The times used methadone with sex has very low numbers of observations as can be seen from the low degrees of freedom.

It is interesting to note the pattern of negative values of the effect sizes. What a negative effect size means in the context of tables 1 and 2 is that the participants who had CT were

lower on those variables. The participants who had CT were not those who engaged in injection drug use as indicated by the negative values on methadone maintenance and HCV. Also, for the men there were negative values for days injected heroin and the laboratory test for hepatitis B. In heterosexual men, the major risk factor for hepatitis B is injection drug use (Boulos et al, 2005). The table for the women shows a negative value for injection drug use of speedball, which in this case was a combination of heroin and cocaine. The other items with negative effect sizes have to do with age. Not only are the participants who had CT younger, but also their ages of first use of several drugs was also younger.

The multivariable logistic regression model for men is shown in Table 3 and the model for women is shown in Table 4. The variables are ordered from high to low values of the odds ratios. For the women, the first two rows show the design variable of sexual orientation and both bisexual and heterosexual women have higher odds of CT infection compared to lesbians. After those two rows for the women, the next three rows are the same as for the men. Also, for both the men and the women, the perceived chance of getting AIDS shows up in both tables. The age in years is in both tables also and has odds ratios less than 1 which means that the lower the age, the more at risk the participant is for CT infection.

The association between CT and candidiasis called for further exploration especially given that the only report of an investigation of CT and candidiasis found no association (Chokephaibulkit, et al., 1997). We had data from a sub study with a subsample of some of the female participants in the parent study reported in this paper. We tested whether there were any associations between use of hormonal birth control and CT, and the practice of douching and CT and found no association in either analysis (data not shown). Thus, neither hormonal birth control nor douching could account for the association between candidiasis and CT infection reported here.

Discussion

We explored differences between community-recruited men and women and risks for CT infection and three hypotheses were proposed. In support of hypotheses 1 and 2 which stated that CT infection would be associated with sex trading (H1) and co-infections with other STIs (H2), results presented in Table 1 to 4 show that several variables were significantly associated with CT infection in both men and women, including sex trading behavior (for drugs, money) (H1) and having ever been diagnosed with STIs such as syphilis, gonorrhea, genital warts and herpes (H2). The association with yeast infection appears to be a novel contribution of this research. Taken together, these factors show risky behavior associated with survival and transactional sex. These transactional sex behaviors to obtain money and/or drugs result in STI infections, perhaps in the context of sex with an older sexual partner. Recent research by Shannon et al. (2019) found high rates of CT and syphilis infection in both HIV infected and non-infected adolescents and young adults in Los Angeles and New Orleans. Sexual minorities were at particularly high risk for both anal and urogenital infections in this study. This has also been reported by international researchers who reported that street-recruited 12-21 year old persons in Kenya were more likely to test positive for STIs if they reported transactional sex, greater than 2 sexual partners, and a

previous STI (Winston et al., 2015), and researchers in Australia have also reported similar findings (Henning, Alice, Sanci, & Dunning, 2007).

Younger age is also a risk factor for CT in the context of inexperience and lack of information. Henning et al. (2007) found a lack of information about CT, and few opportunities for STI education, testing and screening among homeless young people.

In a study of younger gay men in Thailand, researchers found that reporting use of an erectile dysfunction drug in combination with club drugs, having receptive or both insertive and receptive anal intercourse with men, having hepatitis A infection, and having rectal CT were all associated with eventual HIV conversion (Thienkrua et al., 2018). Erectile dysfunction is prevalent in men with HIV infection, and the use of prescription erectile dysfunction drugs is commonly associated with STIs in this population (Heudebert, et al., 2019). However, the association of Viagra specifically with CT is a novel contribution of the current research.

The third hypothesis has two parts: (3a) Women who have sex with women only will have less CT than heterosexual or bisexual women; (3b) Drug abuse and sex trading will be associated with CT infections due to impairment of judgment and lack of power to negotiate for condom use. Findings on 3a presented in Tables 2 and 4 show that Lesbian women have lower risk for CT compared to heterosexual and bisexual women. One possible reason for this finding may be behavioral factors such as heterosexual vaginal intercourse with an increased number and variety of sexual partners that appears to be a constellation of high-risk behaviors for the acquisition of CT in our study. These findings are consistent with several researchers (Molin, et al., 2016), who found that women who have sex with women (WSW) have fewer CT infections than heterosexual or bisexual women. However, researchers from region X found that WSW and bisexual women have more CT than heterosexual women (Singh, et al., 2011).

Regarding the drug abuse part of hypothesis 3b, that drug abuse will be associated with a higher prevalence of CT, Tables 1 and 2 show that to be the case of higher prevalence of CT with both men and women who use illicit drugs. The finding of a specific association between MDMA use and CT infection is a novel contribution of our research. Even though MDMA was the only drug included in the multivariable model, other drug variables such as days used marijuana and times used marijuana with sex, times and days used amphetamine (which in this cohort was methamphetamine), ever used ketamine, GHB/GHL, 2C-T-7, and times used both speedball and other opiates with sex show the multifaceted relationship of drug use to CT infection for the men. For the women, marijuana was included in the multivariable model, but there were also bivariate relationships with days used marijuana, ever used marijuana, and age of first use of marijuana with CT infection. There were also relationships with amphetamines, crack, and cocaine with CT infection. All of these associations with illicit drug use may contribute to the acquisition of CT infection because of drug use influencing judgment (Hutton, et al., 2008).

Our hypothesis 3b also included sex trading being associated with CT infection. For the men this shows up only in the bivariate associations including even given sex to get drugs, ever

given sex to get money, ever given money to have sex, gave sex to get other opiates, and gave sex to get methamphetamines shows a strong relationship to sex trading both giving sex and receiving sex for the men. For the women sex trading for money is included in the multivariable model. There are also trading sex to get drugs or money and giving drugs to have sex. Possible explanation for these findings may be that survival sex traders may not always have the power to negotiate for condom use (Duff, et al., 2013). Thus, both illicit drug use and sex trading are high-risk sexual behaviors which lead to a higher probability of CT infection. The sex trading with its associated higher frequency of vaginal intercourse for the women may also explain our novel finding of the association between CT infection and candidiasis. Chinese researchers found that a higher number of sex partners was a risk factor for vulvovaginal candidiasis (Zeng et al., 2018), and Italian researchers found that an increasing frequency of sexual intercourse was correlated with recurrent candida infection (Spinillo et al., 1993). Finally, Louisiana investigators found sexual activity to be positively correlated with vaginal yeast colonization (Barousse, Van Der Pol, Fortenberry, Orr, & Fidel, 2004)

Implications

One of the implications of this study is related to the fact that CT occurs at any age, in any country and with both genders. Although CT is more common in young people (CDC, 2018; Kaestle et al 2005), however, as our study points out CT occurs in middle aged 39 and older people if they are sexually active and do not use preventive measures such as condoms. Another implication of this study is the comorbidities of CT in terms of its association with other STDs, such as gonorrhea, syphilis, genital warts and in certain cases, precursors of HIV. Thus, health care professionals need to be alert to this fact. If they find a patient with a CT diagnosis, they should also look for other STDs and vice versa, and drug abuse. The third implication of this study is in counseling patients who have a history of high-risk sexual behaviors such as use of drugs during sex (e.g., use of Ecstasy in males and marijuana in females), and being a sex worker to recommend the regular use of condoms with every sexual encounter. CT is a preventable STD. Through counseling, patient teaching and compliance on the part of the patient, we can reduce the incidence of CT. Finally, our study's contribution to the body of knowledge is in the area of the identification of behavioral indicators of CT and gender commonalities and differences.

Limitations

One limitation of the current research was that the CT was by self-report and even though the self-report variable had excellent test-retest reliability, there is no measure of validity for the CT itself. Even so, the relationships that were demonstrated in the results are predominantly consistent with extant literature which would not have resulted if CT had low validity. Another limitation was that the data are cross-sectional, and it was not possible to delineate the sequence of events leading to the CT infection.

Suggestions for future studies

In order to establish the concurrent validity of the CT occurrence, we recommend that the study be replicated using also either a urine or a blood test in addition to the self-report to verify the occurrence of CT. Methamphetamine and MDMA have been shown to be important risk factors in men for HIV/AIDS and some of the other STIs such as syphilis. There has not been a similar study conducted in women. Given that MDMA is a stimulant similar to methamphetamine, one implication for future research would be to investigate MDMA in younger female samples.

Conclusion

Our study reported on gender differences in risk factors and co-infections of CT infection. This is important because there is very little research that has been reported on the risk factors for CT infection in men and identification of gender differences in the occurrence of CT infections.(Stamm, 1999). Our novel finding for the women is the association between yeast infection (candidiasis) and CT. We are assuming that the association that we found was due to the higher frequency of vaginal intercourse among the women who reported CT infection, given that we did not find associations with douching or hormonal birth control, and we did find associations with trading sex for money and drugs, and days had sex in the last 30 days. We also had novel findings for the men with an association between MDMA use and CT infection. The fact that both the women and men who reported CT infection also were more likely to have been tested for HIV and perceived themselves to be at risk for HIV which was probably due to their higher sexual risk behavior, the opportunity to test for CT when individuals come in for HIV testing should not be wasted and CT testing should also take place when HIV testing occurs in both men and women.

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Table 1.

Bivariate Associations with *Chlamydia* Male Data Only

Variable	No <i>n</i> =5060 <i>n</i> (%)/ <i>M</i> (<i>SD</i>)	Yes <i>n</i> =499 <i>n</i> (%)/ <i>M</i> (<i>SD</i>)	χ^2/t	<i>df</i>	ES	<i>p</i>
<u>Variables in Common with Women</u>						
Ever given sex to get drugs	728 (14)	98 (20)	9.82	1	.0420	.0017
Ever given drugs to have sex	1179 (23)	140 (28)	5.76	1	.0322	.0164
Ever given sex to get money	751 (15)	107 (21)	15.12	1	.0522	.0164
Ever had gonorrhea	834 (16)	202 (40)	172.15	1	.1761	.0001
Ever had syphilis	289 (6)	69 (14)	49.81	1	.0947	.0001
Ever had genital warts (HPV)	232 (5)	66 (13)	67.03	1	.1099	.0001
Ever had herpes	155 (3)	31 (6)	13.92	1	.0501	.0002
Lab test for HCV+	609 (41)	35 (22)	21.48	1	-.1192	.0001
Ever used Ecstasy (MDMA)	1075 (24)	174 (38)	46.72	1	.0968	.0001
Ever in methadone maintenance	306 (13)	19 (8)	5.27	1	-.0452	.0216
Tried but unable to get treatment	365 (7)	58 (12)	12.44	1	.0474	.0004
Had blood test for HIV	4180 (84)	464 (94)	35.72	1	.0806	.0001
Age of first crack use	26.2 (9.14)	23.8 (8.67)	3.95	2688	-.267	.0001
Days used marijuana, 30 days	3.6 (8.19)	4.7 (9.22)	2.95	5556	.138	.0032
Days had sex in last 30 days	4.7(7.13)	6.2 (7.44)	4.31	5543	.202	.0001
Times used methadone w sex	0.02 (0.39)	0.14 (1.55)	2.51	1951	.2	.0122
Times used amphetamines w sex	1.4 (5.55)	4.1 (15.47)	5.35	2261	.373	.0001
Age in years	40.0 (12.05)	38.4 (10.36)	2.91	5445	-.138	.0036
Chance of getting AIDS ^a	1.0 (0.94)	1.3 (1.00)	6.66		.183	.0001
<u>Variables Unique to Men</u>						
Race/ethnicity						
Black	1520 (89)	190 (11)				
White	1830 (92)	156 (8)				
Hispanic	1236 (93)	95 (7)				
Asian/Pacific	240 (91)	25 (9)				
Native American	64 (93)	5 (7)				
Other	171 (86)	26 (14)	23.72	5	.0653	.0002
Given money to have sex	1206 (24)	153 (31)	11.41	1	.0454	.0007
Lab test for anti-HBc	605 (22)	50 (17)	4.18	1	-.0737	.0409
Ever used ketamine	320 (7)	54 (12)	13.85	1	.0527	.0002
Ever used GHB/GHL	312 (7)	52 (11)	12.69	1	.0505	.0004
Ever used 2C-T-7	13 (0.3)	5 (1)	7.53	1	.0398	.0061
Ever used Viagra	688 (16)	121 (28)	39.01	1	.0909	.0001
Ever used Cialis	192 (6)	45 (12)	22.22	1	.0784	.0001
Ever used Levitra	93 (3)	19 (5)	6.05	1	.0409	.0139
Gave sex to get other opiates	9 (4)	5 (14)	5.47	1	.1501	.0193
Gave sex to get amphetamines	72 (33)	19 (51)	4.37	1	.1316	.0367

Variable	No <i>n</i> =5060 <i>n</i> (%)/ <i>M</i> (<i>SD</i>)	Yes <i>n</i> =499 <i>n</i> (%)/ <i>M</i> (<i>SD</i>)	χ^2/t	<i>df</i>	ES	<i>p</i>
Age 1 st cocaine use	21.7 (6.81)	20.7 (6.25)	2.33	2889	-.149	.0199
Days used amphetamine	2.6 (6.35)	3.7 (7.17)	2.61	2648	.171	.0092
Days inject heroin	11.4 (11.63)	6.2 (7.94)	2.45	361	-.46	.0147
Number of people had sex with	1.5 (2.96)	2.7 (5.81)	8.03	5553	.377	.0001
Number of sex partners who						
Used drugs	0.3 (1.14)	0.8 (3.42)	7.13	5433	.34	.0001
Number of female sex partners	0.7 (1.65)	1.3 (3.39)	6.26	5555	.294	.0001
Number of male sex partners	0.8 (2.44)	1.5 (4.62)	5.46	5555	.256	.0001
Times used marijuana with sex	1.9 (6.02)	2.8 (6.35)	2.26	2735	.141	.0241
Times used speedball with sex	0.1 (1.51)	0.5 (2.66)	2.62	1979	.208	.0090
Times used other opiates w sex	0.1 (1.21)	0.5 (3.05)	4.00	2035	.306	.0001

^a“Which statement best describes your chance of getting AIDS? 0=No chance=0%, 1=Some chance=25%, 2=Half chance=50%, 3=High chance=75%, 4=Sure chance100%.” Tested with Wilcoxon rank-sum test. Value is Chi-square. ES=Effect Size.

Table 2.

Bivariate Associations with *Chlamydia* Female Data Only

Variable	No <i>n</i> =1793 <i>n</i> (%)/ <i>M</i> (<i>SD</i>)	Yes <i>n</i> =506 <i>n</i> (%)/ <i>M</i> (<i>SD</i>)	χ^2/t	<i>df</i>	ES	<i>p</i>
<u>Variables in Common with Men</u>						
Ever given sex to get drugs	466 (26)	207 (41)	42.03	1	.1353	.0001
Ever given drugs to have sex	112 (6)	51 (10)	8.77	1	.0618	.0030
Ever given sex to get money	575 (32)	267 (53)	73.29	1	.1786	.0001
Ever had gonorrhea	205 (11)	157 (31)	114.08	1	.2228	.0001
Ever had syphilis	97 (5)	47 (9)	10.42	1	.0674	.0012
Ever had genital warts (HPV)	98 (5)	69 (14)	39.33	1	.1309	.0001
Ever had herpes	59 (3)	40 (8)	20.78	1	.0952	.0001
Lab test for HCV+	239 (38)	59 (24)	13.58	1	-.1234	.0002
Ever used Ecstasy (MDMA)	354 (22)	147 (32)	16.73	1	.0902	.0001
Ever in methadone maintenance	163 (18)	31 (11)	9.16	1	-.0876	.0025
Tried but unable to get treatment	141(8)	56 (11)	5.14	1	.0474	.0234
Had blood test for HIV	1457 (82)	459 (93)	33.58	1	.1218	.0001
Age first crack use	25.0 (8.84)	23.5 (7.84)	2.67	1114	-.185	.0077
Days used marijuana/hashish	3.43 (8.31)	5.23 (10.09)	4.09	2295	.206	.0001
Days had sex in last 30 days	6.1 (8.71)	7.8 (9.27)	3.94	2287	.199	.0001
Times used methadone w sex	0.04 (0.55)	0.83 (6.73)	2.79	729	.25	.0053
Times used amphetamines w sex	2.6 (8.48)	4.41 (11.62)	2.51	883	.197	.0124
Age in years	38.45 (11.65)	36.49 (10.63)	3.29	2194	-.171	.0010
Chance of getting AIDS ^a	0.98 (0.98)	1.32 (1.01)	7.19		.307	.0001
<u>Variables Unique to Women</u>						
Ever used alcohol	1668 (93)	494 (97)	12.28	1	.0731	.0005
Ever used marijuana/hashish	1433 (80)	461 (91)	34.02	1	.1216	.0001
Ever used crack	842 (47)	285 (56)	13.85	1	.0776	.0002
Ever used cocaine	800 (45)	268 (53)	11.05	1	.0693	.0009
Ever used amphetamines	760 (42)	273 (54)	21.15	1	.0960	.0001
Consider yourself homeless	585 (33)	215 (43)	16.28	1	.0845	.0001
<u>Sexual Preference/Orientation</u>						
Heterosexual	1255 (70)	328 (65)				
Gay	14 (0.8)	0 (0)				
Lesbian	178 (10)	20 (4)				
Bisexual	332 (19)	152 (30)				
Other	8 (0.5)	3 (0.6)	46.98	4	.1432	.0001
Ever had hepatitis B	97 (5)	40 (8)	4.37	1	.0437	.0365
Ever had yeast infection	837 (48)	318 (65)	47.05	1	.1451	.0001
Ever in prison/jail treatment	126 (14)	60 (20)	7.09	1	.0771	.0078
Age first alcohol use	16.2 (4.23)	15.2 (3.16)	4.46	1893	-.246	.0001
Age first marijuana use	16.5 (5.15)	15.3 (3.54)	4.35	1772	-.241	.0001

Variable	No <i>n</i> =1793 <i>n</i> (%)/ <i>M</i> (<i>SD</i>)	Yes <i>n</i> =506 <i>n</i> (%)/ <i>M</i> (<i>SD</i>)	χ^2/t	<i>df</i>	ES	<i>p</i>
Days inject speedball, 30 days	7.6 (9.72)	2.53 (2.72)	2.02	55	-.606	.0488
Times had receptive anal sex	0.6 (3.09)	1.2 (5.29)	3.58	2297	.18	.0004

^a,"Which statement best describes your chance of getting AIDS? 0=No chance=0%, 1=Some chance=25%, 2=Half chance=50%, 3=High chance=75%, 4=Sure chance100%." Tested with Wilcoxon rank-sum test. Value is Chi-square. ES=Effect size.

Table 3.Multivariable Logistic Regression Model for *Chlamydia trachomatis* infection – Male Data

Variable	Odds Ratio	95% Confidence Limits
Ever had gonorrhea	3.1	2.43 – 3.95
Had blood test for HIV	2.4	1.60 – 3.67
Ever had genital warts (HPV)	2.4	1.67 – 3.37
Ever use Viagra	1.6	1.23 – 2.07
Ever had syphilis	1.6	1.09 – 2.26
Ever use Ecstasy (MDMA)	1.4	1.13 – 1.82
Chance of getting AIDS ^a	1.2	1.06 – 1.32
Number of female sexual partners	1.1	1.04 – 1.12
Age in years	0.87	0.822 – 0.913

Hosmer-Lemeshow Goodness of Fit $\chi^2(8) = 9.0306$, $p = .3397$.

^a“Which statement best describes your chance of getting AIDS? 0=No chance=0%, 1=Some chance=25%, 2=Half chance=50%, 3=High chance=75%, 4=Sure chance100%.”

Table 4.**Multivariable Logistic Regression Model – Female Data**

Variable	Odds Ratio	95% Confidence Limits
Bisexual vs. Lesbian	2.6	1.54 – 4.65
Heterosexual vs. Lesbian	2.2	1.31 – 3.73
Ever had gonorrhea	2.5	1.85 – 3.29
Had blood test for HIV	2.4	1.53 – 3.68
Ever had genital warts (HPV)	1.8	1.25 – 2.65
Ever given sex to get money	1.7	1.33 – 2.22
Ever use marijuana/hashish	1.7	1.14 – 2.42
Ever had yeast infection	1.5	1.21 – 1.96
Chance of getting AIDS ^a	1.2	1.03 – 1.29
Age in years	0.84	0.795 – 0.892

Hosmer-Lemeshow Goodness-of-fit $\chi^2(8) = 14.85$, $p = .0620$.

^a“Which statement best describes your chance of getting AIDS? 0=No chance=0%, 1=Some chance=25%, 2=Half chance=50%, 3=High chance=75%, 4=Sure chance100%.”