Published in final edited form as:

AIDS Behav. 2007 March ; 11(2): 289–297.

Prevalence of HIV, Hepatitis B, Syphilis, and Chlamydia Among Adults Seeking Treatment for a Mental Disorder in Southern India

Michael P. Carey^{1,4}, V. Ravi², Prabha S. Chandra², Anita Desai², and Dan J. Neal^{1,3}

¹ Center for Health and Behavior, Syracuse University, Syracuse, New York.

² Departments of Psychiatry and Neurovirology, National Institute of Mental Health and Neurosciences, Bangalore, India.

³ Now affiliated with the Department of Psychology, University of Texas at Austin.

Abstract

This study estimated the prevalence, and identified the correlates, of HIV, chlamydia, syphilis, and Hepatitis B among patients seeking treatment for a mental disorder in India. Patients ($n = 948$) submitted a blood sample for serologic testing and participated in a brief interview. Lifetime prevalence rates were nearly 2% for HIV, 10% for chlamydia, 3% for Hepatitis B, and 3% for syphilis; 15% of patients had evidence of at least one infection. Bivariate associations between infection status and patient characteristics, including age, gender, psychiatric diagnosis, did not reveal any consistent risk profile. Instead, behavioral characteristics (i.e., multiple partners, exchanging sex for money, and engagement in anal sex) were associated with infection status. Recommendations for the sexual health care of psychiatric patients in India are provided.

Keywords

HIV; chlamydia; syphilis; hepatitis; psychiatric; sexually transmitted infection (STI); sexually transmitted disease (STD); India

INTRODUCTION

Adults living with a mental disorder in *developed* countries are disproportionately vulnerable to HIV. For example, Rosenberg *et al.* (2001) reported that 3.1% of 931 patients receiving psychiatric treatment in the U. S. were infected with HIV. Other studies from the U. S. and Europe completed with psychiatric patients reveal infection rates that range from 3% to 23% (Carey *et al.* 1995), considerably higher than the rates estimated for the general population. The prevalence of HIV among psychiatric patients in *developing* countries has not been well-studied. One developing country that may be particularly vulnerable to the epidemic is India, where concern about HIV is high. Estimates suggest that 4–5 million people are living with HIV/AIDS in India (Solomon *et al.*, 2004).

Two investigations have sampled “at risk” psychiatric patients in India. These purposive samples revealed infection rates of 2.1 and 3.4% (Chandra *et al.*, 1996; 1999). It is difficult to interpret these data, however, because of the sampling strategy. Tharyan *et al.* (2003) conducted an anonymous, unlinked study with 1,160 consecutive psychiatric outpatients at a general hospital in South India between April 1999 and May 2000. These authors found a

⁴To whom correspondence should be addressed at Center for Health and Behavior, 430 Huntington Hall, Syracuse University, Syracuse, NY, USA 13244-2340; e-mail: mpcarey@syr.edu.

SUPPORT: R01-MH54929 and K02-MH01582 from the National Institute of Mental Health.

seroprevalence rate of 1%, compared to national estimates of 0.7%. Needed are scientifically valid estimates of the prevalence of HIV and other sexually transmitted infections (STIs) among psychiatric patients to estimate the service needs, to guide resource allocation, and to inform the development and evaluation of risk reduction programs. To optimize the yield of such research, it has been recommended that both biological and behavioral surveys be collected simultaneously (MacLachlan *et al.*, 2002).

This paper describes the lifetime prevalence estimates and sociodemographic and behavioral correlates of four STIs (HIV, chlamydia, syphilis, hepatitis B) among men and women seeking treatment for a mental disorder in India. We selected these four STIs because they: (a) are believed to be prevalent; (b) can have serious health implications; (c) can be asymptomatic, increasing the probability that they might go undetected and untreated in the psychiatric setting; (d) could be detected from relatively inexpensive tests using serologic specimens; and (e) did not require more invasive diagnostic procedures (e.g., vaginal or urethral swabs) or physical examinations that might have deterred participation, undermining the representativeness of the sample. This is the first Indian study to sample both male and female patients, and to estimate the prevalence of multiple STIs in this population.

METHOD

Participants and Procedures

The participants were newly admitted patients to the inpatient psychiatric unit of the National Institute of Mental Health and Neuro Sciences (NIMHANS) in Bangalore, India during the interval. Patients were eligible to participate if they were: (a) at least 18 years of age, (b) diagnosed with a psychiatric illness, (c) judged to be able to complete the assessment, (d) not acutely psychotic or otherwise unable to participate meaningfully in the assessment, and (e) able to provide informed consent.

All procedures were approved by the Institutional Review Boards of the participating institutions. New admissions during the period April–December, 2001 were reviewed with the clinical team to be certain that each person was able to participate meaningfully in the study. The research staff approached patients to explain the study, answer questions, provide assurances regarding confidentiality, and invite participation. Once a patient provided informed consent, she or he met with a well-trained professional in a private setting. The interviewer established rapport with patients before conducting the interview in the language that was most comfortable for the patient. The interviews assessed demographics, substance use and sexual behavior using three standardized measures.

Measures

Alcohol Use Disorders Identification Test (AUDIT)—We employed the AUDIT (Saunders *et al.*, 1993) to identify drinkers at risk for alcohol abuse and dependence. The AUDIT, a 10 item screening measure yields one summary score (0–40) was constructed for use in developing countries (Saunders *et al.*, 1993), and has been found to be reliable and valid in psychiatric settings throughout the world (Maisto *et al.*, 2000), including India (Carey *et al.*, 2003).

Drug Abuse Screening Test (DAST)—We used the DAST (Skinner, 1982) to identify drug-related problems in the previous year. The DAST has been found to be reliable and valid in many settings (Maisto *et al.*, 2000), and research conducted with Indian participants corroborates the unidimensional structure, internal consistency, and validity of the DAST (Carey *et al.*, 2003). We supplemented the DAST with additional questions about other substance use. Thus, patients were also asked if they (a) smoked commercially-prepared

cigarettes or beedis (beedis are shredded, sun-dried tobacco that is hand rolled into a piece of leaf called tendu); (b) chewed tobacco and/or betel nut (betel or areca nuts (also called betel nuts) are the dried seeds of the *areca catechu* palm and are chewed in South Asia for their psycho stimulant, digestive, and cardiostimulant properties); and (c) injected “street” or other drugs.

HIV-Risk Screening Instrument (HRSI)—We used the HRSI (Gerbert *et al.*, 1998) to assess sexual activity, drug use risk behavior, number of sexual partners, and other risk behaviors. For this study, we made minor modifications (e.g., providing definitions of some words) to make the HRSI culturally appropriate. A score of zero reflects low risk, whereas a score of one or more reflects higher risk for HIV infection. To allow comparisons with previous research, we assessed behavior during the past year and past 10 years. The interviewer also asked questions regarding four STI-related symptoms (i.e., genital discharge, pain while urinating, genital sores, genital swelling) in the past year.

Biological Specimens and STI Testing—Five ml blood samples were collected by a phlebotomist. The samples were centrifuged at 1000 xg for 20 min and the serum separated and stored in aliquots at -20°C until testing. All tests followed standard procedures in a research laboratory. Thus, for HIV 1 and 2, we used a ELISA kit (Bicochem, Canada) with reactive samples subjected to a confirmatory Western Blot test (Immunetics, USA). For syphilis, we used a commercial particle agglutination test kit (Serodia, Japan) to detect antibodies to *Treponema pallidum*. Specimens showing agglutination in the confirmatory test were considered positive indicating current or past infection with this organism. For Chlamydia, we employed a commercial ELISA kit (Novum Diagnostica) for the detection of IgG antibodies to Chlamydia. A sample having an Optical Density (OD) value 10% over that obtained with a cut-off sample was considered positive indicating current or past infection. For Hepatitis B, we used a commercial ELISA kit (DiaSorin, Italy) for the detection of surface antigen in serum samples. Samples giving OD values within 10% of cut-off value were considered positive.

Data Analyses

Although we planned a series of logistic regression models to analyze the data, low base rates of positive test results precluded these plans (i.e., estimation of logistic regression models with outcome variables that have low base rates yields estimated regression coefficients that tend toward infinity, particularly when specific covariates lack variability in the outcome variable (Hosmer and Lemeshow, 2000). Therefore, bivariate analyses were used to provide estimates of the degree of association between each STI and demographic, psychiatric, substance use, and behavioral risk variables. Chi-square tests were used to compare infected and not-infected groups.

RESULTS

Of the 1,639 patients admitted during the study interval, 389 could not be interviewed because of psychiatric instability, 165 were discharged early, 40 were discharged against medical advice, 21 were readmissions, 17 transferred to other departments, 10 did not meet the age criterion, 3 declined to be interviewed, and 6 did not speak any language represented among the research staff. An additional 40 persons were interviewed but did not submit to STI testing. Thus, the final sample comprised 948 patients.

The final sample included 375 female and 573 male patients. The mean age of the sample was 31.6 years (SD = 9.8); for data analytic purposes, we divided the sample into four age categories (18-28 [$n = 449$; 47%], 29-38 [$n = 298$; 31%], 39-48 [$n = 136$; 14%], and >48 years of age [$n = 65$; 7%]). Patients preferred language was Kannada (40%), Telugu (17%), Tamil (13%), Hindi (7%), and others (25%). Religious affiliation was primarily Hindu (83%). Most had some formal education: 21% completed primary education, 29% high school, 15% pre-university,

9% university, and 13% graduate or professional; for data analytic purposes, we reduced these to three categories: no formal education (13%), high school only (50%), and college (37%). Eleven percent were employed in professional positions outside their home, 54% in nonprofessional positions, and 35% were not employed outside the home; the mean monthly household income was 6036 rupees (approximately \$135 US).

Forty-three percent were married, 43% were not married, 8% were separated, and 5% were divorced or widowed; for data analytic purposes, we reduced these data to two categories, unmarried (57%) and married (43%). Fifty-six percent lived in an urban or semi-urban area, and 44% in a rural area. Thirty-six percent lived in their own home whereas 64% lived in a family home, the home of another person, or in an institution, a half-way home, or were homeless.

Three hundred and seventy-four patients (39%) had psychotic disorders, 209 (32%) had bipolar/mania, 143 (15%) had a depressive disorder, and 132 (14%) had neurotic and other disorders. The duration of illness was less than 6 months in 201 (21%) cases, 6 to 12 months in 64 (7%) cases, 1 to 5 years in 313 (33%) cases, and more than 5 years in 370 (39%) cases. Sixteen percent reported smoking cigarettes, 22% smoked beedis, 16% chewed tobacco, and 25% used betel nut. Other drug use was reported by 11% of the sample.

HIV

Sixteen of the 948 patients tested were infected with HIV (1.7%; 95% CI = 1.0%—2.7%). Nearly all of the patients who tested positive were not aware of their HIV status. Patients testing positive included men ($n = 7$) and women ($n = 9$) with a mean age of 29.6 years ($SD = 4$). Diagnoses for those who tested positive was: schizophrenia ($n = 5$), bipolar ($n = 5$), depression ($n = 3$), and other ($n = 3$).

Bivariate comparisons contrasted patients diagnosed with HIV and those who tested negative. *Demographic, psychiatric, and substance use variables* are presented in Table I; none of these variables demonstrated significant correlation with HIV status. *Behavioral risk variables* are presented in Table II; among the behavioral risk variables, having paid for sex in the past ten years, $\chi^2(1, N=945) = 18.0, p < .01$, having paid for sex in the past year, $\chi^2(1, N=947) = 14.9, p < .01$, having been paid for sex lifetime, $\chi^2(1, N=945) = 31.6, p < .01$, having multiple partners in the past ten years, $\chi^2(1, N=945) = 46.7, p < .01$, having multiple partners in the past year, $\chi^2(1, N=948) = 29.4, p < .01$, having had sex with a MSM in the past ten years, $\chi^2(1, N=926) = 7.9, p < .01$, having had sex with a MSM in the past year, $\chi^2(1, N=937) = 5.2, p < .05$, having had anal sex in the past ten years, $\chi^2(1, N=945) = 15.4, p < .01$, and having had anal sex in the past year, $\chi^2(1, N=948) = 12.9, p < .01$, were all significantly correlated with HIV status. Furthermore, having reported symptoms of STI, $\chi^2(1, N=948) = 16.3, p < .01$, having endorsed a lifetime history of STI, $\chi^2(1, N=945) = 57.6, p < .01$, and having endorsed an STI in the past year, $\chi^2(1, N=948) = 36.9, p < .01$, also predicted HIV status.

Chlamydia

Seventy-three of the 727 patients tested were positive for Chlamydia (10%; 95% CI = 8.0%—12.5%). (Test data were missing for 261 patients due to limited availability of test kits from the manufacturer.) Patients testing positive included men ($n = 42$) and women ($n = 31$) with a mean age of 30.1 years ($SD = 8.3$). The diagnostic breakdown for those who tested positive was: schizophrenia ($n = 36$), bipolar ($n = 17$), depression ($n = 13$), and other ($n = 7$).

Bivariate analyses compared patients diagnosed with Chlamydia and those who tested negative. Data for *demographic, psychiatric, and substance use variables* are presented in Table I; among these, only age, $\chi^2(3, N=727) = 9.3, p < .05$, predicted a positive result; younger

patients were more likely than older patients to be infected with Chlamydia (see Table I). *Behavioral risk variables* are presented in Table II; none of these variables were correlated with Chlamydia status.

Syphilis

Thirty-one of the 948 patients tested were positive for Syphilis (3.3%; 95% CI = 2.2%—4.6%). Patients testing positive included men ($n = 24$) and women ($n = 7$) with a mean age of 36.7 years ($SD = 10.0$). The diagnostic breakdown for those who tested positive was: schizophrenia ($n = 10$), bipolar ($n = 14$), depression ($n = 5$), and other ($n = 2$).

Bivariate comparisons contrasted patients diagnosed with Syphilis and those who tested negative. Data for *demographic, psychiatric, and substance use variables* are presented in Table I; among these variables, gender, $\chi^2(1, N=948) = 3.9, p < .05$, age, $\chi^2(3, N=948) = 8.5, p < .05$, any substance use, $\chi^2(1, N=948) = 7.6, p < .01$, beedi use, $\chi^2(1, N=948) = 4.9, p < .05$, and AUDIT score, $\chi^2(1, N=948) = 11.9, p < .01$, predicted a positive Syphilis test. Overall, males, older patients and substance users were more likely to be infected. Data for *behavioral risk variables* are presented in Table II. Among the behavioral risk variables, having paid for sex in the past ten years, $\chi^2(1, N=945) = 12.7, p < .01$, having paid for sex in the past year, $\chi^2(1, N=947) = 11.7, p < .01$, having been paid for sex lifetime, $\chi^2(1, N=945) = 6.2, p < .05$, having multiple partners in the past ten years, $\chi^2(1, N=945) = 23.4, p < .01$, having multiple partners in the past year, $\chi^2(1, N=948) = 6.0, p < .05$, having had sex with a MSM in the past ten years, $\chi^2(1, N=926) = 15.3, p < .01$, having had sex with a MSM in the past year, $\chi^2(1, N=937) = 10.6, p < .01$, having had anal sex in the past ten years, $\chi^2(1, N=945) = 8.0, p < .01$, and having had anal sex in the past year, $\chi^2(1, N=948) = 17.6, p < .01$, all correlated with Syphilis status.

Hepatitis B

Twenty-eight of the 948 patients tested were positive for Hepatitis B (3%; 95% CI = 2.0%—4.1%). Both men ($n = 22$) and women ($n = 6$) tested positive (M age = 28.8 years, $SD = 9.6$). The diagnostic breakdown for those who tested positive was: schizophrenia ($n = 13$), bipolar ($n = 7$), depression ($n = 5$), and other ($n = 3$).

Bivariate comparisons contrasted patients diagnosed with Hepatitis B and those who tested negative. *Demographic, psychiatric, and substance use* data are presented in Table I; gender, $\chi^2(1, N=948) = 4.0, p < .05$, and beedi use, $\chi^2(1, N=948) = 9.5, p < .01$, was correlated with a positive Hepatitis B result. *Behavioral risk variables* are presented in Table II; none of these variables correlated with Hepatitis B status.

All STIs

Of the 948 patients who were tested for at least three STIs, 138 were infected with at least one STI (14.6%; 95% CI = 12.4%—17%); when analyses were restricted to only those patients who provided data for all four STIs, 118 of the 727 (16.2%; 95% CI = 13.6%—19.1%) were infected with at least one STI. Ten of the 948 patients (1.1%; 95% CI = 0.5%—1.9%) were diagnosed with more than one STI.

Bivariate comparisons for *demographic, psychiatric, and substance use variables* are presented in Table I; among these variables, only occupation, $\chi^2(2, N=948) = 6.6, p < .05$, correlated with a positive test result. In this analysis, professional workers were less likely than unemployed and nonprofessional workers to be diagnosed with a STI. *Behavioral risk* data are presented in Table II; among the behavioral risk variables, having paid for sex in the past ten years, $\chi^2(1, N=945) = 6.2, p < .05$, having been paid for sex lifetime, $\chi^2(1, N=945) = 17.8, p < .01$, having been paid for sex in the past year, $\chi^2(1, N=948) = 4.3, p < .05$, having multiple

partners in the past ten years, $\chi^2(1, N=945) = 16.3, p < .01$, having multiple partners in the past year, $\chi^2(1, N=948) = 8.0, p < .01$, having had sex with a MSM in the past ten years, $\chi^2(1, N=926) = 5.3, p < .05$, having had sex with a MSM in the past year, $\chi^2(1, N=937) = 6.6, p < .01$, having had anal sex in the past ten years, $\chi^2(1, N=945) = 4.3, p < .05$, and having had anal sex in the past year, $\chi^2(1, N=948) = 12.2, p < .01$, were all significantly correlated with a positive test result. Furthermore, having endorsed a lifetime history of STI, $\chi^2(1, N=945) = 10.0, p < .01$, and having endorsed an STI in the past year, $\chi^2(1, N=948) = 5.4, p < .05$, also predicted STI status.

DISCUSSION

This investigation provides needed information regarding the lifetime prevalence of HIV and three other STIs among adults seeking treatment for a psychiatric disorder in India. Results indicated seroprevalence rates of 1.7% for HIV, 3% for Hepatitis B, 3.1% for syphilis, and 10% for chlamydia. These rates may be higher than those in the general Indian population (e.g., 0.7%; [Solomon *et al.*, 2004]), but such a comparison must be considered preliminary due to sampling differences. If the estimates obtained with this sample and one earlier study (Tharyan *et al.*, 2003) are representative, they suggest that psychiatric patients in India, like their counterparts in the U. S. (Klinkenberg *et al.*, 2003; Rosenberg *et al.*, 2001) and Europe (Ayuso-Mateos *et al.*, 1997), are especially vulnerable to STIs, including HIV.

We hypothesize that adults with a mental illness may be more vulnerable to STIs for several reasons. Research has shown that psychiatric patients tend to be less well informed about STIs (Kalichman *et al.*, 1994), poorly motivated to adopt risk reduction strategies (Blanchard *et al.*, 1998; Carey *et al.*, 1997), and lacking the interpersonal and social skills needed to negotiate for safer sexual relationships (Mueser *et al.*, 1996). Socially, patients with persistent impairment often cannot work. In our sample, we found that professional workers were less likely to be diagnosed with any STI compared to nonprofessional workers and unemployed persons.

Adults with a mental illness are also more likely to experience periods of homelessness (Drake *et al.*, 1991), and often live in circumstances and environments that are especially risky. Indeed, numerous epidemiological studies document the increased risk associated with poverty and other forms of social disadvantage (Berkman and Kawachi, 2000; Farmer, 1999). As a result of these psychosocial factors, psychiatric patients are more vulnerable to sexual coercion, less stable sexual partnerships, sexual bartering, and risky sexual behavior (Carey *et al.*, 1999, 2001; Chandra *et al.*, 2003; Wenzel *et al.*, 2000), all of which increase their vulnerability for STIs.

This study also sought to identify correlates of STIs, information that could help to target limited care and prevention resources. In this regard, analyses exploring the relationships among a variety of patient characteristics and STI status revealed no reliable pattern of associations. Although younger patient age, for example, was associated with greater risk of Chlamydia, it was also associated with lower risk for Syphilis; moreover, age was not associated with HIV, Hepatitis B or having any STI. In the absence of a consistent pattern of relationships across STIs, it appears prudent to interpret the inconsistent pattern of associations as chance findings, until future research demonstrates a more consistent pattern. In addition, there was no consistent pattern of STI risk associated with psychiatric diagnosis, duration of illness, and substance use. Overall, then, data from this large sample did not identify a consistent profile based on *demographic, psychiatric, or substance use* characteristics that covary with STI risk.

Analyses indicated that STIs were consistently associated with *sexual risk behaviors*. As detailed in Table II, men who reported sexual contact with men, and patients who reported anal

sex, multiple partners, and a history of paying or receiving money for sex, were more likely to be infected with a STI. Such associations are consistent with prior research in other countries, and confirm that it is not “who people are” but rather “what they do” that determines risk for HIV and other STIs. Clearly, STIs occur following risky sexual practices (Aral, 2004), with multiple and/or risky partners, especially when those partners reside within impoverished social environments (Berkman and Kawachi, 2000).

These results should be interpreted mindful of study strengths and limitations. Strengths include the use of hospital-wide screening, assessment using standardized measures, sensitivity to language and culture, and a large and diverse sample; these strengths enhance confidence in the validity and representativeness of the findings. The primary limitation of this study is that our sample did not include approximately 42% of new admissions who were either too impaired psychiatrically (and, thus, could not provide informed consent) or who were discharged or transferred shortly after their admission (making it impractical to include them). We do not know if such patients would differ in any systematic way from the patients included in this study. Second, we did not test for other STIs (e.g., herpes, human papilloma virus, candida, trichomonas, chancroid). If we had we tested for these infections, it is likely that a higher percentage of participants would have been found to be infected with an STI. Third, we sampled only adults. Adolescents are especially vulnerable to STIs, and future research should include adolescents. Fourth, for chlamydia, we had a greater percentage of incomplete data due to a shortage of test kits. Fifth, due to the low base rates of positive test results (especially for HIV), it was not possible to complete multivariate analyses that controlled for the effects of other predictors. As with any investigation, the rates obtained in this study should not be assumed to generalize widely, and further research is needed to confirm these results and track dynamic HIV and STI epidemics.

These findings have important clinical implications. First, all patients can benefit from a sexual health assessment as a part of standard clinical care. This recommendation may seem obvious. However, research has shown that mental health providers often do not receive training in human sexuality; some providers believe that patients should not be sexually active, or that the mentally ill are too disabled to be sexually active, or that discussion of sexual matters may exacerbate patients' psychopathology (Collins, 2001; Satriano *et al.*, 1999).

Second, all patients should be encouraged to participate in counseling and testing for HIV and other STIs. When resources are few, patients who report multiple partners, exchanging sex for money (or other needs), anal sex, injection drug use, and men who have sex with men should receive highest priority for testing. If a patient reports no lifetime sexual activity or, for males, a history of lifetime monogamy with one partner known to be partnered only with him, then testing is likely to be less cost-effective. We are reluctant to make a similar recommendation for female patients because of documented evidence of HIV infection even among those women reporting lifetime monogamy with a single male partner (Newmann *et al.*, 2000).

Although we call for greater access to counseling and testing for STIs, including HIV, we also acknowledge the potential for stigmatization resulting from STI testing, and we recognize the limited availability of adequate therapies. An increased use of HIV counseling and testing should be accompanied by an equivalent commitment to addressing HIV- and STI-related stigma, and to providing comprehensive medical and psychosocial care. We also recognize the challenge of providing such services in countries and settings where resources are especially limited, and call for greater international assistance from wealthier nations.

Many have recognized the “pervasive menace” of STIs (Genuis and Genuis, 2004), and pointed out the personal, societal, and global impact of these diseases. STIs constitute a “hidden epidemic” (Eng and Butler, 1997) because of a sociocultural reluctance to address sexual health

issues, and stigma associated with HIV and other STIs (Paxton *et al.*, 2005). For psychiatric patients, whose needs are many and for whom resources are often inadequate, sexual health promotion and STI care remain substandard. Our findings confirm the vulnerability of psychiatric patients, and demonstrate the need for continued STI surveillance among psychiatric patients in India. Continued research can clarify the nature of the relationship between psychiatric symptoms/disorders and STIs, and evaluate strategies for risk reduction tailored to the needs of this population. Such research can help to limit the spread of HIV and other STIs, and curtail the pandemic's impact on the sub-continent.

ACKNOWLEDGMENTS

This research was supported by grants R01-MH54929 and K02-MH01582 from the National Institute of Mental Health to Michael P. Carey. We gratefully acknowledge the patients for their participation; the therapists and administrators at the National Institute of Mental Health and Neurosciences for their support; Drs. Willo Pequegnat, Juan Ramos, and Ellen Stover for their encouragement; and the Health Improvement Project team for their contributions to this work.

REFERENCES

- Aral SO. Sexual risk behaviour and infection: Epidemiological considerations. *Sexually Transmitted Infections* 2004;80(Supplement II):ii8–ii12. [PubMed: 15572645]
- Ayuso-Mateos JL, Montanes F, Lastra I, Picazo de la Garza J, Ayuso-Gutierrez JL. HIV infection in psychiatric patients: an unlinked anonymous study. *British Journal of Psychiatry* 1997;170:181–185. [PubMed: 9093511]
- Berkman, LF.; Kawachi, I., editors. *Social epidemiology*. Oxford University; Oxford: 2000.
- Blanchard JJ, Mueser KT, Bellack AS. Anhedonia, positive and negative affect, and social functioning in schizophrenia. *Schizophrenia Bulletin* 1998;24:413–424. [PubMed: 9718633]
- Carey KB, Carey MP, Chandra PS. Psychometric evaluation of the alcohol use disorders identification test and short drug abuse screening test with psychiatric patients in India. *Journal of Clinical Psychiatry* 2003;64:767–774. [PubMed: 12934976]
- Carey MP, Carey KB, Maisto SA, Gleason JR, Gordon CM, Brewer KK. HIV-risk behavior among outpatients at a state psychiatric hospital: Prevalence and risk modeling. *Behavior Therapy* 1999;30:389–406.
- Carey MP, Carey KB, Maisto SA, Gordon CM, Venable PA. Prevalence and correlates of sexual activity and HIV-related risk behavior among psychiatric outpatients. *Journal of Consulting and Clinical Psychology* 2001;69:500–505.
- Carey MP, Carey KB, Weinhardt LS, Gordon CM. Behavioral risk for HIV infection among adults with a severe and persistent mental illness: Patterns and psychological antecedents. *Community Mental Health Journal* 1997;33:133–142. [PubMed: 9145255]
- Carey MP, Weinhardt LS, Carey KB. Prevalence of infection with HIV among the seriously mentally ill: Review of research and implications for practice. *Professional Psychology: Research and Practice* 1995;26:262–268.
- Chandra PS, Carey MP, Carey KB, Prasada Rao PS, Jairam KR, Thomas T. HIV risk behaviour among psychiatric inpatients: results from a hospital-wide screening study in southern India. *International Journal of STDs and AIDS* 2003;14:532–538.
- Chandra PS, Krishna VAS, Ravi V, Desai A, Puttaram S. HIV related admissions in a psychiatric hospital: A five-year profile. *Indian Journal of Psychiatry* 1999;41:320–324.
- Chandra PS, Ravi V, Puttaram S, Desai A. HIV and mental illness. *British Journal of Psychiatry* 1996;168:654. [PubMed: 8733813]
- Collins PY. Dual taboos: sexuality and women with severe mental illness in South Africa: Perceptions of mental health care providers. *AIDS and Behavior* 2001;5:151–161.
- Drake RE, Wallach MA, Teague GB, Freeman DH, Paskus TS, Clark TA. Housing instability and homelessness among rural schizophrenic patients. *American Journal of Psychiatry* 1991;148:330–336. [PubMed: 1992835]

- Eng, TR.; Butler, WT., editors. The hidden epidemic: Confronting sexually transmitted diseases. National Academy Press; Washington, DC: 1997.
- Farmer, P. Infections and inequalities: The modern plagues. University of California; Berkeley: 1999.
- Genius SJ, Genius SK. Managing the sexually transmitted disease pandemic: a time for reevaluation. *American Journal of Obstetrics and Gynecology* 2004;191:1103–1112. [PubMed: 15507928]
- Gerbert B, Bronstone A, McPhee S, Pantilat S, Allerton M. Development and testing of an HIV-risk screening instrument for use in health care settings. *American Journal of Preventive Medicine* 1998;15:103–113. [PubMed: 9713665]
- Hosmer, DW.; Lemeshow, S. Applied logistic regression. Wiley; New York: 2000.
- Kalichman SC, Kelly JA, Johnson JR, Bulto M. Factors associated with risk for HIV infection among chronic mentally ill adults. *American Journal of Psychiatry* 1994;151:221–227. [PubMed: 8296893]
- Klinkenberg WD, Caslyn RJ, Morse GA, Yonker RD, McCudden S, Ketema F, et al. Prevalence of human immunodeficiency virus, hepatitis B, and hepatitis C among homeless persons with co-occurring severe mental illness and substance use disorders. *Comprehensive Psychiatry* 2003;44:293–302. [PubMed: 12923707]
- MacLachlan EW, Baganizi E, Bougoudogo F, Castle S, Mint-Youbba Z, Gorbach P, et al. The feasibility of integrated STI prevalence and behaviour surveys in developing countries. *Sexually Transmitted Infections* 2002;78:187–189. [PubMed: 12238650]
- Maisto SA, Carey MP, Carey KB, Gordon CM, Gleason JR. Use of the AUDIT and the DAST-10 to identify alcohol and drug use disorders among adults with a severe and persistent mental illness. *Psychological Assessment* 2000;12:186–192. [PubMed: 10887764]
- Mueser KT, Doonan R, Penn DL, Blanchard JJ, Bellack AS, Nishith P, et al. Emotion recognition and social competence in chronic schizophrenia. *Journal of Abnormal Psychology* 1996;105:271–275. [PubMed: 8723008]
- Newmann S, Sarin P, Kumarasamy N, Amalraj E, Rogers M, Madhivanan P, et al. Marriage, monogamy and HIV: a profile of HIV-infected women in south India. *International Journal of STDs and AIDS* 2000;11:250–253.
- Paxton S, Gonzales G, Uppakaew K, Abraham KK, Okta S, Green C, et al. AIDS-related discrimination in Asia. *AIDS Care* 2005;17:413–424. [PubMed: 16036226]
- Rosenberg SD, Goodman LA, Osher FC, Swartz MS, Essock SM, Butterfield MI, et al. Prevalence of HIV, Hepatitis B, and Hepatitis C in people with severe mental illness. *American Journal of Public Health* 2001;91:31–37. [PubMed: 11189820]
- Satriano J, Rothschild RR, Steiner J, Oldham JM. HIV service provision and training needs in outpatient mental health settings. *Psychiatric Quarterly* 1999;70:63–74. [PubMed: 9924733]
- Saunders JB, Aasland OG, Babor TF, De La Fuente JR, Grant M. Development of the Alcohol Use Disorders Screening Test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption--II. *Addiction* 1993;88:791–804. [PubMed: 8329970]
- Skinner, HA. The Drug Abuse Screening Test (DAST): Guidelines for administration and scoring. Addiction Research Foundation; Toronto: 1982.
- Solomon S, Chakraborty A, Yeptomi RD. A review of the HIV epidemic in India. *AIDS Education and Prevention* 2004;16(Supplement A):155–169. [PubMed: 15262573]
- Tharyan P, Ramalingam S, Kannangai R, Sridharan G, Muliyl J, Tharyan A. Prevalence of HIV infection in psychiatric patients attending a general hospital in Tamil Nadu, south India. *AIDS Care* 2003;15:197–205. [PubMed: 12856341]
- Wenzel SL, Koegel P, Gelberg L. Antecedents of physical and sexual victimization among homeless women: a comparison to homeless men. *American Journal of Community Psychology* 2000;28:367–390. [PubMed: 10945122]

Table 1
Bivariate Associations Between STI Rates and Demographic, Psychiatric, and Substance Use Characteristics

Demographic Variables	<i>n</i> ^a	HIV	Chlamydia	Syphilis	Hepatitis B	Any STI
Gender						
Female	375/287	7 (1.9%)	31 (10.8%)	7 (1.9%) *	6 (1.6%) *	50 (13.3%)
Male	573/440	9 (1.6%)	42 (9.6%)	24 (4.2%) *	22 (3.8%) *	88 (15.4%)
Age						
18-28	449/345	7 (1.6%)	33 (9.6%) *	7 (1.5%) *	19 (4.2%)	62 (13.8%)
29-38	298/227	9 (3.0%)	32 (14.1%) *	13 (4.4%) *	6 (2.0%)	54 (18.1%)
39-48	136/102	0 (0%)	7 (6.9%) *	7 (5.2%) *	1 (0.7%)	15 (11.0%)
48 +	65/53	0 (0%)	1 (1.9%) *	4 (6.5%) *	2 (3.1%)	7 (10.8%)
Level of Education						
No Formal Education	126/97	2 (1.6%)	13 (13.4%)	8 (6.4%)	2 (1.6%)	23 (18.3%)
High School	472/356	11 (2.3%)	35 (9.8%)	16 (3.4%)	14 (3.0%)	70 (14.8%)
College	350/274	3 (0.9%)	25 (9.1%)	7 (2.0%)	12 (3.4%)	45 (12.9%)
Marital Status						
Unmarried	540/411	10 (1.9%)	40 (9.7%)	19 (3.5%)	20 (3.7%)	81 (15.0%)
Married	408/316	6 (1.5%)	33 (10.4%)	12 (2.9%)	8 (2.0%)	57 (13.0%)
Living Environment						
Rural	420/326	9 (2.1%)	34 (10.4%)	19 (4.5%)	14 (3.3%)	68 (16.2%)
Urban	528/401	7 (1.3%)	39 (9.7%)	12 (2.3%)	14 (2.7%)	70 (13.3%)
Living Situation						
Own Home	340/254	6 (1.8%)	30 (11.8%)	11 (3.2%)	8 (2.4%)	51 (15.0%)
Others' Home	608/473	10 (1.6%)	43 (9.1%)	20 (3.3%)	20 (3.3%)	87 (14.3%)
Occupation						
Unemployed	332/258	6 (1.8%)	24 (9.3%)	11 (3.3%)	10 (3.0%)	48 (14.5%) *
Nonprofessional	510/393	9 (1.8%)	45 (11.5%)	19 (3.7%)	17 (3.3%)	83 (16.3%) *
Professional	106/76	1 (0.9%)	4 (5.3%)	1 (0.9%)	1 (0.9%)	7 (6.6%) *
Psychiatric Variables						
Diagnosis						
Psychotic	374/290	5 (1.3%)	36 (12.4%)	10 (2.7%)	13 (3.5%)	60 (16.0%)
Bipolar/Mania	294/224	5 (1.7%)	17 (7.6%)	14 (4.7%)	7 (2.3%)	41 (13.8%)
Depression	143/112	3 (2.1%)	13 (11.6%)	5 (3.5%)	5 (3.5%)	23 (16.1%)
Neurotic/Other	132/101	3 (2.3%)	7 (6.9%)	2 (1.5%)	3 (2.3%)	14 (10.6%)
Duration of Illness						
< 6 Months	201/160	7 (3.5%)	19 (11.9%)	9 (4.5%)	8 (4.0%)	39 (19.4%)
6-12 Months	64/51	0 (0%)	6 (11.8%)	2 (3.1%)	3 (4.7%)	11 (17.2%)
1-5 Years	313/243	2 (0.6%)	23 (9.5%)	6 (1.9%)	9 (2.9%)	38 (12.1%)
> 5 Years	370/273	7 (1.9%)	25 (9.2%)	14 (3.8%)	8 (2.2%)	50 (13.5%)
Substance Use Variables						
Any Substance Use						
No	846/637	13 (1.5%)	66 (10.4%)	23 (2.7%) **	25 (3.0%)	119 (14.1%)
Yes	102/90	3 (2.9%)	7 (7.8%)	8 (7.8%) **	3 (2.9%)	19 (18.6%)
Cigarette Smoking						
No	796/621	14 (1.8%)	67 (10.8%)	23 (2.9%)	22 (2.8%)	119 (15.0%)
Yes	152/106	2 (1.3%)	6 (5.7%)	8 (5.6%)	6 (4.0%)	19 (12.5%)
Beedis Smoking						
No	735/576	13 (1.8%)	64 (11.1%)	19 (2.6%) *	15 (2.0%) **	107 (14.6%)
Yes	213/151	3 (1.4%)	9 (6.0%)	12 (5.6%) *	13 (6.1%) **	31 (14.6%)
Chewing Tobacco						

	^a <i>n</i>	HIV	Chlamydia	Syphilis	Hepatitis B	Any STI
No	801/621	11 (1.4%)	61 (9.8%)	24 (3.0%)	25 (3.1%)	113 (14.1%)
Yes	147/106	5 (3.4%)	12 (11.3%)	7 (4.8%)	3 (2.0%)	25 (17.1%)
Berehnt Use						
No	712/552	11 (1.5%)	53 (9.6%)	22 (3.1%)	21 (3.0%)	98 (13.8%)
Yes	236/175	5 (2.1%)	20 (11.4%)	9 (3.8%)	7 (3.0%)	40 (17.0%)
AUDIT Score						
< 8	866/657	13 (1.5%)	67 (10.2%)	23 (2.7%) ^{**}	26 (3.0%)	121 (14.0%)
8+	82/70	3 (3.7%)	6 (8.6%)	8 (9.8%) ^{**}	2 (2.4%)	17 (20.7%)
DAST Score						
< 2	915/696	16 (1.8%)	72 (10.3%)	29 (3.2%)	26 (2.8%)	133 (14.5%)
2+	33/31	0 (0%)	1 (3.2%)	2 (6.1%)	2 (6.1%)	5 (15.2%)

^a *Note.* Results for HIV, Syphilis, Hepatitis B, and Any STI are based on *n* = 948 with the sample size for each analysis represented by the number on the left side of the slash in the column; Chlamydia data based on *n* = 727 with sample size represented by the number on the right side of the slash in the column. Some variables may not reflect these sample sizes due to missing data.

*
p < .05

**
p < .01.

Table II
Bivariate Associations Between STI Infection Rates and Behavioral Risk Variables

	<i>a</i> <i>n</i>	HIV	Chlamydia	Syphilis	Hepatitis B	Any STI
Behavioral Risk Variables						
Last Sexual Activity						
Never	351/272	2 (0.6%)	26 (9.6%)	7 (2.0%)	14 (4.0%)	47 (13.4%)
Past Year	437/333	11 (2.5%)	35 (10.5%)	15 (3.4%)	10 (2.3%)	67 (15.3%)
Last 10 Years	130/99	3 (2.3%)	8 (8.1%)	7 (5.4%)	4 (3.1%)	19 (14.6%)
Lifetime	30/23	0 (0.0%)	4 (17.4%)	2 (6.7%)	0 (0.0%)	5 (16.7%)
Paid for Sex, Past 10 Years						
No	866/666	10 (1.2%)**	68 (10.2%)	23 (2.7%)**	24 (2.8%)	119 (13.7%)*
Yes	79/60	6 (7.6%)**	5 (8.3%)	9 (10.1%)	4 (5.1%)	19 (24.1%)*
Paid for Sex, Past Year						
No	920/705	13 (1.4%)**	71 (10.1%)	27 (2.9%)**	28 (3.0%)	131 (14.2%)
Yes	27/21	3 (11.1%)**	2 (9.5%)	4 (14.8%)	0 (0.0%)	7 (25.9%)*
Been Paid for Sex, Lifetime						
No	920/704	12 (1.3%)**	69 (9.8%)	28 (3.0%)*	27 (2.9%)	127 (13.8%)*
Yes	25/22	4 (16.0%)**	4 (18.2%)	3 (12.0%)*	1 (4.0%)	11 (44%)*
Been Paid for Sex, Past Year						
No	937/718	15 (1.6%)	72 (10.0%)	30 (3.2%)	27 (2.9%)	134 (14.3%)*
Yes	11/9	1 (9.1%)	1 (11.1%)	1 (9.1%)	1 (9.1%)	4 (36.4%)*
Multiple Partners, Past 10 Years						
No	805/629	4 (0.5%)**	65 (10.3%)	17 (2.1%)**	22 (2.7%)	102 (12.7%)*
Yes	140/97	12 (8.6%)**	8 (8.3%)	14 (10.0%)**	6 (4.3%)	36 (25.7%)*
Multiple Partners, Past Year						
No	908/700	11 (1.2%)**	70 (10.0%)	27 (3.0%)*	27 (3.0%)	126 (13.9%)*
Yes	40/27	5 (12.5%)**	3 (11.1%)	4 (10.0%)*	1 (2.5%)	12 (30.0%)*
Sex with MSM, Past 10 Years						
No	904/703	13 (1.4%)**	71 (10.1%)	27 (3.0%)**	27 (3.0%)	129 (14.3%)*
Yes	22/14	2 (9.1%)**	1 (7.1%)	4 (18.2%)**	1 (4.6%)	7 (31.8%)*
Sex with MSM, Past Year						
No	928/715	14 (1.5%)*	71 (9.9%)	29 (3.0%)**	28 (3.0%)	131 (14.1%)*
Yes	9/5	1 (11.1%)*	1 (20.0%)	2 (22.2%)	0 (0.0%)	4 (44.4%)*
Anal Sex, Past 10 Years						
No	881/680	11 (1.3%)**	69 (10.2%)	25 (2.8%)**	27 (3.1%)	123 (14.0%)*
Yes	64/46	5 (7.8%)**	4 (8.7%)	6 (9.4%)*	1 (1.6%)	15 (23.4%)*
Anal Sex, Past Year						
No	918/706	13 (1.4%)**	70 (9.9%)	26 (2.8%)*	28 (3.1%)	127 (13.8%)*
Yes	30/21	3 (10.0%)**	3 (14.3%)	5 (16.7%)**	0 (0.0%)	11 (36.7%)*
Self-reported STI Variables						
STI Sx Reported						
No	886/686	11 (1.2%)**	67 (9.8%)	30 (3.4%)	27 (3.1%)	125 (14.1%)
Yes	62/41	5 (8.1%)**	6 (14.6%)	1 (1.6%)	1 (1.6%)	13 (21.0%)*
STI Lifetime						
No	876/673	7 (0.8%)**	67 (10.0%)	26 (3.0%)*	27 (3.1%)	119 (13.6%)*
Yes	69/53	9 (13.0%)**	6 (11.3%)	5 (7.3%)*	1 (1.5%)	19 (27.5%)*
STI Past Year						
No	926/710	12 (1.3%)**	71 (10.0%)	30 (3.2%)*	28 (3.0%)	131 (14.2%)*
Yes	22/17	4 (18.2%)**	2 (11.8%)	1 (4.6%)*	0 (0.0%)	7 (31.8%)*

^aNote. Results for HIV, Syphilis, Hepatitis B, and Any STI are based on $n = 948$ with the sample size for each analysis represented by the number on the left side of the slash in the column; Chlamydia data based on $n = 727$ with sample size represented by the number on the right side of the slash in the column. Some variables may not reflect these sample sizes due to missing data.

* $p < .05$
 ** $p < .01$.