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Rates and Correlates of HIV and STI Infection Among Homeless Women

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Abstract We studied the prevalence of biologically confirmed HIV, Chlamydia, and gonorrhea in a randomly selected sample of sheltered homeless women in New York City, and explored their association with demographic, homeless history, and clinical risk factors. 329 women were randomly selected from 28 family and single adult shelters. The estimated prevalence of HIV in the study sample is 0.6 % (±0.3 %); for Chlamydia it is 6.7 % (±2.2 %); for gonorrhea it is 0.9 % (±0.04 %). A history of childhood sexual abuse, arrest history, current psychotic symptoms, and substance use disorder placed women at greater risk of infection. We consider contextual factors that may yield underestimates of HIV prevalence in our sample and discuss how a more comprehensive prevalence estimate might be constructed. Findings underscore the importance of offering HIV/STI testing, counseling, and HIV risk prevention interventions to homeless women and suggest that interventions should be tailored to the needs of specific subgroups of homeless women.

Keywords HIV · STI · Homeless women

Introduction

It is well established that homeless persons in general, and homeless women specifically, are at a higher risk of morbidity and mortality than their housed counterparts [1–3]. Moreover, mortality studies have demonstrated that HIV/AIDS is a leading cause of death in homeless populations [3] particularly among homeless women [4]. Homelessness is associated with numerous factors that place women at elevated risk of contracting sexually transmitted infections

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(STIs), including HIV. These factors include high rates of unprotected intercourse, having sex with multiple partners, and trading sex for drugs [5–7]. Studies have demonstrated that the prevalence rate of HIV infection among homeless and marginally housed adults is elevated [2, 6, 8, 9]. However, the use of rigorous methods to assess prevalence rates of HIV and STI in representative samples of homeless people has been limited.

Psychiatric disorders and substance abuse are common in homeless populations, particularly among those with long histories of residential instability [10]. A greater understanding of the relationship between these conditions and HIV and STI status has implications for preventive interventions. For example, it may help to identify subgroups of homeless women that can benefit most from prevention efforts. It may also provide information needed to effectively tailor prevention messages and strategies delivered to at-risk populations.

This manuscript presents findings on the prevalence rates of biologically confirmed HIV and two STIs, Chlamydia and gonorrhea, in a randomly selected sample of sheltered homeless women in New York City. A self-reported history of a prior STI is also presented. Then, the correlates of biologically confirmed HIV and STI prevalence rates and self-reported prior STI infection to demographics, homeless history, and clinical predictors are presented. It is hypothesized that biologically confirmed HIV and STI prevalence rates and self-reported prior STI infection will be greater among homeless women with multiple homeless episodes and among women with co-occurring problems, e.g., psychiatric and substance use disorder, histories of physical and sexual abuse, and intimate partner violence.

Methods

Women were eligible for the study if they were 18 years of age or older, could communicate in English or Spanish, and could comprehend the terms and conditions of voluntary informed consent. Recruitment, assessment, and STI and HIV testing were conducted by trained masters' level staff certified in HIV testing and counseling procedures. Interviewing for the study was conducted from mid-2007 to mid-2008. The research took place largely on site in shelters located throughout four New York City boroughs. Three hundred twenty-nine women, randomly selected from among 28 family and single adult shelters, were interviewed and tested for HIV and STIs.

The sampling procedure was carried out in two phases. In the first phase, 28 shelters were randomly selected from a total of 126 facilities under the auspices of the New York City Department of Homeless Services (DHS). We did not include facilities associated with the HIV/AIDS Service Administration (HASA), a separate municipal system of shelter care for residentially unstable persons known to be HIV positive who meet specific stage of illness admission criteria. However, we address the implications of the HASA system for the prevalence rate of HIV infection among homeless women in New York City in the Discussion section of this manuscript.

The DHS shelters were stratified by shelter type (e.g., shelters for families with children, shelters for families made up of two or more adults, shelters for single adults with or without services for people with mental illness or substance abuse) and size (under 40 units, over 40 units). Within each stratum, shelters were sampled with probability proportional to size [11] using as a measure of size an estimate of the shelter's capacity. In rare instances it was necessary to substitute a selected shelter for one from the larger list for practical reasons, such as the lack of an available private space in which to conduct study interviews. In the second phase, bed or room numbers, rather than the names of women residing in the shelters, were randomly selected from each of the 28 selected shelters. Letters describing the study were distributed to selected beds/rooms requesting that interested subjects contact the interviewing staff by phone or in person during scheduled on-site visits.

Six hundred seventy-five women were selected in the random draw of bed/room numbers; 360 from single adult shelters, and 315 from family shelters. The overall participation rate was 49 %; 54 % for single adult shelters, and 43 % for family shelters. Twenty-eight percent declined participation or did not attend the scheduled interview after agreeing to participate. Some expressed resistance to being tested for HIV and STIs, or to divulging personal information. The interview team was not able to make contact with 23 % of the selected women, chiefly because they were away from the shelter during daytime hours due to employment obligations or participation in day treatment programs, benefits or housing appointments, or other responsibilities. The research team addressed some of these barriers by making repeated visits to the shelters to locate women who were not available upon the first attempt to contact them, and scheduling appointments at the potential participant's convenience. Study participants were given gift cards valued between $35 and $50 for their participation in the project. When the study was planned, the gift card amount was set at $35. Shortly after data collection began, it was suggested by some shelter staff members that a $50 gift card would be more of an incentive, so the amount was increased. The change in gift amount occurred early in the study implementation, and we have no evidence that it had a significant impact on the participation rate.

Recruitment and interviews were conducted in both English and Spanish. The Mini-Mental State Examination (MMSE) [12] was administered to determine whether a potential participant had any cognitive impairments associated with drug intoxication or other organic psychiatric problems that would interfere with her ability to understand the implications of study participation. Eleven women were found ineligible after scoring lower than 28 on the MMSE. Informed consent procedures for interview and specimen assay were administered only to those subjects who were study eligible.

Portions of the study protocol were administered using a laptop computer and the Audio Computer Assisted Self-Interview [13]. However, research diagnostic procedures, pre-test counseling, and HIV and STI testing procedures were carried out in face-to-face interviews with project staff. The research protocol included an informational video describing HIV testing procedures, administration of pre-test counseling, and HIV and STI testing procedures. Approximately 1 week following the interview, HIV and STI test results were presented to study participants along with post-test assessments and counseling. Women who tested positive were promptly linked to a medical clinic of their choice for treatment. All study subjects were given an information packet on local sexual health services in their neighborhoods. The study was approved by the Columbia University and New York City DHS Institutional Review Boards.

Research Assessments

The OraSure oral fluid test with Western Blot confirmation was used to determine HIV status. DNA amplification assays on urine specimens were used to determine the presence of Chlamydia or gonorrhea infection. In addition to assessing biologically confirmed HIV/STI, subjects were asked if they had ever received a health care provider's diagnosis of a sexually transmitted infection, including HIV/AIDS, HBV, syphilis, gonorrhea, genital ulcer, Chlamydia, trichomoniasis, and genital warts. Socio-demographic variables, including age, education, marital status, race/ethnicity, and information on residential history and episodes of homelessness were included in the computer-assisted portion of the protocol. The following structured assessment tools were employed in the study:

The Structured Clinical Interview for DSM-IV (SCID) [14] was used to determine Axis I psychiatric disorder, including substance use disorder. The SCID yields both a current and a lifetime psychiatric diagnosis based on DSM-IV criteria.

The Life Events Checklist [15] developed by the National Center for Posttraumatic Stress Disorder (PTSD), was utilized to measure exposure to potentially traumatic past or recent events. In the analysis reported here, intimate partner violence was defined as ever having been physically assaulted by an intimate partner (boyfriend, girlfriend, spouse).

The Posttraumatic Stress Disorder Checklist (PCL-C) [16] was used to determine a diagnosis of PTSD based on a standardized self-report scale and DSM-IV criteria.

The Childhood Trauma Questionnaire Short Form [17] was used to assess childhood maltreatment histories. Any experience of childhood physical abuse is reported here. In addition, *The Childhood Sexual Abuse Interview* which consists of questions for adults that evaluate a history of specific sexual experiences prior to the age of 15, was used in the study. Interview questions were generated from the list created by Finkelhor [18] and supplemented with questions by Sgroi [19]. Participants were asked if they had experiences ranging from an invitation to do something sexual, to sexually oriented touching, to penetration and intercourse [20, 21]. Here it is reported whether a subject ever had an experience of touching/exposure or penetration.

Data Analysis

For the analysis of prevalence rates, respondents were weighted by inverse probability of selection. All respondents in any selected shelter got the same weight. For each shelter, the weight of the women in the shelter was proportional to $(A/B) \times (1/C)$, where $A =$ the number of women estimated to be in the shelter when the sampling was done (the measure of size used in the sampling), $B =$ the number of women actually included in the study from this shelter, and $C =$ the probability that the shelter was included in the sample. The probability that any shelter was included in the sample depended on the capacity of the shelter, the number of shelters to be selected from its stratum, and the number and size of other shelters in the stratum. All means and regressions were calculated using weights so as to be representative of the population after adjusting for sampling probabilities and number of respondents from each shelter.

Logistic regression was used to study the relationship of independent variables (DSM-IV diagnosis of mood disorder, substance use disorder, psychotic symptoms, and co-occurring substance use disorder and Axis I disorder, PTSD, childhood physical and sexual abuse, intimate partner violence, and chronic homelessness, defined as multiple shelter stays and ever having stayed in places not meant for sleeping) to the following outcomes: (1) HIV/STI, biologically determined by the procedures mentioned, and (2) self-reported history of STIs. Weighted means and regression analyses were completed in R using the "survey" package, using the 10 shelter strata as primary

Table 1 Sample Characteristics

	Single ($N = 194$)		Family ($N = 135$)	
	N	Weighted mean/proportion[a]	N	Weighted mean/proportion
Demographics				
Age***	190	41	135	33
Marital status				
Single (never married)	117	60 %	73	52 %
Married/common law*	22	11 %	35	28 %
Separated/divorced/widowed	52	29 %	27	19 %
High school diploma	108	58 %	61	45 %
Race				
Black or African-American	87	45 %	62	46 %
Hispanic/Latino	44	22 %	40	29 %
Other/not reported	63	32 %	33	25 %
Homeless history and psychiatric characteristics				
Arrest history	91	49 %	49	36 %
Not first time staying in a shelter	132	68 %	76	57 %
Stayed in places not intended for sleeping	57	29 %	28	20 %
Sexually active**	84	44 %	87	63 %
Childhood sexual abuse (any)	93	48 %	59	43 %
Childhood sexual abuse—touching/exposure	79	41 %	45	32 %
Childhood sexual abuse—penetration	76	39 %	50	36 %
Childhood trauma	109	57 %	66	49 %
Intimate partner violence	88	47 %	59	44 %
PTSD (lifetime)	57	32 %	38	28 %
PTSD (current)	24	15 %	20	15 %
Mood disorder (lifetime)	73	41 %	59	44 %
Mood disorder (current)	38	21 %	22	16 %
Primary psychotic symptoms (lifetime)***	49	25 %	4	3 %
Primary psychotic symptoms (current)***	40	20 %	0	0 %
Any axis I disorder (lifetime)	114	63 %	61	46 %
Any axis I disorder (current)***	76	40 %	22	16 %
Substance use disorder (lifetime)***	85	45 %	32	27 %
Substance use disorder (current)	20	11 %	10	9 %
Substance + axis I disorder (lifetime)***	62	32 %	19	15 %
Substance + axis I disorder (current)	10	4 %	3	1 %

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

[a] Weighted mean applies to age; weighted proportion to all other variables shown in table

sampling units [22]. Bivariate analytic models are presented in this manuscript.

Results

Sample Characteristics

Table 1 shows the demographics, homeless history, and psychiatric characteristics of women in the sample presented as numbers and weighted means (for age) and proportions (all other variables) estimating the occurrence of these characteristics in the shelter population from which the sample was drawn. Data are presented separately by shelter type (single adult shelter and family shelter). Women in single and family shelters share many characteristics in common, but important differences distinguish the two groups. Most women in both groups were of African-American or Hispanic background, and about half had a high school diploma. The two groups shared common histories of homelessness and criminal justice experiences. At an average age of 41 years, women in single shelters were

significantly older than women in family shelters, where the average age was 33 years ($p < 0.001$). Twenty-eight percent of women in family shelters were married or in a common law relationship, compared to only 11 % of women in single shelters ($p < 0.05$). Sixty-three percent of women in family shelters reported that they were sexually active in the last 3 months, compared to 44 % of women in single shelters ($p < 0.01$). However, women in the two types of shelters did not differ in childhood sexual abuse experiences, childhood trauma, or intimate partner violence. In terms of psychiatric characteristics, the two groups of women did not differ on PTSD or mood disorder. However, 25 % of women in single shelters had experienced psychotic symptoms at some point in their lives, compared to only 3 % of women in family shelters ($p < 0.001$). It is notable that 20 % of women in single shelters reported that they were experiencing psychotic symptoms at the time of the interview; no women in family shelters reported current psychotic symptoms ($p < 0.001$). Overall, 40 % of women in single shelters had a current Axis I disorder, compared to 16 % of women in family shelters ($p < 0.001$). Forty-five percent of women in single shelters were diagnosed with lifetime substance use disorder, while 27 % of women in family shelters were given this diagnosis ($p < 0.001$). Thirty-two percent of women in single shelters had a lifetime diagnosis of co-occurring Axis I and substance use disorder, while 15 % of women in family shelters were diagnosed with this comorbidity ($p < 0.001$).

Rates of Biologically Confirmed HIV, Chlamydia, and Gonorrhea in the Study Sample

Six of the 329 women (1.8 %) in the sample tested positive for HIV. HIV prevalence among sheltered single women was 3.3 %. None of the women in family shelters tested positive for HIV. The estimated prevalence rate of HIV in the population of homeless women from which the sample was drawn is 0.6 % (±0.3 %), but as we discuss later, this is likely an underestimate of HIV prevalence among homeless women in New York City, given the low response rate in the family shelters and the presence in NYC of a separate system of shelter for people diagnosed with AIDS (see Discussion section). One of the 329 women (0.3 %) tested positive for gonorrhea, resulting in an estimated prevalence rate of 0.9 % (±0.04 %). Fifteen of the 329 women (4.6 %) tested positive for Chlamydia, resulting in an estimated prevalence rate of 6.7 % (±2.2 %). The prevalence rate of any STI infection among single homeless women was 2.1 %; among women in family shelters the prevalence rate was 7.8 %. A total of 21 of the 329 women (6.4 %) in the study sample tested positive for either biologically confirmed HIV, gonorrhea, or Chlamydia, resulting in an estimated combined prevalence rate of HIV/STI of 7.3 % (±2.3 %).

Self-Reported History of a Prior Sexually Transmitted Infection

Most women in both the family (133/135; 99 %) and single adult (185/194; 95 %) shelters had prior testing for HIV/STI at some point in their lives. One hundred eleven of the 329 women (33.7 %) reported having had a prior STI. It is notable that nine women who did not report a prior STI infection tested positive based on the biological testing employed in this investigation. Thus, 36.6 % of the sheltered homeless women we studied had either self-reported a prior STI infection or tested positive based on biological testing.

Correlates of Self-Reported STI and Biologically Confirmed HIV/STI Status

Table 2 shows odds ratios and confidence intervals for self-reported history of a prior sexually transmitted infection and biologically confirmed HIV/STI status by demographics, homeless history, and clinical characteristics. Results were unchanged after adjustment for age, race, marital status, and education; thus, only unadjusted data are presented.

Self-reported prior occurrences of an STI were more common among women who had an arrest history (OR 2.7; 95 % CI 2.0–3.8; $p < 0.001$). In addition, the occurrence of a self-reported prior STI was associated with *any* childhood sexual abuse (OR 2.2, 95 % CI 1.1–4.7, $p < 0.05$) childhood sexual abuse, touching/exposure (OR 1.9; 95 % CI 1.0–3.4; $p < 0.05$), childhood sexual abuse, penetration (OR 2.4; 95 % CI 1.5–4.1; $p < 0.01$), *any* current Axis I disorder (OR 2.1, 95 % CI 1.1–3.7, $p < 0.05$), and current psychotic symptoms (OR 3.0; 95 % CI 1.3–6.9; $p < 0.05$). Biologically confirmed HIV/STI was less likely to occur among women aged 45 and over (OR 0.1; 95 % CI 0.0–0.3; $p < 0.001$). In addition, a biologically confirmed HIV or STI test was associated with a current substance use disorder (OR 5.3; 95 % CI 2.7–10.4; $p < 0.001$).

Discussion

This manuscript reports the prevalence rates and correlates of biologically confirmed HIV and two STIs, Chlamydia and gonorrhea, and self-reported prior STI infection found in a random sample of sheltered homeless women in New York City. In addition, relationships of biologically confirmed HIV and STI prevalence rates and self-reported prior STI infection to demographics, homeless history, and clinical characteristics of study subjects are presented. In this study of primarily young, unattached, minority women with limited educational achievement, it was revealed that prior homelessness, arrest histories, childhood sexual and

Table 2 Self-reported HIV/STI history & biologically confirmed HIV/STI by homeless history and psychiatric characteristics

	HIV/STI: self-reported history			Biologically confirmed HIV/STI		
	Odds ratio	CI	*p* value	Odds ratio	CI	*p* value
Age						
Under 30	–	–	–	–	–	–
30–44	1.2	(0.7, 2.0)	0.56	0.3	(0.1, 1.3)	0.12
45 and over	1.1	(0.4, 3.6)	0.84	0.1	(0.0, 0.3)	0.001
Marital status						
Single (never married)	–	–	–	–	–	–
Married/common law	0.8	(0.4, 1.5)	0.50	0.9	(0.5, 1.5)	0.68
Separated/divorced/widowed	0.6	(0.3, 1.6)	0.35	0.4	(0.1, 2.2)	0.31
High school diploma	1.8	(0.7, 4.8)	0.23	0.9	(0.3, 2.8)	0.89
Race						
Black or African-American	1.3	(0.8, 2.2)	0.30	0.3	(0.1, 1.3)	0.11
Hispanic/Latino	0.7	(0.3, 1.8)	0.48	0.6	(0.2, 1.6)	0.31
Other/not reported	–	–	–	–	–	–
Single adult shelter	1.2	(0.7, 1.9)	0.55	0.5	(0.2, 1.2)	0.13
Not first time staying in a shelter	1.4	(0.7, 3.2)	0.37	2	(0.5, 8.3)	0.35
Stayed in places not intended for sleeping	1.5	(0.9, 2.3)	0.10	2	(0.7, 5.8)	0.24
Sexually active	3.2	(0.9, 11.2)	0.08	1.1	(0.7, 2.0)	0.63
Arrest history	2.7	(2, 3.8)	0.001	0.9	(0.5, 1.9)	0.87
Childhood sexual abuse—any	2.2	(1.1, 4.7)	0.045	1.2	(0.4, 3.1)	0.77
Childhood sexual abuse—touching/exposure	1.9	(1, 3.4)	0.05	1.9	(0.7, 5.3)	0.24
Childhood sexual abuse—penetration	2.4	(1.5, 4.1)	0.003	0.7	(0.2, 2)	0.50
Childhood trauma	1.7	(0.7, 4.2)	0.25	0.4	(0.2, 1)	0.07
Intimate partner violence	1.7	(1, 2.8)	0.06	0.5	(0.1, 2)	0.32
PTSD (lifetime)	1.4	(0.7, 2.6)	0.35	1.6	(0.5, 4.8)	0.40
PTSD (current)	1.3	(0.5, 3)	0.60	0.6	(0.1, 5.7)	0.69
Mood disorder (lifetime)	1.2	(0.8, 2)	0.40	1.9	(0.5, 7.5)	0.34
Mood disorder (current)	1.8	(0.9, 3.5)	0.11	1.2	(0.3, 5.2)	0.82
Primary psychotic symptoms (lifetime)	1.5	(0.6, 3.6)	0.38	1.1	(0.3, 4.2)	0.91
Primary psychotic symptoms (current)	3.0	(1.3, 6.9)	0.02	0.9	(0.2, 4.4)	0.86
Any axis I disorder (lifetime)	1.3	(0.8, 2.1)	0.251	1.6	(0.4, 6.0)	0.49
Any axis I disorder (current)	2.1	(1.1, 3.7)	0.03	1.1	(0.3, 4.1)	0.844
Substance use disorder (lifetime)	1.9	(1, 3.6)	0.07	1.3	(0.7, 2.5)	0.47
Substance use disorder (current)	1	(0.5, 2)	0.95	5.3	(2.7, 10.4)	0.001
Substance + axis I disorder (lifetime)	1.8	(0.9, 3.5)	0.12	1.2	(0.8, 1.8)	0.49
Substance + axis I disorder (current)	3	(1, 8.9)	0.06	2.8	(0.6, 14.2)	0.21

physical abuse, intimate partner violence, and psychiatric disorder were widespread. Study of the correlates of HIV/STI infection identify that a history of childhood sexual abuse, arrest history, current psychotic symptoms, and substance use disorder are associated with a greater risk of infection. Women age 45 years and older appear to be at reduced risk of infection, perhaps because they are not as sexually active as younger women. Notably, all of the biologically confirmed HIV infections were found among sheltered single women, many of whom suffer from serious psychiatric disorders often accompanied by substance abuse. In contrast, the prevalence of both Chlamydia and gonorrhea in our study sample were higher among women in family shelters. Given their young age, patterns of sexual activity, and relatively high rates of STI infection, women in the family shelter system are at particularly high risk of HIV infection. Such women are a previously unrecognized high-risk group, even though compared to women in single shelters they have less risk associated with drug use and mental illness. This difference has implications for the content and targeting of preventive interventions, as we discuss in the final section below.

Adjustment of the Prevalence Rate of HIV Among Homeless Women in New York City

In considering our findings on the prevalence of HIV infection, it is important to note that both the exclusion of women sheltered in the separately administered HIV/AIDS Services Administration (HASA) system and our study's relatively low response rate in the family shelters make it likely that the number of biologically confirmed cases of HIV we observed is an underestimate of the true prevalence of HIV among homeless women in New York City. To generate a more comprehensive estimate of HIV prevalence in the population, we used additional data from the DHS and from the New York City Human Resources Administration (HRA) to adjust for these two factors. First, given the importance of the HASA system in determining the overall prevalence rate of HIV infection among homeless women in New York City, we obtained information from the HRA on the estimated proportion of women in HASA emergency housing who would most likely be in DHS shelters if HASA were not available. The category of HASA emergency housing roughly equivalent to DHS shelter care facilities is Commercial/MOU SRO housing, consisting of commercial single room occupancy facilities administered under a memorandum of understanding between HRA and the facility operator specifying rental rates, monitoring of incidents, and requirements for on-site support services for HASA clients [23]. It is estimated that the proportion of women in this type of HASA emergency housing ranges from 17 to 18.5 % [24]. Using the HASA monthly data sheets for the 2007–2008 period of data collection for the study, it was determined that in an average month, 788 people were living in Commercial/Mou SRO HASA housing. Estimating that 17.75 % were women, there would have been 140 HIV+ women in HASA housing in an average month during the period of the study.

Second, although we did not find a single case of HIV infection among women in family shelters in the study sample, HIV/AIDS has been reported among women in homeless families. In a population-based assessment of the health of New York City homeless families, Kerker et al. [25] found an annualized rate of new HIV/AIDS diagnoses among adults in homeless families of 1.8 per 1000, similar to that found in New York City low-income neighborhoods. Applying this rate (1.8 %) to the average monthly number of women in DHS family shelters during our study period ($N = 8301$), provides an estimate of 149 HIV+ women in family shelters during this time period.

Finally, our study's biologically confirmed HIV prevalence of 3.3 % was applied to the average monthly number of women in DHS single adult shelters during our study period ($N = 1767$), which provides an estimate of 58 HIV+ women in single adult shelters. Combining this estimate of 58/1767 for the single adult shelters with 149/8301 for the family shelters and 140/140 for HASA Commercial/MOU SRO housing, we arrive at an overall estimate of 347 HIV+ women in the average monthly population of 10,208 sheltered homeless women in NYC during our study period, producing a HIV+ prevalence of 0.034, or 3.4 %.

Acknowledging that an appropriate age- and income-specific control group of non-homeless women is unavailable, both our biologically confirmed HIV prevalence for women in single adult shelters and the overall adjusted estimated prevalence of HIV among all sheltered homeless women in New York City are markedly higher than that found in a recent study of adult females residing in New York City (0.9 %), based on case rates [26]. Our study's data on biologically confirmed Chlamydia and gonorrhea provide an estimated prevalence rate of Chlamydia (6.7 %) that is also higher than that found in the New York City data (0.7 %), as is our estimated prevalence rate of gonorrhea (0.9 % compared to 0.1 % for New York City) [27].

In other studies of HIV in homeless women, prevalence rates range widely. In 2003, Herndon et al. [28] reported that 1.6 % of homeless women studied said that they had been diagnosed with HIV, but biological testing for HIV was not carried out in this investigation. In 2004, Robertson et al. [8] reported a seroprevalence of 6.6 % in a sample of homeless and marginally housed women in San Francisco, higher than both our observed and our adjusted estimate. It is worth noting, however, that over 44 % of subjects of both genders in the Robertson study were currently using drugs, and about one-third of study subjects were intravenous drug users. In the study reported here, current substance use disorder was <10 %, and only 5.8 % ever used intravenous drugs.

The moderate participation rate of women in this study, which is lower than that reported by Robertson et al. [8] is a limitation. It is uncertain how the participation rate might have biased study findings. It is plausible that some women who refused to participate, particularly those in the family shelters where our response rate was lower, may have done so because they were more likely to be aware of being positive for HIV/STIs and did not want their status to be discovered by the research team. While the prevalence we observed for women in single adult shelters is consistent with existing research, other research in the NYC shelters system indicates we have likely missed HIV positive women in the family shelter system. Our sample is roughly comparable in racial/ethnic and age characteristics to that of all women admitted to single adult and family shelters during the time period of the study, and our data showed no systematic relationship between shelter-specific response rates and STI results. Despite these strengths, we believe that our adjusted estimate offers a better approximation of the overall prevalence of HIV among sheltered homeless women in New York City.

Implications for Intervention Development

This is the first study to report the prevalence and correlates of biologically confirmed HIV and STI infections in a sample of homeless women that includes women in both single and family shelters. Findings indicate that compared to women in family shelters, women in single shelters are older, less sexually active, and more likely to have a current Axis I disorder, have experienced lifetime and current psychotic symptoms, lifetime substance use disorder, and lifetime concurrent Axis I and substance use disorder. The correlates of HIV and STIs that we have identified suggest possible guidelines for targeting interventions to subgroups of homeless women with specific vulnerabilities. The offering of HIV/STI testing, counseling, and HIV risk prevention interventions to homeless and unstably housed women, particularly those with mental health and substance abuse problems and past exposure to trauma, is critically important. Our findings on HIV prevalence among women in single adult shelters also suggest that these venues could be particularly important sites for preventive HIV interventions. HIV risk prevention interventions in these types of settings should address psychiatric comorbidity, which, coupled with repeated exposure to trauma and violence, place these homeless women at high risk of HIV infection. Research is needed to determine if HIV prevention interventions that also address trauma, psychiatric comorbidity, and residential instability are more effective than behavioral interventions alone. In contrast, the high prevalence of confirmed current STIs among women in the family shelters indicate that preventive efforts focused on STIs might be particularly appropriate for women in these venues. To the extent that our low participation rate in the family shelters reflects selective opting out of the study by women who knew or had reason to think they would test positive for HIV, interventions focused more broadly on prevention of STIs might be less stigmatizing and better able to engage participants in family shelters. Here, too, research on the effectiveness of comprehensive prevention approaches that address comorbidities and housing needs is warranted.

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