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A Multisite Study of the Prevalence of HIV With Rapid Testing in Mental Health Settings

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Note. The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Contributors

M. B. Blank served as principal investigator and provided oversight to the entire project and was assisted by D. S. Metzger. S. S. Himelhoch was primarily responsible for data collection and all other project activities in Baltimore and was assisted by L. B. Dixon. C. E. Rose and E. Oraka had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the analysis. A. Davis-Vogel supervised the data collection and other project activities in Philadelphia. W. W. Thompson and J. D. Heffelfinger participated in study design and decisions regarding data analysis and presentation. All authors participated in drafting and revising the article.

Human Participant Protection

Institutional review boards at the Centers for Disease Control and Prevention, the University of Pennsylvania, the University of Maryland, and all participating mental health sites approved this study. Details regarding standard operating procedures are provided in an appendix, available as a supplement to the online version of this article at http://www.ajph.org.

Abstract

Objectives—We estimated HIV prevalence and risk factors among persons receiving mental health treatment in Philadelphia, Pennsylvania, and Baltimore, Maryland, January 2009 to August 2011.

Methods—We used a multisite, cross-sectional design stratified by clinical setting. We tested 1061 individuals for HIV in university-based inpatient psychiatric units (n = 287), intensive case-management programs (n = 273), and community mental health centers (n = 501).

Results—Fifty-one individuals (4.8%) were HIV-infected. Confirmed positive HIV tests were 5.9% (95% confidence interval [CI] = 3.7%, 9.4%) for inpatient units, 5.1% (95% CI = 3.1%, 8.5%) for intensive case-management programs, and 4.0% (95% CI = 2.6%, 6.1%) for community mental health centers. Characteristics associated with HIV included Black race, homosexual or bisexual identity, and HCV infection.

Conclusions—HIV prevalence for individuals receiving mental health services was more than 4 times as high as in the general population. We found a positive association between psychiatric symptom severity and HIV infection, indicating that engaging persons with mental illness in appropriate mental health treatment may be important to HIV prevention. These findings reinforce recommendations for routine HIV testing in all clinical settings to ensure that HIV-infected persons receiving mental health services are identified and referred to timely infectious disease care.

People with serious mental illness (SMI) are at increased risk for being infected with HIV. Risk factors associated with HIV infection among persons with SMI mirror those in the general population and include unprotected sexual activity and injection drug use (IDU).[1–5] Studies that estimated HIV prevalence from samples of patients with SMI during the 1990s and early 2000s found that HIV prevalence ranged from 1% to 23%.[6–16] The wide variation in estimates has been attributed to small sample sizes, the use of regional convenience samples, differences in sampling frames, and inadequate adjustment for confounding effects of factors associated with HIV risk.[17,18]

Analysis of administrative data indicates that many HIV-infected persons who receive Medicaid also have comorbid mental illnesses. Walkup et al. found that among persons in the New Jersey HIV/AIDS registry receiving Medicaid, 5.7% had a diagnosis of schizophrenia,[19] much higher than the prevalence of schizophrenia in the general population, which is estimated to be about 1%.[20] A clear weakness of this method is that HIV diagnoses identified in administrative records may not capture all HIV diagnoses and may not be linked to confirmed HIV-positive test results. An approach to measuring rates of HIV among individuals with SMI taken by investigators in Philadelphia, Pennsylvania, was to conduct HIV testing on remnant blood specimens collected from patients on 2 inpatient psychiatric units in the city. In this study, 10.1% of patients were found to be HIV-infected. Chart reviews up to the time of testing of the remnant blood failed to find documentation of previous HIV diagnosis in the clinical record for approximately one third of these persons. However, this study used a very specific sample that does not generalize to all patients seeking mental health services.[16]

As the demographics of the HIV epidemic have shifted in the past decade, the degree to which HIV prevalence among persons with SMI has changed remains unclear. Accurate estimates of HIV prevalence among these persons and more information about access to and retention in care for HIV-positive persons with SMI is needed.

The approval of rapid HIV testing by the US Food and Drug Administration and widespread availability of multiple rapid testing assays provides new opportunities for HIV testing and more efficient determination of prevalence estimates in hard-to-reach populations. Rapid HIV testing results can be obtained in approximately 20 minutes, allowing delivery of immediate posttest counseling and referral and linkage to HIV care. Prevention services for persons with preliminary positive test results can also reduce risks of transmission to others. The rapid turnaround for obtaining and delivering test results increases the flexibility of service delivery and might be useful for testing those with SMI within mental health settings. This is particularly important as the mental health system has been increasingly called upon to provide basic medical and preventive health services[21–24] for those with SMI and is the most common place for where they receive care.[25] Rapid testing thus holds great promise for integrating routine HIV testing into ongoing mental health services in a variety of clinical settings. The specificity of current US Food and Drug Administration–approved rapid HIV tests is high.[26] Sensitivity for established infections is also high, but currently available rapid tests do not detect early infections that can be detected by laboratory tests.[27]

Prevention services for HIV-positive patients in mental health centers have the potential to reduce risks of transmission to others. This is consistent with a positive prevention model proposed by Sikkema et al.[28] although the empirical evidence to date has been mixed,[29–31] with additional studies in progress.[32] There is also an opportunity for rapid testing to facilitate linkage to infectious disease care for these individuals.[33–36]

The purpose of this study was to use rapid HIV testing to estimate HIV prevalence and examine risk factors associated with HIV infection among people receiving treatment in the mental health system. We focused on 2 large urban communities (Philadelphia, PA, and Baltimore, MD) that have a high burden of HIV infection. By drawing the study sample from inpatient psychiatric units, outpatient community mental health centers (CMHCs), and outpatient intensive case management (ICM) programs, we captured patients served by the 3 predominant modalities of mental health service delivery in the United States.

METHODS

We used a multisite, cross-sectional design stratified across 3 clinical settings (inpatient psychiatric units, CMHCs, and ICM programs) with convenience sampling. We selected Philadelphia and Baltimore because both cities are among the major metropolitan areas in the United States with the highest HIV prevalence.[37] In Baltimore, participants were recruited from 1 inpatient unit, 2 ICMs, and 1 CMHC. In Philadelphia, participants were recruited from 2 inpatient units, 2 ICMs, and 2 CMHCs. For the inpatient units, participants were recruited from the roster of admissions. Interview staff approached persons based on the length of time they had been on the unit, starting with those had been admitted the longest because they were more likely to be stabilized and able to participate in the study.

For the CMHCs and ICM programs, participants were approached after they had checked in for their appointment at the facility. In each setting, providers were given the opportunity to recommend exclusion of anyone who they felt was clinically compromised and too unstable to participate. For all settings, persons were eligible to participate if they were aged 18 years or older, understood spoken English, were willing to provide contact information, were competent to consent to the study procedures (demonstrated through a verbal quiz of the content of the consent form), and agreed to a confidential rapid HIV test.

After providing informed consent, the participants received a rapid HIV test in accordance with Centers for Disease Control and Prevention and local testing guidelines. Trained interviewers then administered a 45- to 60-minute face-to-face interview. The responses to the interview were recorded on paper and later transferred to a computer database. Immediately following the interview, the HIV test results were delivered to participants. Results were provided after participants completed the interview to prevent influencing responses. For those who tested preliminary positive, a second oral swab was collected for confirmatory testing with Western blot, which was sent to a commercial laboratory (Quest Diagnostics). All persons identified as HIV-infected were reported to their respective city health departments regardless of whether they had indicated a previous HIV diagnosis. The city health departments confirmed whether reports of HIV infections were known previously or if they were new reports. Participants were compensated $20 for their time taking the survey and HIV test.

Persons enrolled in other research trials were allowed to participate. Known HIV-infected individuals were eligible to participate to avoid underestimating prevalence. To perform point-of-care HIV testing outside a standard clinical laboratory, Clinical Laboratory Improvement Amendment waivers were obtained for all the study sites.

In addition to the interviews and HIV testing, we conducted chart abstractions for all participants to collect information regarding psychiatric diagnoses.

Measures

A face-to-face structured interview was used to collect information on participant demographics, past-6-month drug and alcohol use, sexual practices, hepatitis and sexually transmitted infections (STIs), concerns about HIV, and HIV testing history. A copy of the interview was provided to participants so they could read along if they were able to do so, but the procedures did not assume any functional level of literacy. We used the Short Form 12-Item Health Survey (SF-12) from the Medical Outcomes Study to assess comprehensive health status and functioning.[38] We used the Risk Assessment Battery (RAB) Prescreen Questionnaire[39,40] to assess sexual orientation, homelessness and unstable housing, involvement with the criminal justice system, type and frequency of drug use, and, for IDU, source of needles used during the past 6 months. We assessed psychiatric symptoms with the 24-item Behavior and Symptom Identification Scale (BASIS-24).[41] We included 6 subscales of the BASIS-24 in analyses: depression/functioning, relationships, self-harm, emotional lability, psychosis, and substance abuse. The BASIS-24 is well suited for this study because it is not diagnosis-specific; rather, it measures a broad range of symptoms of mental illness across a broad range of diagnoses. We generated diagnostic codes on the basis of chart

abstraction. As psychiatric and substance abuse disorders commonly co-occur, we created the following algorithm to create 3 mutually exclusive categories based on *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*,[42] diagnoses: (1) those with a psychiatric diagnosis only, (2) those who had co-occurring psychiatric and substance dependence or abuse diagnoses, and (3) those who had a substance dependence or abuse diagnosis only.

Analyses

We performed univariable analyses of demographic characteristics and risk factors associated with HIV prevalence by using Poisson regression with a robust standard error with generalized estimating equation procedures.[43] We estimated *P* values by using the type III likelihood ratio χ^2 test to test for overall differences in HIV prevalence among the levels of a characteristic.

We estimated the association between continuous variables (RAB score, SF-12, and BASIS-24 scores) and HIV status by using univariable Poisson models and present the prevalence ratios in terms of a 1-unit increase for these continuous variables. Because the RAB drug risk score was highly skewed, it was utilized as a dichotomous variable (0, 1) for this study.

We used a multivariable Poisson model to estimate adjusted prevalence ratios with the following guidelines. First, we included a priori variables in the multivariable model regardless of the univariable Poisson model prevalence results. The a priori variables were site, age, gender, race, and sexual identity. We chose these because they were likely to be risk factors (age, gender, race, and sexual orientation) or a blocking factor (site) and we wanted to control for these variables regardless of statistical significance. Next, we included all other factors listed in Tables 1 and 2 in the multivariable model if the univariable model *P* value was .1 or less. We estimated the HIV unadjusted prevalence and 95% confidence interval (CI) for all levels of the categorical demographic characteristics and risk factors by using the univariable Poisson models (Table 1). We present the unadjusted and adjusted prevalence ratios with 95% CI and *P* values for the final models. For all analyses, we considered a *P* value of .05 or less statistically significant.

RESULTS

The study sample of 1061 persons included 621 men (58.8%) and 436 women (41.2%) with 4 declining to specify gender (0.4%); most participants were Black (65.7%). Overall, 51 (4.8%; 95% CI = 3.7%, 6.3%) had confirmed positive HIV test results. Among the 570 people who only had a psychiatric disorder, 332 (58.3%) had schizophrenia or another psychotic disorder, 227 (39.8%) has an affective disorder, and 11 (1.9%) had another psychiatric diagnosis. Among the 350 with a psychiatric disorder as well as a co-occurring substance abuse disorder, 141 (40.3%) had schizophrenia or another psychotic disorder, 208 (59.4%) had an affective disorder, and 1 (0.3%) had another psychiatric diagnosis. There were 141 people with only a substance abuse disorder and no other psychiatric diagnoses. The rate of infection was higher in Baltimore (5.9%; 95% CI = 4.1%, 8.6%) than in Philadelphia (3.9%; 95% CI = 2.7%, 5.8%), but this difference was not statistically

significant. We tested 288 participants from university-based inpatient psychiatric units, of whom 17 (5.9%; 95% CI = 3.7%, 9.4%) were HIV-infected; 273 participants from ICM programs, of whom 14 (5.1%; 95% CI = 3.1%, 8.5%) were HIV-infected; and 501 participants from CMHCs, of whom 20 (4.0%; 95% CI = 2.6%, 6.1%) were HIV-infected; these differences were not statistically significant (P = .47; Table 1).

The majority (76.0%; 95% CI = 64.6%, 88.3%) of persons who tested positive were already aware of their HIV status. In Philadelphia, a total of 608 participants were tested, of whom 24 (3.9%; 95% CI = 2.7%, 5.8%) tested positive. Of the 24 participants testing positive, 21 (87.5%; 95% CI = 74.7%, 99.0%) reported that they had previously known that they were HIV-infected. In Baltimore, a total of 454 participants were tested, of whom 27 (5.9%; 95% CI = 4.1%, 8.6%) tested positive. Seventeen (65.4%; 95% CI = 48.1%, 84.7%) participants with positive test results reported that they had previously known that they were HIV-infected.

Age was significantly associated with HIV status (P = .04); those who were aged 40 to 49 years had the highest HIV prevalence (6.7%; 95% CI = 4.5%, 9.9%), followed by those who were aged 50 years or older (5.7%; 95% CI = 3.8%, 8.5%). We also found race to be significantly associated with HIV status (P = .02), with Black participants having the highest HIV prevalence (6.2%; 95% CI = 4.7%, 8.3%). Participants who reported current homelessness had a higher prevalence of HIV compared with those who were not currently homeless (8.1%; 95% CI = 4.9%, 13.3% vs 4.2%; 95% CI = 3.1%, 5.8%; P = .03). HIV prevalence was significantly higher among participants who reported being coinfected with HCV (10.8%; 95% CI = 6.9%, 17.0% vs 3.7%; 95% CI = 2.7%, 5.2%; P < .001) and among those who identified as homosexual or bisexual compared with those who identified as heterosexual (10.4%; 95% CI = 5.8%, 18.7% vs 4.2%; 95% CI = 3.1%, 5.7%; P = .01). We found no significant differences in rates of HIV prevalence by level of care, study site, gender, marital or cohabitation status, income, education, having had an STI in the past 12 months, non-injection drug use in the past 4 weeks, or psychiatric diagnosis (Table 1).

Table 2 examines differences between participants on the RAB, SF-12, and BASIS-24 by HIV status to examine associations between HIV infection and drug and sexual risk, social and emotional well-being, and severity of symptoms of mental illness. There were no differences between those who tested positive or negative for HIV on any of the indicators of health-related quality of life as measured by the SF-12. We found significant differences for emotional lability (P = .046) and for the total RAB score (P=.045). Although we found no statistical significance for the BASIS-24 overall score (P = .06) the P value suggests relevance of the difference in the scores.

Table 3 presents the multivariable analyses. Participants were more likely to be HIV-infected if they were Black (adjusted prevalence ratio [aPR] = 5.71; 95% CI = 1.58, 20.67) compared with White (P = .01); homosexual or bisexual (aPR = 2.27; 95% CI = 1.03, 5.00) compared with heterosexual (P = .04); ever been told that they had HCV infection (aPR = 2.28; 95% CI = 1.23, 4.22; P = .01); and had a higher BASIS-24 score (aPR = 1.69; 95% CI = 1.01, 2.83; P = .049).

DISCUSSION

This study is one of the largest to date to estimate HIV prevalence and risk factors among persons receiving treatment in mental health settings. By recruiting participants from 3 distinct settings (inpatients, outpatients receiving routine care, and outpatients receiving intensive case management services), we evaluated patients served by the 3 predominant modes of delivering mental health services in the United States.[44] Consistent with previous studies, we found that HIV infection is highly prevalent among persons receiving mental health care. A total of 4.8% (3.7%–6.3%) of participants in our study were HIV-infected, which is more than 4 times the overall prevalence in Philadelphia (1.4%) and Baltimore (1.3%).[45,46] We also found that characteristics associated with HIV status followed a pattern similar to the general population and included Black race, homosexual or bisexual identity, and HCV infection. The association between HIV status and HCV infection is likely a marker of lifetime IDU among this population; however, participants were only asked about IDU in the past 6 months.

The results of the current study also showed that persons with more severe symptoms of mental illness were at higher risk for being HIV-infected. This is consistent with a recent study that examined the association of HIV risk and psychiatric symptom severity by using the Colorado Symptom Index and found a 47% increased risk for HIV among persons with scores of 30 or greater (a criterion score for severe psychiatric symptoms) compared with those with scores lower than 30.[47] Although psychiatric severity appeared to be associated with HIV infection, we did not find any differences in HIV prevalence when stratified by service setting, indicating that persons receiving care in more acute treatment settings (e.g., inpatient units) were not more likely to be HIV-infected. Our findings suggest that specific neurocognitive or psychiatric symptoms may be associated with HIV prevalence independent of treatment needs at the time of testing.[48–50]

Although our study found a high prevalence of HIV among those receiving mental health care, we detected relatively few new HIV cases. However, these new cases of HIV represent an important failure in the public health and mental health system of care. Higher rates of undetected HIV have been found in other groups in the community, but our sample is gleaned from individuals who are actively receiving mental health care in a hospital or community-based clinic. Both the Centers for Disease Control and Prevention and the Institute of Medicine recommend HIV screening in all clinical settings, including mental health settings, to increase identification of those infected and strengthen access to care.[51] However, since these recommendations were released, little progress has been made toward integrating HIV testing into mental health care visits.[52–56] Overcoming system-level barriers, including identifying sources of funding for training, credentialing, and procurement of point-of-care rapid HIV testing kits needed for on-site HIV testing, may be required to ensure wider adoption of HIV testing in mental health care settings.

As with HIV screening conducted in any setting, ensuring that those who are identified with HIV are linked to, retained in, and adhere to HIV care is vitally important. Ensuring linkage for HIV-infected persons with mental illness to HIV care in the community can be very difficult because of issues such as ongoing substance abuse, unstable housing, and lack of

employment. However, the opportunity to initiate referrals in specialty mental health settings is enhanced by long-term caring relationships that are developed with many persons with SMI. Both HIV and mental illness are chronic conditions with significant health burdens and associated economic costs[57] that have traditionally been treated with fragmented rather than integrated approaches. There have been several calls for the integration of public health and mental health systems[58–60] and a greater understanding of the health disparities among individuals with mental illnesses.[61–63] To address these concerns, the National AIDS Strategy suggests a wide range of approaches including policy integration of mental health promotion, prevention of mental illness, and the control and prevention of other chronic diseases.[49] Better integration of HIV testing in these settings will enhance the identification of HIV infection among persons with mental illnesses and improve linkage to and, presumably, retention in HIV medical care. Indeed, public health systems in the future should focus on developing tailored treatments for complex co-occurring conditions.[50] This is particularly relevant because mental health treatment may prevent HIV acquisition and transmission in a similar way as substance abuse treatment prevents HIV acquisition and transmission.[48–50]

These findings also support treatment as prevention among people with mental illnesses who know they are HIV-infected. We need to continue to expand risk reduction and other prevention services for persons with co-occurring mental illnesses and HIV within existing mental health service settings. These data suggest the need for risk reduction counseling within these settings; such counseling could be of great public health significance.

This study is subject to several limitations. First, the data were cross-sectional so we cannot make any causal inferences between SMI and HIV infection. Second, although efforts were made to recruit patients systematically, only a small number of mental health care venues in Philadelphia and Baltimore were included and study participants were not recruited randomly within these venues. Therefore, the findings from this study may not be representative of persons with SMI in these venues or in the 2 cities. Third, some individuals were ineligible to participate because of the severity of symptoms of their mental illnesses and lack of competence to provide informed consent based on a 2-step competence determination procedure. However, the exclusion of these individuals likely biased our findings toward the null because we found that more severe mental illness was associated with a higher rate of HIV infection. Finally, we were not able to determine immunological status, viral loads, and treatment status of the HIV-infected persons included in these analyses. Additional research should determine the extent to which persons with mental illness are receiving HIV care and treatment and collect data on immunologic and viral load status of patients with SMI. Determination of in-care viral load for persons with mental illnesses may provide insights about disparities in access to, use of, and compliance with HIV medical care and suggest possible interventions to address these.[64]

The results of this investigation provide some clues as to fruitful directions of future research in HIV among persons with mental illnesses. It would be useful to examine if different risk groups are more likely to miss detection in mental health settings. Community mental health services should routinely include programs that explore sexuality and positive adjustment among consumers of all sexual orientations and to provide information and

referral to other community services. If mental health centers are to serve as "medical homes" for persons with mental illnesses,[65] they need to embrace the need to provide comprehensive screening and referral for HIV and other STIs.

In conclusion, we found high rates of HIV infection among persons receiving mental health services in Philadelphia and Baltimore, which is consistent with findings from previously published reports. We also found a positive association between the severity of psychiatric symptoms and HIV infection, which indicates that engaging persons with mental illness in appropriate mental health treatment may be an important approach to HIV prevention. Receipt of appropriate mental health care may be a particularly effective approach to HIV prevention and care. As progress is made in integrating mental health care and HIV prevention programs, this could promote increased detection of HIV, enhanced linkage to and retention in HIV care, and improved adherence to psychotropic and antiretroviral medications. In this way, integrated HIV testing and integrated delivery of health services could help reduce the spread of HIV and improve the health and well-being of persons who are already HIV-infected.

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TABLE 1

Characteristics of Participants by HIV Status Among Persons Receiving Treatment in Mental Health Settings: Philadelphia, PA, and Baltimore, MD, January 2009–August 2011

Variable	All Participants (n = 1061), No. (%)	Participants by HIV Status, No. (%)		HIV Prevalence (95% CI)	P[a]
		HIV-Positive (n = 51)	HIV-Negative (n = 1010)		
Level of care					
Inpatient	287 (27.1)	17 (33.3)	270 (26.7)	5.9 (3.7, 9.4)	
ICM	273 (25.7)	14 (27.5)	259 (25.6)	5.1 (3.1, 8.5)	.46
Outpatient	501 (47.2)	20 (39.2)	481 (47.6)	4.0 (2.6, 6.1)	
Study site					
Philadelphia	608 (57.3)	24 (47.1)	584 (57.8)	4.0 (2.7, 5.8)	.13
Baltimore	453 (42.7)	27 (52.9)	426 (42.2)	5.9 (4.1, 8.6)	
Age, y					
18–29	133 (12.5)	3 (5.9)	130 (12.9)	2.3 (0.7, 6.9)	
30–39	181 (17.1)	2 (3.9)	179 (17.7)	1.1 (0.3, 4.4)	.03
40–49	344 (32.4)	23 (45.1)	321 (31.8)	6.7 (4.5, 9.9)	
≥ 50	403 (38.0)	23 (45.1)	380 (37.6)	5.7 (3.8, 8.5)	
Gender					
Male	621 (58.8)	28 (54.9)	593 (59.0)	4.5 (3.1, 6.5)	.57
Female	436 (41.3)	23 (45.1)	413 (41.1)	5.3 (3.5, 7.9)	
Race					
White	196 (18.6)	2 (3.9)	194 (19.3)	1.0 (0.3, 4.1)	
Black	692 (65.7)	43 (84.3)	649 (64.7)	6.2 (4.7, 8.3)	.02
Other[b]	166 (15.8)	6 (11.8)	160 (16.0)	3.6 (0.2, 7.9)	
Education					
< HS graduate	391 (37.0)	25 (49.0)	366 (36.4)	6.4 (4.4, 9.3)	
Grade 12 or GED	416 (39.4)	18 (35.3)	398 (39.6)	4.3 (2.8, 6.8)	.16
At least some college	249 (23.6)	8 (15.7)	241 (24.0)	3.2 (1.6, 6.4)	
Annual income, $					
< 10 000	889 (86.5)	45 (88.2)	844 (86.4)	5.1 (3.8, 6.7)	.71
≥ 10 000	139 (13.5)	6 (11.8)	133 (13.6)	4.3 (2.0, 9.4)	

Variable	All Participants (n = 1061), No. (%)	Participants by HIV Status, No. (%)		HIV Prevalence (95% CI)	P[a]
		HIV-Positive (n = 51)	HIV-Negative (n = 1010)		
Housing status					
Currently homeless	173 (16.4)	14 (27.5)	159 (15.9)	8.1 (4.9, 13.4)	.03
Not currently homeless	880 (83.6)	37 (72.6)	843 (84.1)	4.2 (3.1, 5.8)	
Marital status					
Married or living as married	114 (10.9)	6 (11.8)	108 (10.8)	5.3 (2.4, 11.5)	.83
Single[c]	934 (89.1)	45 (88.2)	889 (89.2)	4.8 (3.6, 6.4)	
STI, past 12 months					
No	1000 (94.5)	50 (98.0)	950 (94.4)	5.0 (3.8, 6.6)	.29
Yes	58 (5.5)	1 (2.0)	57 (5.7)	1.7 (0.3, 12.0)	
Ever told had hepatitis C[d]					
No	891 (85.0)	33 (66.0)	858 (86.0)	3.7 (2.7, 5.2)	<.001
Yes	157 (15.0)	17 (34.0)	140 (14.0)	10.8 (6.9, 17.0)	
Any NIDU, past 4 wk					
No	218 (20.6)	8 (15.7)	210 (20.8)	3.7 (1.9, 7.2)	.38
Yes	843 (79.5)	43 (84.3)	800 (79.2)	5.1 (3.8, 6.8)	
Sexual identity					
Heterosexual	945 (90.8)	40 (80.0)	905 (91.3)	4.2 (3.1, 5.7)	.01
Homosexual or bisexual	96 (9.2)	10 (20.0)	86 (8.7)	10.4 (5.8, 18.7)	
Psychiatric diagnosis[e,f]					
Psychiatric disorder only	570 (54.7)	21 (41.2)	549 (55.4)	3.7 (2.4, 5.6)	.12
Psychiatric and substance abuse disorders	350 (33.6)	21 (41.2)	329 (33.2)	6.0 (4.0, 9.1)	
Substance abuse disorder only	122 (11.7)	9 (17.7)	113 (11.4)	7.4 (3.9, 13.8)	

Note. CI = confidence interval; GED = general education development; HS = high school; ICM = intensive case management programs; NIDU = noninjection drug use; STI = sexually transmitted infection. Numbers might not add to total because of missing data.

[a] *P* value from Wald statistic for type 3 generalized estimating equation analysis.

[b] Includes persons who indicated Asian, Hawaiian/Pacific Islander, American Indian/Alaska Native, or multiple races.

[c] Includes separated, divorced, widowed, and never married.

[d] By a doctor, nurse, or other health care provider.

[e] Obtained through patient chart abstraction.

[f] Diagnostic codes were generated on the basis of chart abstraction. As psychiatric and substance abuse disorders commonly co-occur, we created the following algorithm to create 3 mutually exclusive categories based on *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition,*[42] diagnoses: (1) those with a psychiatric diagnosis only, (2) those who had co-occurring psychiatric and substance dependence or abuse diagnoses, and (3) those who had a substance dependence or abuse diagnosis only.

TABLE 2

Substance Use and Risk Behaviors, Health Status, and Psychiatric Symptoms by HIV Status Among Persons Receiving Treatment in Mental Health Settings: Philadelphia, PA, and Baltimore, MD, January 2009–August 2011

	HIV Status, No. (%) or Mean ±SD			
Variable	**HIV-Infected (n = 51)**	**Non–HIV-Infected (n = 1010)**	**PR (95% CI)**	***P*[a]**
RAB[40]				
Drug risk score 0	47 (92.2)	978 ±96.8	4.6 (3.5, 6.1)	.07
Drug risk score 1	4 (7.8)	32 ±3.2	11.1 (4.4, 28.0)	
Sexual risk score, range 0–18	3.1 ±2.6	2.8 ±2.1	1.06 (0.93, 1.20)	.39
Overall score, range 0–19	3.9 ±4.4	3.0 ±2.8	1.07 (1.00, 1.14)	.045
SF-12[38]				
Physical functioning score	42.7 ±12.3	44.5 ±11.4	1.01 (0.99, 1.04)	.24
Role limitation physical score	44.9 ±10.0	42.0 ±13.4	1.02 (0.99, 1.04)	.24
Pain score	42.7 ±13.3	42.1 ±13.4	1.00 (0.98, 1.02)	.74
General health score	38.5 ±11.3	40.3 ±11.8	0.99 (0.97, 1.01)	.29
Vitality score	49.1 ±12.4	48.9 ±11.7	1.00 (0.98, 1.03)	.88
Social functioning score	38.2 ±15.5	40.5 ±13.9	0.99 (0.97, 1.01)	.27
Role limitation emotional score	36.6 ±13.2	37.9 ±12.7	0.99 (0.97, 1.01)	.47
Mental health score	42.5 ±13.8	42.7 ±12.5	1.00 (0.98, 1.02)	.96
Aggregate physical health score	44.4 ±10.1	44.3 ±10.3	1.00 (0.98, 1.03)	.93
Aggregate mental health score	40.5 (14.1)	41.4 ±12.2	0.99 (0.97, 1.02)	.66
BASIS-24[41]				
Depression functioning	1.8 ±0.8	1.6 ±0.9	1.22 (0.95, 1.59)	.12
Interpersonal relationships	2.4 ±1.0	2.6 ±0.9	0.83 (0.62, 1.11)	.21
Self-harm	0.5 ±0.9	0.3 ±0.8	1.21 (0.93, 1.58)	.16
Emotional lability	2.0 ±1.2	1.6 ±1.1	1.29 (1.01, 1.65)	.045
Psychosis	1.3 ±1.2	1.1 ±1.1	1.19 (0.93, 1.52)	.17
Substance abuse	1.0 ±1.1	0.8 ±1.0	1.19 (0.93, 1.55)	.16
Overall score	1.7 ±0.6	1.5 ±0.6	1.52 (0.98, 2.36)	.06

Note. BASIS-24 = The Behavior and Symptom Identification Scale; CI = confidence interval; PR = prevalence ratio; RAB = Risk Assessment Battery; SF-12 = Short-Form 12-Item Health Survey. Numbers might not add to total because of missing data.

[a] *P* value from Wald statistic for type 3 generalized estimating equation analysis.

TABLE 3

Final Model, Unadjusted and Adjusted Association Between Select Participant Characteristics and HIV Status Among Persons Receiving Treatment in Mental Health Settings: Philadelphia, PA, and Baltimore, MD, January 2009–August 2011

Variable	PR (95% CI)	*P*	APR[a] (95% CI)	*P*
Study site				
Philadelphia (Ref)	1.00		1.00	
Baltimore	1.51 (0.88, 2.58)	.13	1.56 (0.91, 2.66)	.11
Age, y				
18–29 (Ref)	1.00		1.00	
30–39	0.49 (0.08, 2.89)	.43	0.45 (0.08, 2.65)	.38
40–49	2.96 (0.91, 9.71)	.07	2.24 (0.65, 7.66)	.2
≥ 50	2.53 (0.77, 8.29)	.13	2.11 (0.60, 7.37)	.24
Gender				
Female (Ref)	1.00		1.00	
Male	0.85 (0.50, 1.46)	.57	1.12 (0.60, 2.07)	.73
Race				
White (Ref)	1.00		1.00	
Black	6.09 (1.49, 24.91)	.01	5.79 (1.60, 20.90)	.01
Other[b]	3.54 (0.72, 17.32)	.12	3.80 (0.79, 18.37)	.1
Sexual identity				
Heterosexual (Ref)	1.00		1.00	
Homosexual or bisexual	2.46 (1.27, 4.76)	.01	2.21 (1.00, 5.00)	.049[c]
Housing status				
Currently homeless	1.92 (1.06, 3.48)	.03	1.50 (0.79, 2.84)	.22
Not currently homeless (Ref)	1.00		1.00	
STI, past 12 mo				
No (Ref)	1.00		1.00	
Yes	0.34 (0.05, 2.45)	.29	0.34 (0.04, 2.58)	.3
Any substance abuse disorder diagnosis[d]				
No (Ref)	1.00		1.00	
Yes	1.72 (1.00, 2.97)	.05	1.25 (0.70, 2.22)	.46
Ever told had hepatitis C[e]				
No (Ref)	1.00		1.00	
Yes	2.92 (1.67, 5.12)	< .001	2.24 (1.21, 4.16)	.01
RAB[40] overall score	1.07 (1.00, 1.14)	.05	1.07 (0.97, 1.18)	.16
BASIS-24[41] overall score	1.52 (0.98, 2.35)	.06	1.70 (1.02, 2.84)	.041

APR = adjusted prevalence ratio; BASIS-24 = The Behavior and Symptom Identification Scale; CI = confidence interval; GED = general education development; HS = high school; PR = prevalence ratio; RAB = Risk Assessment Battery; STI = sexually transmitted infection.

[a] Adjusted for all variables in table.

[b] Includes persons who indicated Asian, Hawaiian/Pacific Islander, American Indian/Alaska Native, and multiple races.

[c] This value was truncated to .049 from .0496 rather than rounded to .05 in order to make clear that it was statistically significant at the standard level of alpha.

[d] Diagnostic codes were generated on the basis of chart abstraction. As psychiatric and substance abuse disorders commonly co-occur, we created the following algorithm to create 3 mutually exclusive categories based on *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*,[42] diagnoses: (1) those with a psychiatric diagnosis only, (2) those who had co-occurring psychiatric and substance dependence or abuse diagnoses, and (3) those who had a substance dependence or abuse diagnosis only.

[e] By a doctor, nurse, or other health care provider.