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Correlates of *Trichomonas vaginalis* Among Middle Age and Older Adults Who Use Drugs

Lauren E. Hearn¹, Nicole Ennis Whitehead¹, Eugene M. Dunne¹, William W. Latimer²

¹Clinical and Health Psychology, University of Florida, Gainesville, Florida, USA;

²School of Health Sciences, Human Services and Nursing, Lehman College, CUNY, Bronx, New York, USA

Abstract

Background: Recent studies have reported high rates of *Trichomonas vaginalis* among middle age and older adults. Though trichomoniasis risk factors in this age cohort remain largely unknown, illicit drug use has been associated with increased incidence of sexually transmitted infections (STIs). The number of mid-older adults using illicit drugs has increased significantly in recent years suggesting the need to understand the relationship between drug use and STIs in this age cohort.

Objectives: This study examined the relationship between drug use, sexual-risk behaviors, and biologically confirmed *T. vaginalis* in a sample of mid-older and younger adults who reported recent drug use.

Methods: The cross-sectional design examined the relationship between past 6-month drug use, sexual risk-behaviors, and PCR-confirmed *T. vaginalis* in 264 adults age 18–64 who were recruited from Baltimore, Maryland. These relationships were also explored in the age-stratified sample among those 18–44 years (“younger”) and individuals 45+ years (“mid-older”).

Results: Trichomoniasis prevalence did not differ significantly between younger (18.8%) and mid-older (19.1%) adults. Mid-older adults that tested positive for *T. vaginalis* were more likely to have used marijuana and crack in the past 6 months. Among younger adults, there were no associations between trichomoniasis and past 6-month drug use and sexual-risk behavior.

Conclusions/Importance: Age- and drug-related immune decline is hypothesized to contribute to increase susceptibility to *T. vaginalis* in mid-older adults. Broad screening for trichomoniasis, particularly among older adults who are often not regarded as at risk for STIs, is needed to control this often asymptomatic infection.

Keywords

trichomoniasis; older adults; drug use; crack cocaine; sexually transmitted infections; immunity

Address correspondence to Lauren E. Hearn, Clinical and Health Psychology, University of Florida, Box 100165, Gainesville, FL 32610-1065 USA; lehearn@php.ufl.edu.

Declaration of Interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

INTRODUCTION

Trichomonas vaginalis is a common sexually transmitted protozoal parasite affecting an estimated 3.7 million people in the United States (Sutton et al., 2007). The true prevalence of trichomoniasis is likely even higher. Owing to the asymptomatic nature of the infection, many infected individuals do not seek treatment (Hobbs et al., 2006). Further, most clinics do not routinely screen for trichomoniasis, and trichomoniasis currently is not a reportable infection in any state (Hoots et al., 2013; Krieger, 1995). The more sensitive nucleic amplification tests used in recent investigations have shown that *T. vaginalis* prevalence rates are higher than previously estimated through wet mount microscopy and culture (Andrea & Chapin, 2011; Caliendo et al., 2005).

For reasons not understood, susceptibility to infection upon exposure to *T. vaginalis* varies widely among individuals, as do the symptoms experienced by infected persons (Andrea & Chapin, 2011; Gaydos, Barnes, Quinn, Jett-Goheen, & Hsieh, 2013; Joyner, Douglas, Ragsdale, Foster, & Judson, 2000; Sutton et al., 2007). Women are biologically more susceptible to sexually transmitted infections (STIs) than men, yet *T. vaginalis* has been detected in up to 70% of male partners of infected women (Petrin, Delgaty, Bhatt, & Garber, 1998; Seña et al., 2007). Recently, a higher prevalence of trichomoniasis has been detected among older men and women compared to younger adults (Andrea & Chapin, 2011; Gaydos et al., 2013; Sutton et al., 2007). Biological changes associated with aging have been proposed to influence older adults' susceptibility for STIs (Patel, Gillespie, & Foxman, 2003). Extant literature has shown that while the frequency of sexual activity may decrease in middle and older adulthood, a significant proportion of older adults engage in risky sex behaviors, such as inconsistent condom use and multiple sex partnerships (Foster, Clark, Holstad, & Burgess, 2012). Additionally, aging adults who use drugs may have heightened STI susceptibility. Prevalence of past-year illicit drug use has been increasing among individuals over age 50, driven in large part by the aging baby boomer cohort (Johnson & Gerstein, 1998). By 2020, the number of adults over age 50 with a substance use disorder is expected to reach 5.7 million, a twofold increase from reported rates in 2006 (Han, Gfroerer, Colliver, & Penne, 2009). Elevated STI rates have been observed among drug users due to risky sex behavior such as low condom use and multiple partners (Kwiatkowski & Booth, 2003).

Aging adults who use drugs have received attention as an understudied, high-risk group for HIV, and STI's (Blazer & Wu, 2009; Gossop & Moos, 2008; Wu & Blazer, 2011). To expand on the recent findings of high trichomoniasis prevalence among older adults, this study aimed to identify and compare trichomoniasis prevalence among a sample of community-recruited older and younger adults. A second aim of this study was to characterize drug-use and sexual-risk-behavior patterns among older and younger adults to explore their potential associations with trichomoniasis. In light of recent findings, we hypothesized that higher trichomoniasis prevalence would be found among older adults than among younger adults. Additionally, we predicted that a higher prevalence of behavioral risk factors (i.e., drug use and sexual risk taking) would explain higher trichomoniasis prevalence among older adults.

METHODS

Data from this study were obtained from the baseline data of the NEURO-HIV Epidemiologic Study. The study was approved by the University of Florida's Institutional Review Board and has received annual renewals. The NEURO-HIV Epidemiologic Study is a longitudinal epidemiological examination of neuropsychological, social and behavioral risk factors of HIV, hepatitis B, hepatitis C, and STIs among injection and noninjection drug users in Baltimore, MD. Study participants were recruited using a variety of community-based outreach strategies, including local newspaper advertisements, street recruitment, and referral; participants were enrolled if they were 18 years of age or older and reported injection or noninjection drug use in the past 6 months. Trained research staff provided detailed information about the study and obtained informed consent before giving the interviewer-administered risk behavior interview (Harrell, Mancha, Petras, Trenz, & Latimer, 2012; Latimer et al., 2007). Urine samples collected at the baseline assessment were screened for the presence of *T. vaginalis*. Participants who tested positive for *T. vaginalis* were notified of their results and received counseling; during the counseling conversation, participants received an informational packet on trichomoniasis and a list of community-based clinics that offer free STI testing and treatment. Participants were compensated \$45 for completing the baseline assessment.

The present study examined data from the baseline assessment. This study used a subset of participants from the parent study who had a *T. vaginalis* test performed on their urine sample ($n = 275$). The final sample size ($n = 264$) was reached after excluding those with missing data on a variable of interest: age ($n = 4$) and condom use ($n = 7$).

Measurements

Demographics.—Participant demographic information including age, gender, race, education, employment, history of homelessness in the past 6 months, and history of incarceration in the past 6 months was obtained. Age was dichotomized as 18–44 years of age or 45+ years of age. Previous studies have denoted 45+ as mid-older age (Phongsavan et al., 2013). Race was dichotomized as Black versus non-Black, as a higher prevalence of trichomoniasis has been reported among individuals who identify as Black (Gaydos et al., 2013; Gollub et al., 2010; Sutton et al., 2007). Dichotomous variables were also created to distinguish participants with or without a high school diploma or General Education Development (GED) equivalent, income from regular employment in the past 6 months, and a positive history of homelessness or incarceration in the past 6 months.

Alcohol and Illicit Drug Use.—The baseline interview assessed for drug type, route of administration, and frequency of usage over the 6 months preceding the assessment. Past 6-month drug use is a common duration of time in substance use research and is often used to reflect patterns of drug use defined as “recent” (e.g., Parry, Petersen, Carney, Dewing, & Needle, 2008; Trenz et al., 2013). Dichotomous variables were created for self-reported past 6-month use of the following drugs: nasal heroin, injection heroin, marijuana, smoked crack, and problem drinking. These drugs were included because they had a past 6-month use prevalence of at least 20% in the sample (Trenz et al., 2013). Problem drinking was defined

according to Center for Disease Control and Prevention (2014) guidelines as averaging more than one alcoholic beverage per day for females and more than two per day for males (2014). The baseline interview also acquired information on participants' lifetime number of years of drug use and lifetime number of years of regular (i.e., daily) drug use.

Sex Risk Behaviors.—Sex risk behaviors that were assessed by the baseline interview include: condom use at last sex; receiving or giving drugs or money for sex in the past 6 months (transactional sex); using alcohol before or during sex in the past 6 months; using noninjection drugs before or during sex in the past 6 months; and using injection drugs before or during sex in the past 6 months. Condom use at last sex is considered a valid indicator of typical condom use behaviors over longer periods (Younge et al., 2008). Dichotomous variables were also created for the five sex risk behaviors to distinguish individuals who reported the behavior from those who did not.

T. Vaginalis Infection.—Participants provided a urine sample that was used to test for *T. vaginalis* by polymerase chain reaction (PCR). For women, trichomoniasis was assessed using a PCR-based enzyme-linked immunosorbent assay (ELISA) with a digoxigenin-labeled for the detection of amplified *T. vaginalis* DNA from urine with a sensitivity and specificity of the PCR of 90.8% and 93.4%, respectively (Kaydos et al., 2002.) For men, trichomoniasis was diagnosed from a positive urine test using the GEN-Probe transcription-mediated amplification *T. vaginalis* research assay with a sensitivity and specificity of 96.7% and 97.5%, respectively (Hardick, Hardick, Wood, & Gaydos, 2006).

Data Analysis

The sample was stratified by age 18–44 and 45+ years. Descriptive statistics for each variable of interest were obtained by frequencies, percentages, and means for the overall sample and for both age groups. Chi-square and two-tailed *t*-test analyses compared the two age groups on demographic variables, past 6-month drug use, sexual risk taking, and *T. vaginalis*. In addition, differences in *T. vaginalis* across gender and age were measured with a two [gender (female, male)] by two [age (18–44 years, 45+ years)] Analysis of Variance (ANOVA) test. The odds ratio (OR) and 95% confidence interval (CI) for the main effects of past 6-month drug use and sexual risk taking on trichomoniasis were calculated using binary logistic regression, stratifying by age to appreciate the relationship between health behaviors and *T. vaginalis* in older and younger adults. Adjusted models included gender, race, educational attainment, past 6-month incarceration, and past 6-month homelessness; these variables were included due to their previously reported association with trichomoniasis (Allsworth, Ratner, & Peipert, 2009; Nijhawan et al., 2011; Swygard, Sena, Hobbs, & Cohen, 2004). All statistical analyses were performed using IBM SPSS Statistics 21 (2013).

RESULTS

Sample Characteristics

The majority of the overall sample ($N = 264$) identified as Black (86.4%); 57.6% of participants were female, and 18.9% of the sample tested positive for *T. vaginalis* (Table 1). Past 6-month sexual risk behavior was high, 76.5% of the sample reported engaging in at

least one sexual risk behavior. The sample was fairly evenly split between older and younger participants, with 52.3% of the sample between 18 and 44 years of age and 47.7% age 45 and older.

The mean age of the 18–44 age group was 34.7 (SD = 7.3), and the average age of the 45+ age group was 49.6 (SD = 3.6). Females comprised a larger portion of the 18–44 age group (65.2%) than the 45+ group (49.2%), $\chi^2(1, N = 264) = 6.6, p = 0.007$. Individuals in the 45+ age group were more likely to have used a condom at last sex ($\chi^2(1, N = 264) = 5.6, p = 0.018$) and to have used crack in the past 6 months ($\chi^2(1, N = 264) = 7.5, p = 0.006$) than those ages 18–44. Individuals in the 18–44 age group were more likely to have engaged in past 6-month problem drinking ($\chi^2(1, N = 264) = 4.6, p = 0.032$) and more likely to have used marijuana in the past 6 months ($\chi^2(1, N = 264) = 12.5, p < 0.001$) than the older age group. The younger cohort was also more likely in the past 6 months to have used noninjection drugs before or during sex ($\chi^2(1, N = 264) = 6.9, p = 0.009$) and to have used injection drugs before or during sex ($\chi^2(1, N = 264) = 9.0, p = 0.003$). The older cohort reported greater lifetime number of years of crack smoking ($t(262) = 2.1, p = 0.034$) and marijuana use ($t(262) = 3.8, p < 0.001$), though the two groups did not differ in number of years of daily crack smoking or daily marijuana use. The two groups also did not differ on race, education, and biologically confirmed *Trichomonas* infection, or on past 6-month employment, homelessness, incarceration, transactional sex, alcohol use before or during sex, nasal heroin use, and injection heroin use.

Comparison of Trichomoniasis by Gender, Age

There was a significant main effect of gender on trichomoniasis, $F(1,261) = 15.33, p < 0.001, \eta^2 = 0.046$, with a significantly higher prevalence of trichomoniasis among women compared with men. There was not a main effect of age on *T. vaginalis* prevalence, $F(1,261) = 0.44, p = 0.506, \eta^2 = 0.001$. There was no interaction between age and gender, $F(1,261) = 0.67, p = 0.413, \eta^2 = 0.002$ (Table 2).

Associations Between Risk Behavior and Trichomoniasis, by Age Group

Younger Adults.—Among those ages 18–44, there were no associations between past 6-month drug use and trichomoniasis. There were also no associations between sexual-risk behavior and trichomoniasis. Adjusting for sociodemographic variables did not change the pattern of nonsignificance.

Middle Age and Older Adults.—Individuals that tested positive for *T. vaginalis* were more likely to have used crack in the past 6 months (OR = 3.8, 95% CI: 1.5–9.8) and to have used marijuana (OR = 2.6, 95% CI: 1.1–6.6). Those who reported that they used a condom at last sex were less likely to test positive for *Trichomonas* (OR = 0.3, 95% CI: 0.1–0.9) than those who reported using a condom. After adjusting for sociodemographic variables, the patterns of significance remained unchanged for marijuana and crack use, though condom use lost significance (AOR = 0.3, 95% CI: 0.1–1.1). Unadjusted and adjusted odds ratios are presented in Table 3.

DISCUSSION

This study examined correlates of trichomoniasis among a cohort of older and younger drug-using adults. The overall prevalence of trichomoniasis in this sample fell within the range of previously reported values detected using PCR in high-risk populations (Freeman et al., 2010; Kaydos et al., 2002). Consistent with previous reports, the prevalence of infection among women was significantly higher than among men (Krieger, 1995; Petrin et al., 2008; Seña et al., 2007). The prevalence of trichomoniasis in this sample did not differ significantly between older and younger adults, in contrast to previous samples of community residing adults and patients presenting for STI-related complaints (Andrea & Chapin, 2011; Gaydos et al., 2013; Verteramo, Calzolari, Degener, Masciangelo, & Patella, 2008). It is possible that the high-reported rate of sexual risk behaviors in this drug-using sample contributed to similar rates of infection in both age groups. In addition, the sexual networks of these participants may have been characterized by high prevalence of STIs (Hallfors, Iritani, Miller, & Bauer, 2007; Laumann & Youm, 1999).

However, differences in the correlates of trichomoniasis were found between the two age cohorts. Among older adults, crack smoking and marijuana use predicted *Trichomonas* infection while no association was found between drug use and risk behaviors among the younger cohort.

Consistent with prior research, alcohol, crack, heroin, and marijuana were the most commonly used drugs among the older cohort (Wu & Blazer, 2011). Crack use was particularly prevalent among older participants in this sample, with nearly 50% reporting recent use. Extant literature has shown that women who recently smoked crack were significantly more likely to have trichomoniasis compared with noncrack smokers, highlighting its possible role in trichomoniasis acquisition (Cu-Uvin et al., 2002; Gollub et al., 2010). Crack's contribution to trichomoniasis infection may be due to its association with risky sexual behavior. Prior research has associated crack use with increased number of drug-using partners, exchange of sex for drugs, and low rates of condom use (Gossop & Moos, 2008). In the overall sample, crack smokers were almost eight times more likely to have engaged in transactional sex. However, when these relationships were reexamined in the age-stratified sample, the association between crack smoking and transactional sex was only found in the younger cohort. Therefore, crack's association with sexual risk behavior cannot fully account for the increased prevalence of *T. vaginalis* among older crack users, suggesting that other factors such as age- and drug-related biological factors may have conferred greater susceptibility to infection among older participants in this sample.

Of the few studies that have examined the effects of aging on trichomoniasis susceptibility, it appears that mid-life biological changes may confer increased risk of trichomoniasis. Among women, declining estrogen levels in menopause can cause drying and thinning of vaginal mucosa (Bachmann & Leiblum, 2004; Kauschic, Roth, Anipindi, & Xiu, 2011). Mucosal tears can result from sexual activity, enhancing transmission of STIs (Minkin, 2010; Senanayake, 2000). Additionally, low estrogen levels result in elevated vaginal pH (Caillouette, Sharp, Zimmerman, & Roy, 1997). Increased vaginal pH appears important for *T. vaginalis* pathogenesis and has been hypothesized to contribute to the increased risk of

trichomoniasis observed among menopausal women compared with younger women (Garber, Lemchukfavel, & Bowie, 1989; Spinillo et al., 1997). Hormone levels also affect the female reproductive tract's innate immune system, which mounts the primary response against *T. vaginalis* (Beagley & Gockel, 2003; Fichorova, 2009). However, it is currently unclear how hormonal changes may affect *T. vaginalis* susceptibility in older women (Hickey, Patel, Fahey, & Wira, 2011; Wira & Fahey, 2008; Wira, Patel, Ghosh, Mukura, & Fahey, 2011).

Extant literature suggests a link between illicit drug use and susceptibility to infections. Evidence suggests that crack use promotes susceptibility to infection, though inconsistent findings warrant further exploration (Baldwin, Roth, & Tashkin, 1998; Pellegrino & Bayer, 1998). Similarly, it appears that marijuana may decrease resistance to infection. However, marijuana's effects on various immune cell types and the clinical significance of these effects remain poorly understood (Friedman, Newton, & Klein, 2003). In addition to studying the immune-altering affects of illicit drug use, longitudinal epidemiological studies are needed to explore associations between drug use, altered immune function, and infection (Cabral, 2006). Other risk factors associated with drug using lifestyles, such as poor nutritional status, may contribute to poor health and infection susceptibility (Rosen, Smith, & Reynolds, 2008). Because recent drug use showed association with trichomoniasis among older adults but not younger adults in this study, it appears likely that cumulative years of drug use, associated lifestyle factors and age-related biological factors contributed to trichomoniasis susceptibility among the older adults.

This study fills a critical gap in the literature toward understanding clinically relevant associations between recent and chronic substance use and STI among older adults. Additional epidemiological studies, in conjunction with improved understanding of the effects of drug use and drug-related lifestyle factors on infection susceptibility, are needed to better understand these relationships. This study also describes the substance use patterns of a sample of older adults who continue to use drugs into middle and later life. The number of older adult illicit drug users is expected to increase over the next decades, and this population's substance use will likely exacerbate many problems associated with aging (Colliver, Compton, Gfroerer, & Condon, 2006; Gossop & Moos, 2008). Limitations of this study include lack of information on participants' history of diagnosis and treatment for trichomoniasis. Past 6-month drug use and sexual behaviors were self-reported by participants, which may have been inaccurate due to recall bias or social desirability bias. However, self-reported sex behavior and drug use from drug users have been found to be valid and reliable (Anthony et al., 1991). Our study differs from previous reports in that we found no association between race and trichomoniasis. This may be related to the small sample of non-Black participants in this study, which may have resulted in insufficient power to detect an association between race and trichomoniasis. Additional limitations include the cross-sectional nature of the data, limiting the ability to draw a causal connection between drug use and trichomoniasis.

While acknowledging these limitations, the current study demonstrates the high prevalence of trichomoniasis among both younger and older adults who use drugs, reinforcing the position that broad screening for trichomoniasis is needed to make a substantial impact on

controlling this infection. Clinicians often do not consider their older patients to be at risk for STIs, making trichomoniasis especially likely to remain undiagnosed among older adults (Kwiatkowski & Booth, 2003). Without the inclusion of trichomoniasis as a standard component of STI screenings, testing, and treating only symptomatic individuals is unlikely to reduce the high prevalence of trichomoniasis in the United States. Further, clinicians frequently miss or misdiagnose substance use disorders among older adults, even as the number of adults with substance use disorders is expected to rise as the baby-boomer generation ages (Wu & Blazer, 2011). Substance use among older adults may exacerbate physical and psychological conditions. Given the proportion of older adults who engage in sexual risk behaviors, substance use may also place older adults at higher risk of acquiring STIs (Foster, Clark, Holstad, & Burgess, 2012; Gossop & Moos, 2008). Within the past decade the Screening, Brief Intervention, and Referral to Treatment for substance use disorders, designed as a universal screening component of routine medical care, has been tailored to the needs of older adults (SAMHSA, 2014; Schonfeld et al., 2014). Pilot data of the Brief Intervention and Treatment of Elders (BRITE) model show significant decreases in substance use following brief intervention (Schonfeld et al., 2010). Adoption of brief, universal screening programs by medical and community service settings is a promising opportunity to identify and treat substance misuse among older adults, which may potentially impact drug-associated health conditions in this population.

Biographies

Lauren E. Hearn, MS, is a doctoral student in Clinical and Health Psychology at the University of Florida. Her research interests include healthcare utilization and disease management among medically underserved populations.

Nicole Ennis Whitehead, PhD, is an Assistant Professor in the Clinical and Health Psychology program at the University of Florida. Dr. Whitehead's research aims to understand the unique factors that influence inequities in health outcomes among low income and minority populations and to apply this knowledge in the development and dissemination of effective interventions.

Eugene M. Dunne, MA, is a doctoral student in Clinical and Health Psychology and a predoctoral fellow at University of Florida Substance Abuse Training Center in Public Health (NIDA-T32–035167; PI: Linda Cottler). His research interests are focused on prevention of substance abuse and infectious disease.

William W. Latimer, PhD, MPH, is Dean of the School of Health Sciences, Human Services and Nursing at Lehman College of the City University of New York. He has published extensively on the epidemiology, prevention, and treatment of infectious disease and drug dependence, with a focus on neurobehavioral risk factors of disease, treatment engagement, and outcome.

GLOSSARY

Polymerase Chain Reaction (PCR)

A technique used to generate copies of a DNA sequence. This technique has several applications, including diagnosing infectious diseases.

Trichomoniasis

A sexually transmitted infection of the urogenital tract affecting both men and women.

Trichomonas vaginalis

The causative agent of trichomoniasis, a sexually transmitted infection.

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TABLE 1.

Demographic and drug use comparisons by age ($N = 264$)^a

Variable	Entire sample		18–44 years old		45+ years old		Test statistics	
	M or N	SD or %	M or N	SD or %	M or N	SD or %	χ^2 or t	p-value
N	264	100	138	52.3	126	47.7		
Age	41.8	9.5	34.7	7.3	49.6	3.6	-21.4	<0.001
Gender							6.6	0.007
Female	152	57.6	90	65.2	62	49.2		
Race/ethnicity							0.6	0.452
Black	228	86.4	116	84.1	112	88.9		
Non-Black	31	11.7	18	13.0	13	10.3		
Education							3.6	0.056
<High school	106	40.2	63	45.7	43	34.1		
High school or GED	158	59.9	75	54.3	83	65.9		
Employed past 6 months	50	18.9	32	23.2	18	14.3	3.4	0.065
Homeless in last 6 months	40	15.2	21	15.2	19	15.1	0.001	0.916
Incarcerated in past 6 months	26	9.9	15	10.9	12	9.5	0.03	0.987
<i>T. vaginalis</i> (+)	50	18.9	26	18.8	24	19.1	0.002	0.966
Engaged in 1 sex risk behavior in past 6 months	202	76.5	110	79.7	92	73.0	2.7	0.099
Transactional sex	26	9.9	16	11.6	10	7.9	1.0	0.319
Used alcohol before/during sex	98	37.1	54	39.1	44	34.9	0.5	0.475
Used non-IV ^b drugs	97	36.7	61	44.2	36	28.6	6.9	0.009
Used IV drugs before/during sex	89	33.7	58	42.0	31	24.6	9.0	0.003
Condom used at last sex	78	29.6	32	23.2	46	36.5	5.6	0.018
Past 6 month drug use								
Problem drinking	105	39.8	63	45.7	42	33.3	4.6	0.032
Nasal heroin	67	25.4	32	23.2	35	27.8	0.7	0.411
Marijuana	96	36.4	64	46.4	32	25.4	12.5	<0.001
Smoked crack	103	39.0	43	31.2	60	47.6	7.5	0.006
Injection heroin	36	13.6	16	11.6	20	15.9	1.0	0.312
Lifetime drug use history								

Variable	Entire sample		18–44 years old		45+ years old		Test statistics	
	M or N	SD or %	M or N	SD or %	M or N	SD or %	χ^2 or t	p-value
Years smoked crack	14.3	7.9	13.0	7.2	15.6	8.3	2.1	0.034
Years daily crack smoking	4.9	7.4	4.6	6.8	5.3	8.0	0.8	0.428
Years marijuana use	15.1	13.1	12.1	9.9	18.4	15.3	3.8	<0.001
Years daily marijuana use	5.3	8.0	5.1	6.6	5.5	9.3	0.4	0.672

^a N may vary slightly according to missing data.

^b Injection.

TABLE 2.Comparison of trichomoniasis by gender and age ($N = 264$)

	<i>df</i>	Mean Square	<i>F</i>	η^2	<i>p</i>
Gender	1	2.253	15.33	0.046	<0.001
Age	1	0.065	0.44	0.001	0.506
Gender $\times$ age	1	0.099	0.67	0.002	0.413
Error	261	0.147			

Group differences in positive *T. vaginalis* test, by gender (male, female) and age (18–44 years, 45+ years).

TABLE 3.

Odds ratios and 95% CIs for association between risk behavior and trichomoniasis, by age

	18–44 years				45+ years			
	Unadjusted OR ^a	p	Adjusted OR ^c	p	Unadjusted OR ^a	p	Adjusted OR ^c	p
Problem drinking								
No	Referent		Referent		Referent		Referent	
Yes	1.1 (0.5–2.6)	0.847	0.8 (0.3–2.1)	0.742	1.3 (0.5–3.2)	0.63	1.0 (0.4–2.7)	0.979
Nasal heroin								
No	Referent		Referent		Referent		Referent	
Yes	1.2 (0.5–3.2)	0.702	1.4 (0.5–3.8)	0.562	1.3 (0.5–3.3)	0.612	0.9 (0.3–2.4)	0.780
Injection heroin								
No	Referent		Referent		Referent		Referent	
Yes	0.3 (0.03–2.1)	0.215	0.4 (0.1–3.3)	0.398	0.7 (0.2–2.6)	0.591	1.1 (0.3–4.8)	0.907
Marijuana								
No	Referent		Referent		Referent		Referent	
Yes	0.89 (0.4–2.3)	0.797	1.0 (0.4–2.6)	0.941	2.6 (1.1–6.6)	0.046	3.1 (1.1–8.9)	0.036
Smoked crack								
No	Referent		Referent		Referent		Referent	
Yes	1.1 (0.4–3.0)	0.848	1.0 (0.3–2.7)	0.956	3.8 (1.5–9.8)	0.005	3.8 (1.4–10.3)	0.010
Condom used at last sex								
No	Referent		Referent		Referent		Referent	
Yes	1.0 (0.4–2.8)	0.988	0.8 (0.3–2.3)	0.653	0.3 (0.1–0.9)	0.035	0.3 (0.1–1.1)	0.073
Transactional sex past 6 months								
No	Referent		Referent		Referent		Referent	
Yes	0.6 (0.1–2.8)	0.530	0.4 (0.6–2.5)	0.308	1.0 (0.2–5.2)	0.959	1.0 (0.2–5.9)	0.986
Used alcohol before/during sex past 6 months								
No	Referent		Referent		Referent		Referent	
Yes	1.2 (0.5–3.0)	0.604	1.2 (0.5–3.1)	0.727	0.5 (0.2–1.4)	0.208	0.7 (0.2–1.9)	0.54
Used non-IV ^d drugs before/during sex past 6 months								

	18–44 years				45+ years			
	Unadjusted OR ^a	p	Adjusted OR ^c	p	Unadjusted OR ^a	p	Adjusted OR ^c	p
No	(CI) ^b		(CI) ^b		(CI) ^b		(CI) ^b	
Referent	Referent		Referent		Referent		Referent	
Yes	1.0 (0.4–2.3)	0.953	1.1 (0.4–2.8)	0.880	1.2 (0.5–3.1)	0.683	1.4 (0.5–4.0)	0.495
Used IV drugs before/during sex past 6 months								
No	(CI) ^b		(CI) ^b		(CI) ^b		(CI) ^b	
Referent	Referent		Referent		Referent		Referent	
Yes	1.3 (0.6–3.2)	0.527	1.6 (0.6–4.2)	0.357	1.6 (0.6–4.1)	0.356	2.0 (0.7–5.9)	0.208

^a Odds ratio.

^b 95% confidence interval (CI).

^c Adjusted for age, gender, education, race, past 6-month homelessness and past 6-month incarceration.

^d Injection.