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Do HIV risk and prevention behaviors change over time among adults in permanent supportive housing?

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ABSTRACT

Persons experiencing homelessness have a disproportionate burden of HIV infection and high rates of HIV risk behavior. Permanent supportive housing (PSH) has been identified as a primary solution to homelessness, but little is known about HIV sexual risk behavior among persons in PSH, nor about how HIV risk and prevention behavior may change as persons move from homelessness into PSH. Utilizing longitudinal data from 421 persons prior to moving in and over their first year living in PSH, this study assesses change over time in HIV risk and prevention behavior utilizing generalized linear mixed models. Results reveal changes in sexual risk behavior over time, including an overall increase in the rate of sexual activity, but a decrease in rates of some sexual risk behaviors, including condomless sex and multiple partners. While decreasing overall, the prevalence of condomless sex remains high (63%) at 12-months. Combined with a precipitous drop in HIV prevention programming exposure (from 56% at baseline to 23% at 12-months), only two-thirds of those sexually active reporting a past year HIV test at 12-months post-housing, and rare use of PrEP, these findings suggest a need for additional attention to promotion of sexual health behaviors and HIV prevention within PSH.

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Introduction

Persons experiencing homelessness suffer disproportionately high rates of HIV, ranging from 2% to 10.5% (Caton et al., 2013; Robertson et al., 2004; Wenzel et al., 2017b). Studies show that many persons experiencing homelessness are sexually active (Wenzel, Tucker, Elliott, & Hambarsoomians, 2007) and have multiple or concurrent partners (Wenzel et al., 2007, 2012). While sexual activity and non-monogamy are not in themselves risky and indeed sexuality and sexual health are linked with well-being (World Health Organization, 2006), persons experiencing homelessness have been found to be more likely to engage in sexual risk behavior than low-income housed persons (Kidder, Wolitski, Pals, & Campsmith, 2008; Wenzel et al., 2004, 2007), including inconsistent condom use (Tucker et al., 2013). Experiencing homelessness may expose persons to factors that increase HIV risk, including drug-using networks (Elifson, Sterk, & Theall, 2007), sexual assault (Kushel, Evans, Perry, Robertson, & Moss, 2003), and subsistence needs leading to transactional sex for survival purposes (Henwood et al., 2013; Padgett, Henwood, Abrams, & Drake, 2008).

Permanent supportive housing (PSH) is an evidence-based solution for chronic homelessness (Rog et al., 2014). PSH refers to long-term housing accompanied by supportive primary health and behavioral health services (United States Department of Housing and Urban Development, 2008). As an important site for health and behavioral health service provision, PSH may also be an ideal location for dissemination of effective HIV prevention services, including education programs, and condom and other barrier method provision (Marrazzo et al., 2014). Consistent with the importance of providing supportive services with non-time-limited housing, PSH may also serve as an important platform for facilitating access to HIV testing and pre-exposure prophylaxis (PrEP), a highly effective medication for preventing HIV (Centers for Disease Control and Prevention, n.d.). However, recent research suggests that HIV prevention services, including general HIV education and PrEP, are not commonly available within PSH settings (Wenzel, Henwood, Harris, Winetrobe, & Rhoades, 2017a).

Further, while evidence supports the necessity of studying HIV sexual risk among persons experiencing homelessness, it is unclear how PSH as a major change

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in the context of the lives of homeless individuals may change the nature of risk and protective factors that are associated with HIV risk. Homelessness presents barriers to sexual relationships due to limited privacy (Ryan et al., 2009) and possible postponement of intimate relationships until housing is gained (Padgett et al., 2008). As such, obtaining housing may facilitate intimacy. In contrast, having housing may be accompanied by decreased sexual activity if, for example, there is reduced reliance on survival sex. However, research examining change in HIV risk and prevention behaviors over time in PSH is largely absent.

While studies of HIV risk and prevention behaviors among persons in supportive housing are limited, mixed findings from research examining housing for persons living with HIV/AIDS (PLWHA) may be relevant to understanding HIV risk behavior among those in PSH. A randomized trial comparing PLWHA experiencing homelessness assigned to housing vs. case management or rental assistance found no differences in number of sex partners, sex exchange, or condomless sex (Wolitski et al., 2010), while another study found housed PLWHA were more likely to be sexually active than PLWHA experiencing homelessness (Kidder et al., 2008).

Pilot work by the current authors suggests that HIV risk behaviors among adults experiencing homelessness may increase after moving into housing (Henwood et al., 2013). In that study, respondents reported increased sexual risk behaviors 3 months after moving into PSH. The percentage of sexually active participants engaging in condomless sex nearly doubled from 45% at baseline to 85% at the 3-month interview, and the rate of concurrent sex (having two or more partners in a single week) among those who were sexually active also increased, from 4% at baseline to 20% at 3-months. These findings are limited as they are from a small pilot study of 31 persons followed for only 3 months after move-in to a single PSH site. In contrast, a study of HIV infection among persons in supportive housing in New York identified a decreased risk of new HIV infections among those with 3+ continuous years of supportive housing (Lee et al., 2018), suggesting that PSH can serve as a platform for primary HIV prevention. Given these mixed findings, additional research is warranted to better understand the association between housing and sexual risk behavior in this population.

The current study

This study investigates HIV/STI risk and prevention behaviors among persons who formerly experienced homelessness and transitioned into and resided in PSH over a 12-month period. With these longitudinal data, this study aims to understand whether HIV risk and prevention behaviors change over time among persons moving into and living in PSH.

Materials and methods

Study

This study draws from a sample of adults who moved into PSH in the Los Angeles area between August 2014 and January 2016. Participants moving into PSH were recruited in partnership with 26 housing providers in the Los Angeles area. PSH placements in LA County occur with the aid of a housing or social service agency staff member and generally involved utilization of the Vulnerability Index Service Prioritization Decision Assistance Tool (VI-SPDAT), which prioritizes the most vulnerable in terms of health status, based on score and housing voucher type. Participants were eligible for the longitudinal study if they were 39 years old or older (thus, at least age 40 during the study period), spoke English or Spanish, and were considered currently homeless unaccompanied adults (without minor children). Because of the focus on HIV risk and prevention in the study, the age and non-parenting requirements were implemented to maximize our ability to detect changes in HIV risk outcomes by minimizing variability due to developmental life stage or current parenting status. Given the emphasis of PSH on addressing chronic homelessness and accompanying health conditions, individuals in PSH increasingly tend to be older individuals not living with children (US Department of Housing and Urban Development 2015). Participants in this study recruited at baseline ($N = 421$) were similar to all individuals age 39 or older without dependent children who were entered into the Los Angeles County Homeless Management Information System (HMIS) within the Los Angeles Continuum of Care during the same time period as study recruitment. The age and race/ethnicity distributions of both samples was nearly identical; however, our sample was 27.8% women, whereas the County HMIS reflects a higher proportion (33.4%) of women (Los Angeles Homeless Services Authority, 2016).

Prior to participation, adults completed the informed consent process in English or Spanish. Participants were interviewed prior to or within 5 days of PSH move in and at three, six, and 12 months after their move-in date. Interviews were conducted by trained study interviewers and took 1–1.5 h. At baseline, 421 persons were enrolled in the study; 405 completed 3-month interviews (96.2% retention), 400 6-month interviews (95.0% retention),

and 383 12-month interviews (91% retention). Reasons for loss at each time point included death, incarceration, withdrawal, and loss of contact. Persons not interviewed at any survey mid-point were still eligible for later interviews (excluding those persons who passed away or withdrew from the study). Analyses in this paper include a slightly smaller sample of persons, due to missing data on HIV risk outcomes and restriction of some models to only sexually active participants (see analytic methods for model-specific sample size). All study procedures were approved by the authors' university's institutional review board. Additionally, the study received a certificate of confidentiality from the U.S. Department of Health and Human Services to protect participant data from subpoena.

Measures

HIV risk and prevention variables

Individual HIV risk behavior was assessed with items adapted from the authors' previous research with adults experiencing homelessness (Wenzel, Rhoades, Tucker et al., 2012). Respondents were asked at each time point how many sex partners (vaginal or anal sex) they had in the prior 3 months. Persons who reported at least one partner were coded as being sexually active, and those with 2+ partners were coded as having multiple partners. For those persons who were sexually active, follow-up questions assessed behavior with those partners in the past 3 months, including whether the participant had used a condom every time they had sex with each partner, whether they had exchanged sex for money, food, drugs, a place to stay or anything else with that partner, and whether they had sex with that partner under the influence of drugs or alcohol. Each of these items was coded as an indicator of reporting the behavior with any partner versus not.

HIV testing was assessed by asking the respondent the date of their last HIV test, and creating an indicator for any test within the past year (measure adopted from the authors' previous research with people experiencing homelessness; Wenzel, Rhoades, Tucker et al., 2012). We chose to measure HIV testing history within the past year and subsequently model changes in testing from baseline to the 12-month interview (rather than at every time point) as recommendations for persons at high risk for HIV suggest only yearly testing (Branson et al., 2006). HIV prevention program participation was assessed using two measures: 1. Whether a healthcare provider had discussed a series of HIV prevention topics with the participant (topic response options adapted from: Dawson-Rose, Myers, & McCready, 2010), and 2. An item created by the authors assessing whether the respondent had taken a class, training, or gone to a presentation about HIV prevention. A single variable was created indicating whether or not the participant had discussed any HIV prevention topics with a healthcare provider or attended any HIV prevention class/presentation within the past year; this timeframe was chosen to be consistent with the HIV testing recommendations. HIV-negative respondents reported whether they had been prescribed pre-exposure prophylaxis (PrEP) for HIV prevention.

Covariates

We adjusted for common factors that may also be associated with sexual risk behavior, including demographic characteristics (age, gender, race/ethnicity, high school education/ GED, and sexual orientation), any lifetime incarceration, and lifetime length of literal homelessness; these items were assessed with items adopted or adapted from previous research (Wenzel et al., 2007). Models also adjusted for a single item indicator of physical disability (Ware, Kosinski, Dewey, & Gandek, 2001; "During the past 4 weeks, how much did physical health problems limit your usual physical activities?": 1. not at all to 5. Could not do physical activities).

Analysis

The analyses were conducted in SAS (version 9.4). Frequencies and percentages of each outcome behavior were calculated for every measurement point at baseline, 3-months, 6-months and 12-months. Generalized linear mixed models (GLMM) were used to compare the changes in the probability of each outcome behavior over the first year of living in PSH to their baseline references. Because of the hierarchical nature of the data, GLMM was employed to account for the correlations among the repeated observations within the same individual by including both the fixed and random effects. Since outcome measures were all dichotomous, the GLMM modeled the log of odds of each outcome by specifying the logit link function. Wave (time) was treated as dummy variables to allow comparison of each follow-up measurement point against their baseline. Only the random intercept was specified in the analysis; estimation of more than one random effect with binary data at only 2–4 repeated measurements resulted in convergence problems. For every outcome, we adjusted for age, gender, race/ethnicity, education, sexual orientation, lifetime incarceration, lifetime years of literal homelessness, and physical disability. These were all subject-level covariates (level-2) except physical disability, which was a level-1 variable. Maximum likelihood estimation based on adaptive quadrature (METHOD = QUAD) was chosen as the

estimation method for all models. Sexual activity was modeled among the whole sample ($n = 421$), HIV test/prevention and PrEP use was restricted to participants who were sexually active and self-reported that they were HIV negative ($n = 228$). All other outcome behavior measures were modeled among sexually active participants only ($n = 260$).

Results

As shown in Table 1, the average age of the 421 participants at baseline was 54 (SD = 7.53), 29% were female, and 77% had completed high school or an equivalent level of education. Persons who identified as Black or African American accounted for 56% of the study sample, 24% identified as White, and 20% of other races/ethnicities. More than three-quarters (77%) had at least a high school education, 89% identified as heterosexual, and 32% had ever been incarcerated. The mean lifetime years of literal homelessness was 6 years, and the average score on the physical disability item was 2.8 (range: 1–5; 5 indicates highest level of physical limitation).

Table 2 shows the raw rate and percentages of each outcome at every measurement time point, while the *p*-value that compares the probability at each follow-up against the baseline was obtained from the GLMM. Sexual activity increased after respondents moved into PSH, going from 36% at baseline to 43% at the 12-month interview. Among those participants who were sexually active, condomless sex decreased over time, from 76% at baseline to 63% at 12-months, as did the rate of persons with multiple sexual partners (30% at baseline and 22% at 12-months). There is also a decrease in rates of exchange sex at both 3-months (7%) and 6-months (5%), as compared to baseline (13%). However, the odds of exchange sex at 12-months was not statistically significantly different from baseline (OR = 0.61, 95% CI = 0.24–1.56, data not shown). There is no statistically significant change in the odds of participants reporting sex under the influence of drugs or alcohol, with the rates remaining consistent at 37-34% over time and odds ratios ranging from 0.58–0.72 (95% CI included 1, data not shown).

Rates of HIV testing in the past year decreased slightly (not statistically significant) from baseline (73%) to 12-months (67%). Rates of HIV prevention programming exposure in the past year demonstrated a drastic and statistically significant decrease over time, going from 56% of the sample at baseline to only 23% at 12-months (OR = 0.14, 95% CI = 0.06–0.33, data not shown). Rates of pre-exposure prophylaxis were extremely low (<1-2%) at every time point and there was no statistically significant change in this rate over time.

Table 1. Demographic Characteristics (baseline; $n = 421$).

Age at baseline, mean (sd)	54.4 (7.5)
Female, n (%)	120 (28.5)
Completed high school/equivalent degree, n (%)	324 (77.0)
Race, n (%)	
African-American/Black	235 (56.0)
White	100 (23.8)
Other	85 (20.2)
Heterosexual sexual orientation, n (%)	374 (88.8)
Lifetime incarceration, n (%)	317 (94.1)
Years of lifetime literal homelessness, mean (sd)	6.0 (6.9)
Limitations in physical activity (range: 1 = 5), mean (sd)	2.8 (1.2)

Discussion

PSH residents in this study reported statistically significant increases in sexual activity over their first year of living in housing. By itself, increased sexual activity does not indicate increased sexual risk, and rates of condomless sex and multiple partners decreased by 12-months in housing. However, these decreases appear to have happened most rapidly only after six months in housing and nearly two-thirds of respondents still reported condomless sex at the 12-month interview, suggesting significant ongoing risk for exposure to HIV and other STIs. Further, rates of sex under the influence of drugs or alcohol did not decrease over time in PSH. These findings suggest that there remains a persistent need for HIV prevention in PSH. This need appears particularly acute when we take into account that exposure to HIV prevention programming within the past year decreased precipitously while persons were in housing (from 56% at baseline to 23% at 12-months), that only two-thirds of those who are sexually active have been tested for HIV within their first year living in PSH, and that very few PSH residents have been prescribed pre-exposure prophylaxis for HIV, consistent with previous findings that HIV prevention programs are uncommon in PSH settings (Wenzel et al., 2017a).

Limitations

These data have limitations that should be noted. This study used an observational rather than experimental design, and as such, we cannot draw conclusions regarding the specific impact of PSH – as opposed to other factors – on HIV risk and prevention behaviors. The study sample furthermore had specific age and parenting requirements and thus restricts generalizability beyond a similar population, particularly with regard to HIV risk. Further, given that these data were collected in a large and densely populated U.S. city with the some of the highest numbers of persons experiencing

Table 2. Change over time in sexual activity, sexual risk behavior, and HIV prevention.

	Baseline ($n = 421$)		3-months ($n = 405$)		6-months ($n = 400$)		12-months ($n = 383$)	
Outcomes, *n* (%)								
Sexually active	153	(36.3%)	167	(41.2%)*	165	(41.3%)*	164	(42.8%)*
Among sexually active participants	*n = 153*		*n = 167*		*n = 165*		*n = 164*	
Any condomless sex	112	(75.7%)	119	(71.3%)	118	(71.5%)	104	(63.4%)*
Multiple partners	46	(30.1%)	46	(27.5%)	46	(27.9%)	36	(22.0%)*
Exchange sex	19	(12.5%)	11	(6.6%)*	8	(4.9%)*	15	(9.2%)
Sex under the influence of drugs/alcohol	57	(37.3%)	59	(35.3%)	55	(33.3%)	56	(34.2%)
Past year HIV test	111	(72.6%)	–	–	–	–	109	(66.5%)
Past year HIV prevention education	85	(55.6%)	–	–	–	–	37	(22.6%)*
Among HIV negative	*n = 127*		*n = 142*		*n = 137*		*n = 137*	
PrEP use	1	(0.8%)	3	(2.1%)	1	(0.7%)	1	(0.7%)

*Statistically significantly different from baseline in adjusted model, $p < 0.05$.
Models adjust for age, gender, race, high school education, sexual orientation, lifetime incarceration, years of homelessness, and rating of physical disability.

homelessness in the U.S., these findings may not be representative of persons living in PSH in other cities, rural areas, or in non-U.S. settings.

Conclusions

Despite these limitations, these findings contribute to our understanding of sexual risk behavior and HIV prevention within PSH, an area with little extant evidence. Overall, this research suggests increased efforts are necessary to ensure persons living within PSH are provided with health-promoting and potentially life-saving HIV prevention services, including education, affordable and available condoms and other barrier protection methods, pre-exposure prophylaxis, and HIV testing opportunities. Introduction and promotion of HIV prevention services must occur with attention to acceptability among residents and feasibility for providers to ensure that services can be sustained and will contribute to the overall well-being of residents.

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