Housing Status and HIV Viral Suppression Across Multiple US Cohorts

549

Carolyn A Fahey[1], Lydia N Drumright[1], Catherine Lesko[2], Shruti Mehta[2], Marianna Baum[3], Bridget M Whitney[1], Stephanie A Ruderman[1], Raul Mandler[4], Sonia Napravnik[5], Deana Agil[5], George A Yendewa[6], Maile Karris[7], Julia Fleming[8], Greer Burkholder[9], Geetanjali Chander[1]

[1]University of Washington, Seattle, WA [2]Johns Hopkins University, Baltimore, MD [3]Florida International University, Miami, FL [4]National Institute on Drug Abuse, North Bethesda, MD [5]University of North Carolina at Chapel Hill, Chapel Hill, NC
[6]Case Western Reserve University, Cleveland, OH [7]University of California San Diego, San Diego, CA [8]Harvard Medical School, Fenway Institute, Boston, MA [9]University of Alabama at Birmingham, Birmingham, AL

BACKGROUND

- People with HIV (PWH) in the US experience high levels of housing instability relative to the general population.
- To better understand HIV clinical care outcomes including viral suppression among unstably housed PWH, we examined associations: (a) with different types of housing instability; and (b) across clinical and community cohorts.

METHODS

- *Study Design:* Cross-sectional analysis.
- *Setting*: Three cohorts of adult PWH across the US:
  - Centers for AIDS Research Network of Integrated Clinical Systems (CNICS);
  - Johns Hopkins HIV Clinical Cohort (JHHCC); and
  - AIDS Linked to the IntraVenous Experience (ALIVE).
- *Participants*: PWH with concurrently measured housing status and HIV viral load (within the prior 6 months).
- *Exposure:* Most recent housing status via self-report:
  - CNICS/JHHCC: Stable/Unstable/Homeless/Don't know;
  - ALIVE: Homeless or sleeping unsheltered (binary).
- *Outcomes*: HIV viral suppression (<200 | <400 copies/mL); CD4 cell count; and self-reported ART use and adherence.
- *Covariates*: Age, sex, race and ethnicity, year, and site.
- *Analysis:* Relative risk regression and linear regression.

RESULTS

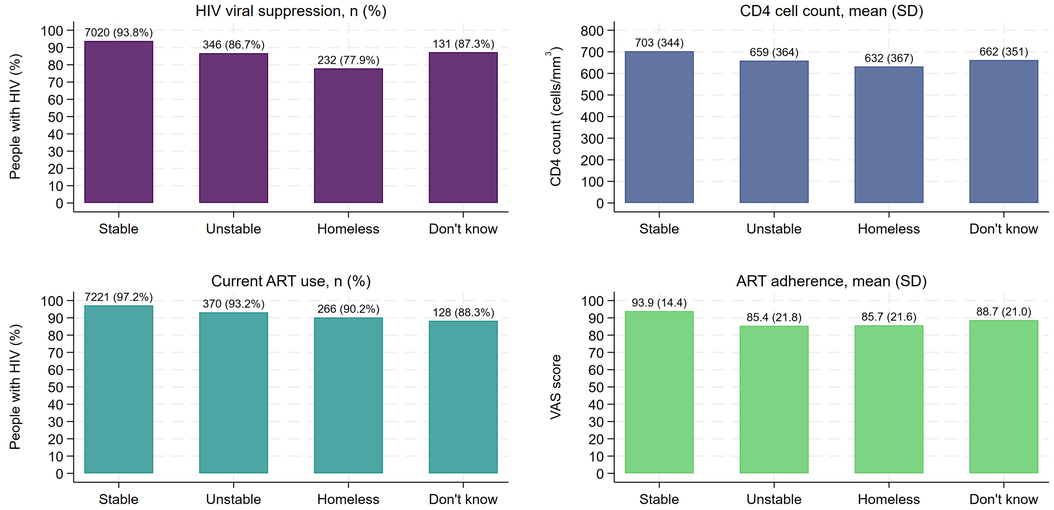
Table 1. Demographic characteristics of PWH across the US in CNICS/JHHCC by self-reported housing status, 2019-2025.

		Self-reported housing status, past month			
	Total (N=8,328)	Stable (n=7,481, 89.8%)	Unstable (n=399, 4.8%)	Homeless (n=298, 3.6%)	Don't know (n=150, 1.8%)
Age, mean (SD)	50.5 (13.2)	51.1 (13.1)	44.3 (12.0)	45.8 (12.3)	46.6 (12.9)
Male	6,775 (81.4%)	6,069 (81.1%)	343 (86.0%)	254 (85.2%)	109 (72.7%)
Race & ethnicity					
Non-Hispanic Black	3,716 (44.6%)	3,275 (43.8%)	212 (53.1%)	128 (43.0%)	101 (67.3%)
Non-Hispanic White	3,306 (39.7%)	3,050 (40.8%)	130 (32.6%)	97 (32.6%)	29 (19.3%)
Hispanic/Latine	893 (10.7%)	777 (10.4%)	46 (11.5%)	58 (19.5%)	12 (8.0%)
Other	413 (5.0%)	379 (5.1%)	11 (2.8%)	15 (5.0%)	8 (5.3%)

Data are n (%) or mean (SD).

Housing instability is associated with unsuppressed HIV viral load across multiple US cohorts

Figure 1. HIV clinical care outcomes by self-reported housing status in CNICS/JHHCC, 2019-2025.



Data are n (%) or mean (SD). Abbreviations: ART, antiretroviral therapy; VAS, visual analog scale.

Table 2. Associations between self-reported housing status & HIV clinical care outcomes in CNICS/JHHCC, 2019-2025.

	HIV viral suppression (<200 copies/mL) (N=8,328)		CD4 count (cells/mm^3) (N=8,100)	
Housing status	n	PR (95% CI)[a]	n	β (95% CI)[b]
Stable (ref)	7,481	—	7,266	—
Unstable	399	0.94 (0.91, 0.98)	393	-46 (-81, -11)
Homeless	298	0.84 (0.79, 0.90)	293	-67 (-107, -27)
Don't know	150	0.95 (0.89, 1.01)	148	-40 (-96, 15)
	Self-reported ART use (N=8,270)		ART adherence (VAS)[c] (N=7,286)	
Housing status	n	PR (95% CI)[a]	n	β (95% CI)[b]
Stable (ref)	7,433	—	6,626	—
Unstable	397	0.96 (0.94, 0.99)	325	-7.2 (-8.9, -5.5)
Homeless	295	0.93 (0.89, 0.96)	233	-7.3 (-9.3, -5.3)
Don't know	145	0.91 (0.86, 0.97)	102	-3.9 (-6.8, -0.9)

Abbreviations: PR, prevalence ratio; CI, confidence interval; ART, antiretroviral therapy; VAS, visual analog scale. **Note:** Associations were similar when stratifying by illicit drug use and depressive symptoms (PHQ-9). **a)** Relative risk regression with robust standard errors adjusted for age, sex, race and ethnicity, year, and site. **b)** Linear regression adjusted for age, sex, race and ethnicity, year, and site. **c)** Among PWH who reported current, non-injectable ART use; measured using the visual analog scale (VAS).

Table 3. Associations between self-reported housing status & HIV viral suppression (<400 copies/mL)[a] across different US cohorts.

	CNICS (6 sites): Clinical Cohort (N=7,627)		JHHCC (Baltimore): Clinical Cohort[b] (N=701)		ALIVE (Baltimore): Community Cohort[c] (N=623)	
Housing status	n (%)	PR (95% CI)	n (%)	PR (95% CI)	n (%)	PR (95% CI)
Housed (ref)	7,349 (96.4%)	—	681 (97.2%)	—	550 (88.3%)	—
Homeless[d]	278 (3.6%)	0.86 (0.81, 0.92)	20 (2.9%)	0.84 (0.65, 1.07)	73 (11.7%)	0.79 (0.64, 0.98)

Abbreviations: PR, prevalence ratio; CI, confidence interval. **Note:** The overall association from fixed-effects meta-analysis pooling of estimates from all three cohorts was PR=0.86 (0.81, 0.91) with no statistical evidence of heterogeneity detected (I^2=0%, p=0.7). **a)** For this analysis, viral suppression was defined as <400 copies/mL to account for changes in the lower level of detection over time in ALIVE data (2010-2024). **b)** For this analysis, JHHCC is presented separately from CNICS to provide a Baltimore-based comparison to ALIVE. **c)** ALIVE is a long-running cohort study of persons who inject drugs; this analysis was restricted to the subset of ALIVE participants with HIV. **d)** In CNICS and JHHCC, housing status was defined as a self-reported living situation of "homeless" in the past month (vs. housed: stable, unstable, or don't know). In ALIVE, housing status was defined as self-report of being homeless or sleeping unsheltered for at least 1 night in the past 6 months.

CONCLUSIONS

- Compared to stable housing, experiencing unstable housing or homelessness was associated with a lower prevalence of HIV viral suppression in cohorts of PWH in the US.
- PWH with stable housing also had the highest CD4 counts, current ART use, and ART adherence.
- These results highlight that lack of access to stable housing is deleterious to successful management of HIV and a barrier to ending the HIV epidemic.

ADDITIONAL KEY INFORMATION

The authors would like to acknowledge all study participants and personnel for their contributions to this work.

Contact: Carolyn Fahey, faheyc@uw.edu

Sources of Support: CNICS and HIV SUCCESS are NIH funded programs made possible respectively by the National Institute of Allergy and Infectious Diseases (NIAID) [R24 AI067039, P30 AI027767, P30 AI027757, P30 AI036214, P30 AI036219, P30 AI094189, P30 AI060354, P30 AI50410] and the National Institute of Drug Abuse (NIDA) [U01 DA036297, U01DA036935, U24 DA058307, R01 DA058938]. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

PLAIN LANGUAGE SUMMARY

Multiple types of housing instability are associated with poorer HIV clinical outcomes. Further, housing instability is associated with lower achievement of HIV viral suppression across clinical and community cohorts of PWH in the US.