ORIGINAL PAPER

Socioeconomic, Behavioral, and Clinical Characteristics of Persons Living with HIV Who Experience Homelessness in the United States, 2015–2016

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Abstract

Homelessness is a substantial barrier to consistent, recommended HIV care, access and adherence to antiretroviral therapy (ART), and sustained viral suppression, thus increasing the risk for morbidity and transmission. We used data from the Medical Monitoring Project for June 1, 2015–May 31, 2017 to estimate the weighted prevalence of homelessness among persons with diagnosed HIV (PWH) (N = 7665) overall and by selected sociodemographic, behavioral, and clinical characteristics. Prevalence of homelessness was 8.5%. PWH experiencing homelessness were > 3 times as likely to have needed and not received shelter or housing services (32% vs. 10%), > 4 times as likely to inject drugs (9% vs. 2%), and > 7 times as likely to engage in exchange sex (10% vs. 1%), respectively, compared with PWH who did not experience homelessness. Homelessness was associated with lower HIV care retention, ART dose adherence, and sustained viral suppression. This analysis demonstrates substantial need for enhanced treatment, care, and service delivery for PWH experiencing homelessness. Research has demonstrated that housing assistance programs improve HIV-related outcomes and diminish HIV risk behaviors; therefore, housing assistance for PWH should be prioritized in public health policies and practice.

Keywords Homeless persons · HIV · Health risk behaviors · Sustained virologic response · Housing

Introduction

In the United States, persons experiencing homelessness often suffer from a substantial burden of physical and mental illness that can contribute to elevated levels of morbidity and mortality [1–3]. The estimated seroprevalence of HIV among those who experience homelessness ranges from 1.8 to 20%, which is higher than the seroprevalence found among the general populations in major US cities [4–7]. Persons who experience homelessness are substantially less likely to access HIV medical care or to be retained in continuous care [8]. Poor clinical outcomes experienced by homeless persons with diagnosed HIV (PWH) include higher viral loads, decreased probability of viral suppression, and lower CD4$^+$ counts [9, 10]. To achieve the aims of the United States federal government's Ending the HIV Epidemic initiative [11], a strong focus on populations who have a disproportionate burden of HIV and poor HIV outcomes should be a priority. Our study focuses on one particularly vulnerable population and provides needed information for prevention programs and policymakers by describing the sociodemographic, behavioral, and clinical characteristics of PWH in the United States who reported homelessness.

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Methods

The Medical Monitoring Project (MMP) is an annual, nationally representative, complex sample, cross-sectional survey that is designed to produce nationally representative estimates of clinical and behavioral characteristics of US adults with diagnosed HIV. Full MMP methods are reported elsewhere [12]. MMP employs a 2-stage sampling scheme. For the 2015 and 2016 surveys, in the primary stage, 23 health jurisdictions were sampled from US states, the District of Columbia, and Puerto Rico. The secondary stage involved a random sample of PWH aged ≥ 18 years living in each participating state or territory from the National HIV Surveillance System (NHSS), a census of PWH residing in the United States. We combined data from two annual MMP cycles; we did not adjust the weights when combining data from annual cycles; combined 2015 and 2016 cycle data estimates represent US persons with diagnosed HIV during 2015–2016. Data were collected from June 1, 2015 through May 31, 2017, through face-to-face or telephone interviews and medical record abstractions. Response rates were 100% for the state or territory level and 40–44% for the person level.

Data were adjusted for nonresponse and weighted on the basis of known probabilities of selection [13]. Factors associated with nonresponse that were available in NHSS for all participants were used to inform the weighting classes; these were sex at birth, HIV exposure category, age of most recent contact information, and the person's frequency of receipt of care (as indicated by HIV-related laboratory test results in NHSS). As a final step in the weighting process, the data were post-stratified to NHSS population totals by age, race/ethnicity, and gender.

We used SAS (version 9.4) to calculate the weighted prevalence and associated 95% confidence intervals (CIs) of housing status during the previous 12 months among PWH (N = 7665), overall and by selected sociodemographic characteristics. Homelessness was defined by an affirmative response to any of the following living situation categories: on the street, in a car, in a shelter, or in a single-room occupancy hotel during the previous 12 months. Participants could specify ≥ 1 living situation category.

The weighted prevalence of behavioral and clinical characteristics were calculated and compared among those who had and had not reported experiencing homelessness. We used SAS-callable SUDAAN (version 11.0.3) to calculate prevalence ratios and Wald F-tests to assess statistically significant differences between those who had and had not been homeless. All statistical analyses accounted for the complex sample design and weights. Statistical significance for all tests was defined as $P < .05$.

All covariates included were self-reported and assessed over the 12 months before the interview, except where noted otherwise. Participants were categorized as men who have sex with men (MSM), women who have sex with men (WSM), and men who only have sex with women (MSW), on the basis of sexual behavior among the sexually active and sexual orientation among the sexually inactive. All participants not categorized as MSM, WSM, or MSW were classified into the *Other* category. Disability was defined as self-reported problems with hearing, vision, cognition, mobility, self-care, or independent living. Household poverty level was defined by using the US Department of Health and Human Services poverty guidelines [14]. Binge drinking was defined for men as consuming ≥ 5 alcoholic drinks during a single sitting or ≥ 4 for women on ≥ 1 day during the 30 days before the interview. Sex that increases the risk for HIV transmission was defined as condomless vaginal or anal sex with ≥ 1 HIV-negative partner or partner with unknown status and not known to be taking preexposure prophylaxis (PrEP) while not sustainably virally suppressed (PrEP use was only assessed for the five most recent sexual partners). Exchange sex was defined as sex in exchange for food, shelter, transportation, money, or drugs. Food insecurity was defined as skipping a meal because of lack of money for food. Participants were asked if they used shelter or housing services and, among those who reported not using them, whether or not they needed such services. Depression was categorized on the basis of responses to the items on the Patient Health Questionnaire (PHQ-8), according to criteria from the Diagnostic and Statistical Manual of Mental Health Disorders, 4th ed. (DSM-IV) [15]. Anxiety was categorized on the basis of the responses to the Generalized Anxiety Disorder Scale (GAD-7), a validated scale assessing anxiety symptoms during the previous 2 weeks [16]. Responses to the GAD-7 were scored according to criteria from the DSM-IV. Clinical characteristics assessed by medical record abstraction at a participant's most frequent source of HIV care included documentation of antiretroviral therapy (ART) prescription and sustained viral suppression (all viral load measurements in the past year documented as < 200 copies/mL or as undetectable). We chose to examine sustained viral suppression rather than viral suppression at last test due to need for maintenance of viral suppression over time for optimal health and prevention of HIV transmission. The participant's most frequent source of HIV care was self-reported during the interview. Participants currently taking ART were asked about their adherence to ART during the 30 days before the interview by using questions from a 3-item scale that ranged from 0 to 100, with a score of 100 representing perfect ART adherence [17]. HIV care retention was defined as having received ≥ 2 elements of outpatient HIV care ≥ 90 days apart within the previous 12 months. Outpatient HIV care was defined as any documentation in

the medical record of any of the following: encounter with an HIV care provider, viral load test result, CD4$^+$ test result, HIV resistance test or tropism assay, ART prescription, *Pneumocystis pneumonia* prophylaxis, or *Mycobacterium avium-intracellulare* infection prophylaxis. An encounter with an HIV care provider could also be self-reported.

MMP project data collection is part of routine public health surveillance, and therefore, determined to be non-research [18]. When required, participating states or territories obtained local institutional review board approval before collecting data. Informed consent was obtained from all participants.

Results

The estimated prevalence of homelessness among US PWH was 8.5% (Table 1). The most common category of homelessness experienced was living in a single-room occupancy hotel (55%; 95% CI 48.9–60.3%), followed by living on the street (46%; CI 39.8–51.1%) (data not shown). Living in a shelter and living in a car were less prevalent (31%; CI 27.5–34.8% and 30%; CI 24.9–34.4%, respectively). The prevalence of homelessness was significantly higher among transgender persons, those with less than a high school education, and those living below the poverty level (Table 1). Persons who had been incarcerated for > 24 h during the previous 12 months were > 4 times as likely to have experienced homelessness, compared with those who had not been incarcerated (33% vs. 7%). Persons with a disability were > 2 times as likely to have experienced homelessness, compared with those with no disability (12% vs. 5%).

Persons who reported experiencing homelessness were > 3 times as likely to report having needed and not received shelter or housing services (32% vs. 10%), compared with those who had not experienced homelessness (Table 2). Persons who had experienced homelessness reported significantly higher levels of cigarette smoking and noninjection- and injection-drug use. Persons who had experienced homelessness were > 4 times as likely to inject drugs, compared with those who did not experience homelessness (9% vs. 2%). Homelessness was associated with a higher prevalence of sex that increases the risk for HIV transmission (10% vs. 6%). Persons who experienced homelessness were > 7 times as likely to engage in exchange sex, compared with those who had not experienced homelessness (10% vs. 1%). Homelessness was significantly associated with lower HIV care retention, ART dose adherence, and sustained viral suppression. Persons who had experienced homelessness were more likely to have a higher number of emergency room visits and hospitalizations. Persons who had experienced homelessness were significantly more likely

to report depression and more likely to report anxiety, compared with those who did not report homelessness.

Discussion

Our analysis estimated that 8.5% of US adults with diagnosed HIV experienced ≥ 1 form of homelessness during 2015–2016. The estimated prevalence of homelessness among the general US population is 17 persons per 10,000 population or 0.17% [19]. Our results support other findings that HIV disproportionately affects marginalized and vulnerable populations in the United States [20].

Our analysis determined that unmet need for shelter or housing services among homeless persons was 31.6%, which is similar to the results of a prior study [8]. Lack of secure, adequate, and stable housing is a substantial structural barrier to recommended and consistent HIV medical care, access and adherence to ART, and sustained viral suppression [9]. PWH who receive housing assistance and become stably housed have lower levels of illicit drug use, reduced HIV-risk behaviors, and lower rates of recent incarceration [21–23]. Studies have reported that receiving housing assistance is a strong and consistent predictor for entry into HIV medical care [8], retention in HIV medical care [22, 24], and better HIV-related health outcomes [22, 25]. Furthermore, housing assistance programs reduce the use of emergency department visits and hospitalizations among PWH who are receiving housing services, compared with those experiencing homelessness who are not [26].

An example of a housing assistance program is Housing First, based on the belief that housing is a basic right. The program is designed to address the needs of homeless persons from their perspective. Housing First programs provide clients with immediate housing without any stipulations or preconditions, encourage clients to define their own needs and goals, and offer them treatment and support programs [27]. The rationale behind Housing First is that providing stable housing immediately establishes a foundation on which the treatment and recovery process can begin [27]. Housing First participants use more supportive services, reduce substance use, and use emergency services less frequently [28]. A Housing First program for HIV-positive persons who experience homelessness reported a 69% undetectable viral load among participants, compared with only 16% among participants in other housing assistance programs [29]. The US Department of Housing and Urban Development's (HUD) Housing Opportunities for Persons with AIDS program (HOPWA) is the primary federally funded program designed to address the housing needs of PWH [30]. This program offers assistance to PWH who are homeless or at risk of becoming homeless. Some state and city HOPWA programs prohibit entry if a person or a

Table 1 Prevalence of homelessness among persons with diagnosed HIV by sociodemographic characteristics —Medical Monitoring Project, 2015–2016

Characteristic	Homeless		Prevalence ratio (95% CI)	Wald F-test	P value
	No.[a]	Row % (95% CI)[b]			
Total	669	8.5 (7.6–9.3)			
Sex				6.6	.001
Male	499	8.5 (7.6–9.4)	1.12 (0.91–1.37)		
Female	149	7.6 (6.1–9.2)	Ref.		
Transgender	19	19.1 (9.5–28.6)	2.51 (1.53–4.11)		
Race and ethnicity				10.4	< .001
White non-Hispanic	149	6.0 (4.9–7.1)	Ref.		
Black non-Hispanic	331	10.3 (9.0–11.7)	1.73 (1.38–2.16)		
Hispanic or Latino	136	7.7 (5.3–10.1)	1.29 (0.88–1.88)		
Other/multiracial[c]	53	10.6 (7.0–14.2)	1.77 (1.27–2.48)		
Age (yrs)				9.3	< .001
18–29	84	14.0 (10.7–17.4)	2.10 (1.55–2.86)		
30–39	149	12.3 (9.5–15.1)	1.84 (1.38–2.45)		
40–49	171	7.5 (6.1–8.8)	1.12 (0.89–1.41)		
≥ 50	265	6.7 (5.6–7.8)	Ref.		
Education				27.8	< .001
< High school	192	14.1 (11.3–16.9)	2.45 (1.93–3.11)		
High school diploma or equivalent	197	10.4 (8.7–12.0)	1.79 (1.47–2.20)		
> High school	280	5.8 (5.1–6.5)	Ref.		
Sexual behavior or orientation				18.4	< .001
Men who have sex with men	255	6.0 (5.1–6.9)	Ref.		
Men who have sex with women only	229	13.6 (11.3–15.9)	2.26 (1.77–2.87)		
Women who have sex with men	148	7.8 (6.2–9.3)	1.29 (1.01–1.63)		
Other	37	13.5 (9.4–17.6)	2.24 (1.57–3.20)		
Time since HIV diagnosis (yrs)[d]				9.6	< .001
< 5	140	11.6 (9.5–13.8)	1.62 (1.29–2.03)		
5–9	162	9.8 (8.1–11.6)	1.37 (1.11–1.69)		
≥ 10	366	7.2 (6.2–8.1)	Ref.		
Incarcerated > 24 h, past 12 months				205.8	< .001
Yes	121	33.0 (28.0–37.9)	4.63 (3.84–5.57)		
No	548	7.1 (6.4–7.9)	Ref.		
Any disability[e]				61.6	< .001
Yes	444	12.2 (10.6–13.7)	2.32 (1.88–2.86)		
No	223	5.3 (4.4–6.1)	Ref.		
Poverty level, past 12 months[f]				120.1	< .001
Above poverty level	140	3.7 (2.9–4.4)	Ref.		
At or below poverty level	485	14.2 (12.4–16.0)	3.86 (3.03–4.93)		

HIV human immunodeficiency virus, *CI* confidence interval; all variables measured by self-report, except where otherwise noted

[a]Numbers are unweighted

[b]Percentages and corresponding CIs are weighted percentages

[c]Includes American Indian/Alaska Native, Asian, Native Hawaiian/Other Pacific Islander, or multiple races

[d]Data from the National HIV/AIDS Surveillance System

[e]Defined as self-reported problems with hearing, vision, cognition, mobility, self-care, or independent living

[f]Poverty guidelines as defined by the US Department of Health and Human Services

Table 2 Association between homelessness and behavioral and clinical characteristics among persons with diagnosed HIV—Medical Monitoring Project, 2015–2016

Characteristic	Homeless		Not homeless		Prevalence ratios (95% CI)	Wald F-test	P value
	No.[a]	Col % (95% CI)[b]	No.[a]	Col % (95% CI)[b]			
Total (row %)	669	8.5 (7.6–9.3)	6996	91.5 (90.7–92.4)			
Received shelter or housing services							
Needed, but did not receive	209	31.6 (27.5–35.7)	681	10.1 (8.9–11.3)	3.13 (2.68–3.66)	179.3	< .001
Received	276	37.8 (32.7–42.8)	1044	14.1 (13.0–15.2)	2.68 (2.35–3.06)	155.6	< .001
Did not need and did not receive	179	30.6 (25.6–35.6)	5238	75.8 (74.6–77.0)	0.40 (0.34—0.48)	231.9	< .001
Cigarette smoking							
Yes	372	55.0 (49.7–60.3)	2286	33.7 (32.3–35.1)	1.63 (1.48–1.80)	66.4	< .001
Any drug use							
Yes	323	46.3 (42.2–50.4)	1987	28.4 (26.5–30.2)	1.63 (1.47–1.81)	73.1	< .001
Noninjection-drug use							
Yes	313	45.1 (41.0–49.1)	1960	28.0 (26.2–29.9)	1.61 (1.44–1.79)	63.8	< .001
Injection-drug use							
Yes	70	9.1 (5.9–12.4)	162	2.1 (1.5–2.7)	4.28 (2.96–6.18)	57.2	< .001
Binge drinking, past 2 weeks							
Yes	102	13.9 (10.9–16.9)	1060	15.8 (14.3–17.3)	0.88 (0.70–1.11)	1.1	.293
Sex that increases the risk for HIV transmission[c]							
Yes	64	10.2 (7.1–13.2)	359	5.9 (5.0–6.8)	1.72 (1.26–2.36)	11.2	< .001
Exchange sex[d]							
Yes	64	9.8 (7.1–12.4)	86	1.3 (0.9–1.7)	7.56 (5.11–11.19)	99.8	< .001
Experienced food insecurity							
Yes	373	55.0 (49.7–60.3)	1263	18.3 (17.1–19.4)	3.01 (2.69–3.38)	219.7	< .001
Retained in care[e]							
No	127	27.4 (23.1–31.8)	900	19.3 (17.3–21.2)	1.43 (1.18–1.71)	13.3	< .001
ART prescription[e]							
No	92	18.9 (14.1–23.6)	776	15.0 (13.1–16.9)	1.26 (0.98–1.61)	3.1	0.079
100% antiretroviral therapy dose adherence, previous 30 days[f]							
No	319	54.5 (49.6–59.4)	2624	39.9 (38.1–41.6)	1.37 (1.23–1.52)	26.5	< .001
Sustained viral suppression[e]							
No	318	51.1 (46.0–56.2)	2130	34.5 (32.6–36.4)	1.48 (1.34–1.63)	47.1	< .001
ER visits							
0	305	46.0 (41.1–50.9)	4501	64.6 (62.5–66.8)	0.71 (0.64–0.79)	55.3	< .001
1	134	20.2 (16.4–24.0)	1218	17.2 (16.1–18.2)	1.18 (0.97–1.42)	2.7	.104
2–4	171	25.1 (21.3–29.0)	1037	15.3 (14.1–16.6)	1.64 (1.40–1.92)	33.6	< .001
≥ 5	56	8.6 (5.8–11.5)	209	2.8 (2.3–3.4)	3.05 (2.09–4.44)	32.2	< .001
Hospitalizations							
0	458	71.5 (67.2–75.7)	5862	84.6 (83.4–85.9)	0.84 (0.80–0.89)	60.0	< .001
1	86	13.1 (10.0–16.3)	664	9.3 (8.4–10.3)	1.41 (1.11–1.79)	7.5	.006
2–4	94	11.8 (8.8–14.8)	367	4.9 (4.1–5.7)	2.39 (1.79–3.20)	33.0	< .001
≥ 5	27	3.6 (2.2–5.0)	77	1.1 (0.8–1.4)	3.29 (1.96–5.52)	20.0	< .001
Depression, past 2 weeks[g]							
Major or other depression	252	38.6 (33.6–43.7)	1374	20.8 (19.3–22.3)	1.85 (1.61–2.13)	60.6	< .001
Anxiety, past 2 weeks[h]							
Any anxiety	272	41.3 (36.3–46.3)	1588	23.9 (22.5–25.3)	1.73 (1.53–1.96)	58.5	< .001

HIV human immunodeficiency virus, *CI* confidence interval; all variables measured by self-report during the 12 months before the survey, except where otherwise noted

[a]Numbers are unweighted

[b]Percentages and corresponding CIs are weighted percentages

[c]Vaginal or anal sex with ≥ 1 HIV-negative or unknown status partner, while not virally suppressed, when a condom was not used, and the part-

Table 2 (continued)

ner was not known to be on preexposure prophylaxis

[d]Sex in exchange for food, shelter, transportation, money, or drugs

[e]Assessed by medical record abstraction

[f]Among those taking antiretroviral therapy

[g]Response to items on the Patient Health Questionnaire-8 were used to define "major depression" and "other depression," according to criteria from the Diagnostic and Statistical Manual of Mental Health Disorders-IV (DSM-IV). "Major depression" was defined as having ≥ 5 symptoms of depression; "other depression" was defined as having 2–4 symptoms of depression

[h]Responses to the Generalized Anxiety Disorder Scale-7 were used to define anxiety, according to criteria from the DSM-IV

household member is a current drug user. Using Housing First to guide HOPWA programs for PWH who experience homelessness can benefit this population immensely. Our analysis demonstrates that a substantial need exists for housing assistance among PWH who experience homelessness— many of whom have substance use disorder and/or mental illness—and research has demonstrated that housing assistance programs improve HIV-related outcomes and diminish HIV risk behaviors; therefore, housing assistance for PWH should be prioritized in public health policies and practice. Given this, other HUD-supported assistance programs could consider HIV status as part of the priority population screening process.

Similar to findings of other studies, our analysis revealed that PWH who had experienced homelessness, compared with those who had not, were less adherent to ART, less likely to be retained in outpatient HIV care, and less likely to achieve sustained viral suppression [10, 20, 31]. Prevalence of viral suppression among those who had experienced homelessness was suboptimal, with only approximately half having achieved it. Low levels of ART adherence and low retention in HIV care are challenges that contribute to this outcome. Enhanced efforts to improve viral suppression among PWH who experience homelessness are needed. Delivery of ART adherence support services can be an effective measure for increasing levels of viral suppression and lowering risk for HIV transmission. Similar to another study [26], our analysis revealed that those who experienced homelessness had a significantly higher prevalence of hospitalizations and emergency room visits, compared with those who did not experience homelessness. Helping PWH who experience homelessness improve their access to routine and preventative care may help reduce health care costs by promoting better health and, thus, decreased use of emergency room visits and hospitalizations [26].

We determined that those who had experienced homelessness were more likely to engage in behaviors associated with HIV transmission risk, in addition to being at risk for poorer HIV-related outcomes. Similar to other studies of homeless persons, we confirmed that PWH who experience homelessness had high rates of drug use, including injection-drug use [2, 4, 21], and sexual behaviors that carry a risk for HIV transmission, including engaging in exchange sex [5, 6, 21,

32]. Connecting these persons to substance abuse treatment and harm-reduction services is vital. Considering their relatively high prevalence of exchange sex, providing prevention and information messaging tailored to this vulnerable population, as well as condom provision, can be useful in decreasing their risk for HIV transmission. Our analysis also demonstrates that PWH experiencing homelessness have a greater burden of depression and anxiety, compared with those who have not experienced homelessness. Increased burden of mental illness among PWH who experience homelessness has also been reported in other studies [4, 21]; increasing access to and usage of mental health treatment services is essential. Depression and anxiety among PWH has been linked with decreased likelihood of viral suppression and increased HIV-related mortality [33, 34]. Further, we found a high prevalence of homelessness among transgender persons and those who had recently been incarcerated. Ensuring these populations receive tailored housing assistance programs when needed is crucial to improve their health outcomes and reduce HIV transmission risk.

One limitation of our analysis is the way in which homelessness was defined. Throughout the literature, the method by which homelessness is defined differs greatly. To date, federal definitions of homelessness vary by departmental programs and there are no standard measures of homelessness. Our measure of homelessness is inclusive of the most common categories used in the literature, but it is not inclusive of all possible measures of housing instability. Because we did not include all measures of housing instability, our estimate of homelessness might be interpreted as a lower bound. Another limitation to our homelessness measure is that it does not capture the length of time the person experienced homelessness. Second, because of MMP's cross-sectional design, temporality and causality cannot be assessed. Third, we assessed self-reported use of and need for shelter and housing services, but MMP does not collect information on the specific types of shelter or housing services used or needed. Fourth, our viral suppression and care engagement measures are based on documentation in the participant's medical record at their self-reported most frequent source of HIV care. Test results based on medical records may differ from those reported to the National HIV Surveillance System, but due to incomplete lab reporting and incomplete

de-duplication in NHSS, on one hand, and MMP's focus on the person's most frequent source of care, on the other hand, it is difficult to say in which way the estimates would be biased. Persons with no documented tests results were categorized as not sustainably virally suppressed. Although some people did not access care during that period, it is possible that some may have had viral load tests at other care facilities and MMP would not capture those data. However, we felt it was more conservative to assume these persons were not suppressed than to assume they were virally suppressed. Finally, self-reported information may be subject to biases that can result in measurement error. However, we have no reason to believe these biases differ by housing status and thus our findings with regard to the relationships between examined factors and housing status should not be affected by this limitation.

Conclusion

Our analysis demonstrates that a substantial need exists for enhanced treatment, care, and service delivery for PWH experiencing homelessness. Because secure and stable housing is a solid foundation on which PWH experiencing homelessness can improve their health and reduce HIV transmission risk behaviors, providing these individuals with stable and secure shelter can be the first step in retaining them in HIV medical care. Research demonstrates that housing assistance for this vulnerable population is effective in improving their HIV outcomes as well as reducing their risk behaviors [22, 25, 28, 29]; expanding Housing First-based programs to serve this population can be useful in attaining that objective.

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