THE PREVALENCE OF HOMELESSNESS AMONG INJECTION DRUG USERS WITH AND WITHOUT HIV INFECTION

JOHN Y. SONG, MD,[1] MAHBOOBEH SAFAEIAN, MPH,[2] STEFFANIE A. STRATHDEE, PHD,[2] DAVID VLAHOV, PHD,[3] AND DAVID D. CELENTANO, SCD[2]

ABSTRACT Cross-sectional investigations of homelessness have many potential biases. Data from 2,452 individuals enrolled in a longitudinal cohort study of Baltimore, Maryland, residents recruited in 1988–1989 with a history of injection drug use were analyzed to identify the extent and determinants of homelessness. Proportions having ever experienced homelessness were compared across subgroups of injection drug users (IDUs) who were human immunodeficiency virus (HIV) negative, HIV positive, and HIV seroconverting. Logistic regression identified independent predictors of homelessness. In the cohort, 1,144 (46.7%) participants experienced homelessness during the course of the study. There were differences in prevalence of homelessness by serostatus: 42.4% (n = 621) of participants who remained HIV negative were ever homeless, while 50.6% (n = 346) of HIV-infected individuals and 58.9% (n = 178) of those who seroconverted during the study were ever homeless ($P < .001$). Participants who consistently denied active injection drug use during follow-up were unlikely to experience homelessness (19%). Independent predictors of homelessness were male sex, HIV seroprevalence, and HIV seroconversion. Following participants over time captures more experiences of homelessness than cross-sectional studies and more accurately identifies risk characteristics. Our data suggest that homelessness is a significant problem among IDUs, especially those with HIV/AIDS.

KEY WORDS HIV, Homelessness, Injection drug use, Prevalence.

INTRODUCTION

The associations among homelessness, drug use, and human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS) have been well described. The prevalence of drug use disorders among homeless individuals is approximately 30–40%,[1] with many studies demonstrating even higher prevalence rates.[2–4] Conversely, drug users report a high prevalence of homelessness.[5–9] The prevalence of HIV infection among homeless populations has been estimated as 3% in a national survey[10] to local samples that have reported proportions from 9% to 62%.[11–13] The proportion of homelessness among people living with HIV/AIDS ranges anywhere from 8% to 64%.[5,8,14–16]

There are significant methodological difficulties in examining the relationship between homelessness and injection drug use or HIV/AIDS given the general instability and inaccessibility of these populations. The most important methodological barrier is the cross-sectional nature of most studies and the point prevalence bias that arises from this methodology. These studies measure homelessness either at one point in time or over a relatively short period of time and may underestimate true prevalence given the dynamic and transient nature of homelessness and drug use.

Regardless of the population source (e.g., street, shelter, clinic, hospital), a cross-sectional examination misses many of the "hidden homeless"[17]—those who live in areas that are inaccessible to researchers or those who simply did not access a social service or health care facility during that period. Homeless people who currently are living with friends or relatives may also be overlooked.[18] In addition, a person who may have been homeless recently, but is housed currently may not self-identify as being homeless.

Since homeless people may be mistrustful of institutions[19] and given the stigmatization of their status, homeless individuals may also deny their true housing status. Some cross-sectional studies have also attempted to characterize the proportion of time spent homeless through the use of interviews.[2,11] This method of ascertainment may underestimate true experience[20] because of problems of recall or social desirability.

Another possible bias introduced by cross-sectional investigations that is relevant especially to homeless populations is the potential oversampling of certain characteristics associated with frequent or chronic homelessness. For example, if a study is shelter based and a survey is performed at one point in time, it is likely that frequently or chronically homeless people will be over-represented. Characteristics associated with chronically homeless people may then be over-reported and may not be representative of the general homeless population or

those who experience infrequent or one-time homelessness. Phelan and Link[21] recently demonstrated the magnitude of this bias in an elegant study through a comparison of data sets.

Given that a current state of homelessness is inadequate to account for housing instability, an estimate of lifetime or long-term prevalence may delineate better the economic, sociologic, and personal factors that may be predisposing factors. To explore further the associations among homelessness, drug use, and HIV/AIDS, we examined the prevalence of homelessness over an extended period of time among a prospective study of injection drug users (IDUs); at the time of this analysis, the study had the benefit of 10 years of continuous follow-up. We hypothesized that a longitudinal study would reveal more opportunities to capture experiences of homelessness than a cross-sectional approach. In addition, we explored the relationship between homelessness and HIV infection over time in relation to HIV serostatus. We hypothesized that the proportion of homelessness would be highest among those who were either infected with HIV at study entry or those who had become infected with HIV (seroconverters) during the course of follow-up.

METHODS

STUDY SUBJECTS

The ALIVE (AIDS Links to the Intravenous Experience) study and its methods have been described in detail elsewhere.[22] The ALIVE cohort was recruited to identify risk factors for HIV infection and for progression to AIDS among those who used injection drugs. It was established in Baltimore, Maryland, in 1988–1989 and is ongoing. Individual participants were recruited through a variety of means, including word of mouth, drug treatment programs, street outreach efforts, sexually transmitted disease and HIV clinics, the Maryland Division of Parole and Probation, and emergency rooms. These analyses were performed using information from the 2,452 individuals still enrolled in the study as of 1998. Of this cohort, 59.7% (n = 1,465) were HIV negative at baseline and remained so throughout the follow-up period (denoted as HIV negative), while 27.9% (n = 684) were HIV positive at baseline (denoted as HIV prevalent); 12.3% (n = 302) were HIV negative at baseline, but were confirmed as having seroconverted during the course of follow-up (denoted as HIV seroconverters). Participants had follow-up visits every 6 months, during which interviewer-administered questionnaires and clinical data were collected.

STATISTICAL ANALYSIS

Homelessness was determined by a question that required self-definition of the condition: Have you been homeless at any time in the last 6 months? This question

was asked at each visit and recorded as "yes," "no," or "don't know." For the purposes of analysis, "don't know" was recorded as "no." Duration or frequency of homelessness during each 6-month follow-up period was not assessed. Period prevalence of homelessness was calculated for the duration of the 6-month follow-up period. Drug use was calculated as the number of semesters that a participant claimed current drug use divided by the total number of follow-up visits for each individual.

Predictors of homelessness were assessed in univariate logistic regression models, for which the outcome variable was any homelessness reported during the follow-up period. All analyses were stratified by HIV status. Stepwise logistic regression analysis was utilized to assess the independent effect of variables that were significant in the univariate analyses at the 5% level on the outcome of homelessness.

RESULTS

STUDY SAMPLE

Of 2,452 participants enrolled in the ALIVE study in the current analysis, 2,281 (93.1%) were African-American; 1,201 participants (49.1%) of the sample had at least a high school degree; and 1,856 enrollees (75.7%) were male. The median age of the sample was 34 years at the time of enrollment. Of the sample, 12% (n = 294) reported no active drug use *ever* during the course of the study (Table I).

PREVALENCE OF HOMELESSNESS

A total of 1,144 participants (46.7%) of the overall cohort experienced homelessness at least once during the follow-up period ("ever homeless"). There were marked and significant differences in the period prevalence of homelessness between groups when stratified by serostatus. Of HIV-negative subjects, 621 (42.4%) were ever homeless, while 346 (50.6%) of HIV-prevalent subjects were ever homeless. Relative to these groups, a higher proportion of HIV seroconverters, 58.9% (n = 178), were ever homeless (P < .001; see Table I).

PREDICTORS AND CHARACTERISTICS OF HOMELESSNESS

Univariate analysis demonstrated that current drug use predicted homelessness, with the strength of the association increasing with frequency of active drug use (Table II). Participants who denied injection drug use consistently during the course of the follow-up were least likely to experience homelessness (19%) regardless of HIV serostatus. Gender and serostatus were predictive of ever reporting homeless in univariate analyses (Table II), while age, race, and education were

TABLE I Demographic Variables, Injection Drug Use, and Prevalence of Homelessness

Variables	HIV Negative		HIV SP		HIV SC	
	Ever Homeless	Never Homeless	Ever Homeless	Never Homeless	Ever Homeless	Never Homeless
Duration of follow-up (median), in years	6.7	4.9	7.3	5.8	8.7	8.5
Average number of visits	9.4	7.7	10.6	9.2	12.1	11.1
Entire cohort	621 (42.4)	845 (57.6)	346 (50.6)	338 (49.4)	178 (58.9)	124 (41.1)
Age						
34 years or younger	292 (43.2)	384 (56.8)	197 (50.9)	190 (49.1)	115 (58.1)	83 (41.9)
> 34 years	329 (41.7)	461 (58.3)	149 (50.2)	148 (49.8)	63 (60.6)	41 (39.4)
Race						
African-American	568 (42.5)	770 (57.5)	334 (50.7)	325 (49.3)	163 (57.4)	121 (42.6)
Other	52 (40.9)	75 (59.1)	12 (48.0)	13 (52.0)	15 (83.3)	3 (16.7)
Education						
High school diploma	320 (42.4)	435 (57.6)	167 (51.4)	158 (48.6)	71 (58.7)	50 (41.3)
No high school diploma	299 (42.2)	410 (57.8)	177 (49.7)	179 (50.3)	107 (59.1)	74 (40.9)
Gender						
Male	505 (45.3)	609 (54.7)	276 (53.2)	243 (46.8)	139 (62.3)	84 (37.7)
Female	116 (33.0)	236 (67.0)	70 (42.4)	95 (57.6)	39 (49.4)	40 (50.6)
Drug use						
None of ALIVE visits	37 (18.8)	160 (81.2)	15 (18.3)	67 (81.7)	3 (20.0)	12 (80.0)
25% or fewer of ALIVE visits	55 (41.4)	78 (58.6)	33 (50.8)	32 (49.2)	16 (55.2)	13 (44.8)
>25% of ALIVE visits	529 (46.6)	607 (53.4)	298 (55.5)	239 (44.5)	159 (61.6)	99 (38.4)

SP = seroprevalent; SC = seroconverted.

not predictors of homelessness. Stepwise multivariate analysis incorporating variables significant in univariate analyses demonstrated gender, serostatus, and current injection drug use as independent predictors of homelessness (Table III).

DISCUSSION

We observed a high prevalence of homelessness over a 10-year study period in this longitudinal cohort of former and current IDUs. Nearly half of our sample (46.7%) claimed to have been homeless at least once during follow-up. Our prevalence estimate of homelessness is higher than reported in other studies and is consistent with our hypothesis that a prolonged period of observation reveals more frequent reports of homelessness.

Link et al.[17] examined the lifetime prevalence of homelessness using a telephone sample of currently housed people in New York City and estimated that

TABLE II   Univariate Analyses of Predictors of
             Homelessness

Variables	OR	95% CI
Age		
≤34	1	
>34	1.105	0.94–1.3
HIV serostatus		
Negative	1	
Positive	1.4	1.1–1.8
HIV seroconversion	2.0	1.6–2.3
Race		
Other	1	
African-American	1.01	0.74–1.4
Education		
High school diploma	1	
No high school diploma	1.01	0.86–1.2
Gender		
Male	1	
Female	0.62	0.51–0.75
Drug use		
None of ALIVE visits	1	
<25% of ALIVE visits	3.4	2.2–4.9
>25% of ALIVE visits	4.2	3.0–5.5

CI = confidence interval; OR = odds ratio.

TABLE III   Final Multivariate Logistic Model of
             Independent Predictors of Homelessness

Variables	OR	95% CI
HIV		
Negative	1	
Positive	1.4	1.2–1.7
HIV seroconversion	2.0	1.5–2.6
Gender		
Male	1	
Female	0.61	0.50–0.74
Drug use		
None of ALIVE visits	1	
<25% of ALIVE visits	3.4	2.2–4.9
>25% of ALIVE visits	4.2	3.0–5.5

CI = confidence interval; OR = odds ratio.

14% of their sample had been homeless at one time in their lives. That study probably underestimated true prevalence because it only sampled individuals with telephones (clearly domiciled) from the general population. Two other cross-sectional studies found even less homelessness in their general samples.[18,20] Although our longitudinal study design may have captured more homelessness, it is likely that this difference in prevalence predominantly reflects the higher prevalence of homelessness among IDUs than in a general population.

However, our analysis did uncover more experiences with homelessness than previous cross-sectional investigations of similar populations. It must be noted that there are methodological difficulties in drawing comparisons among studies of homeless populations. One challenge is the wide variation in definitions. Due to different research and policy agendas, there is little uniformity among studies. Most investigators concur that individuals living in shelters or on the street should be considered homeless.[20] This definition yields a conservative estimate of homelessness. Others have moved to a more expansive definition of homelessness, one that includes individuals with "unstable housing" or those "at imminent risk" of homelessness.[20] These criteria significantly inflate estimates of homelessness. However, even among studies with similar definitions, there remains much variation in terms of populations under study. For example, some studies enumerate incarcerated individuals or those in residential treatment facilities as being "at risk of homelessness," while others do not.

Since definitions of homelessness have a profound impact on prevalence estimates, we cannot compare our study to those that use a significantly different definition.[20] We asked participants to self-identify as homeless, a conservative approach. Cross-sectional studies of injection drug use or people with HIV/AIDS that utilize a definition more consistent with ours all report a significantly lower prevalence of homelessness, generally in the range of 10–20%.[6,9,14,16,23-26] Interestingly, the baseline data in the ALIVE study reported a prevalence of homelessness of 11%,[7] clearly demonstrating that a longer period of observation will yield a higher prevalence.

Examination of current drug use in our study supports several reports of a positive association between drug use and homelessness.[3-5,11,14] In addition, our data demonstrate that more frequent drug use is a stronger predictor for homelessness than less-frequent use. These data—made possible by the study's longitudinal design—suggest a more intimate relationship between drug use and homelessness than previously observed in cross-sectional investigations and are less likely to reflect point prevalence bias.

We also observed significant differences in homelessness by HIV status that

were not explained by sociodemographic factors. Our findings support others that demonstrate a strong link between HIV/AIDS and homelessness.[11–13] In our study, 46% of IDUs who experienced homelessness were HIV positive at the time of analysis, compared to 35% prevalence of HIV infection among those who never experienced homelessness. Moreover, our study uncovered an important relationship between homelessness and HIV seroconversion. In multivariate logistic regression models, HIV seroconverters were twice as likely to be homeless. A previous case-control study of IDUs found unstable housing to be predictive of HIV seroconversion.[27] One explanation for these findings is that the instability of homelessness and the struggle for survival may add significant risk to acquiring HIV beyond the use of injection drugs. An alternative explanation is that becoming infected with HIV may be associated with significant life events such as job loss, depression, or other factors that may contribute to homelessness.

The literature demonstrates that homeless individuals are less likely to access primary care, as evidenced by fewer ambulatory visits, more frequent emergency department visits, and a less consistent source of usual care compared to housed individuals.[28–30] There are indications that diminished access may be exacerbated for homeless individuals living with HIV/AIDS.[31,32] Our data demonstrate that a substantial proportion of IDUs who are HIV infected experience many episodes of homelessness. Although this analysis did not address the health care utilization history of these patients, the sheer magnitude of homelessness we observed suggests that there are probably unmet primary care needs among this population.

As in other longitudinal studies, this study is limited by volunteer bias, reporting bias, and incomplete data for some individuals. In other studies, homeless individuals may have been less likely to enroll because of their isolation and less-frequent contact with health care and social service institutions. However, this bias may not have operated as strongly in the ALIVE cohort since participants were provided with a monetary reimbursement at each visit and referrals to services. Indeed, the trend in our study was for homeless people to attend study visits more frequently and to be followed for longer than those who never experienced homelessness.

Another potential source of bias is our study definition of homelessness; as we could not validate their self-reports, it is possible that participants could have misrepresented their experience. However, homeless individuals usually underreport their homelessness (e.g., by not understanding that living transiently with friends may be considered as homelessness). We tried to compensate for this in our analysis by including "don't know" responses with "no" responses, thereby

potentially underestimating the true frequency. Finally, another limitation to our findings is the lack of generalizability.

The strength of this study is its longitudinal design with excellent retention of participants; individuals were followed for 10 years, providing up to 20 evaluations. Thus, prevalence measurements of homelessness are less likely to suffer from biases borne of cross-sectional studies, and associations are less likely to reflect bias borne of oversampling frequently or chronically homeless individuals.

Several important conclusions can be drawn from our observations. First, longitudinal studies capture more instances of homelessness and may portray better the extent of the homeless problem in many urban centers. Next, using longitudinal data describes a much more intimate relationship between homelessness and drug use and HIV/AIDS than previously described. As homeless people face barriers accessing health care and appear to be at higher risk of HIV infection, these findings have important implications for primary care and public health.

REFERENCES

1. Koegel P, Burham MA, Baumohl J. The causes of homelessness. In: Baumohl J, ed. *Homelessness in America*. Phoenix, AZ: Oryx Press, 1996:31.
2. Susser E, Stuening EL, Conover S. Psychiatric problems in homeless men: lifetime psychosis, substance use, and current distress. *Arch Gen Psychiatry*. 1989;46:845–850.
3. Gelberg L, Linn LS, Leake BD. Mental health, alcohol and drug use, and criminal history among homeless adults. *Am J Psychiatry*. 1988;145:191–196.
4. Robertson MJ, Zlotnick C, Westerfelt A. Drug use disorders and treatment contact among homeless adults in Alameda County, California. *Am J Public Health*. 1997;87: 221–228.
5. Smereck GA, Hockman EM. Prevalence of HIV infection and HIV risk behaviors associated with living place: on-the-street homeless drug users as a special target population for public health intervention. *Am J Drug Alcohol Abuse*. 1998;12:299–319.
6. Broers B, Morabia A, Hirschel B. A cohort study of drug users' compliance with zidovudine treatment. *Arch Int Med*. 1994;154:1121–1127.
7. Celentano DD, Vlahov D, Cohn S, Shadle VM, Obasanjo B, Moore RD. Self-reported antiretroviral therapy in injection drug users. *JAMA*. 1998;280:544–546.
8. Strathdee SA, Palepu A, Cornelisse PGA, et al. Barriers to use of free antiretroviral therapy in injection drug users. *JAMA*. 1998;280:547–549.
9. Siegal HA, Carlson RG, Falck R, et al. HIV infection and risk behaviors among intravenous drug users in low seroprevalence areas in the Midwest. *Am J Public Health*. 1991; 81:1642–1644.
10. Allen DM, Lehman JS, Green TA, Lindegren ML, Onorato IM, Forrester W, et al. HIV infection among homeless adults and runaway youth, United States, 1989–1992. *AIDS*. 1994;8:1593–1598.
11. Zolopa AR, Hahn JA, Gorter R, et al. HIV and tuberculosis infection in San Francisco's homeless adults: prevalence and risk factors in a representative sample. *JAMA*. 1994; 272:455–461.
12. Paris NM, East RT, Toomey KE. HIV seroprevalence among Atlanta's homeless. *J Health Care Poor Underserved*. 1996;7:83–93.
13. Torres RA, Altholz J, Brickner PW. Human immunodeficiency virus infection among homeless men in New York City shelter. *Arch Int Med*. 1990;150:2030–2036.

14. Lieberman B. The state of AIDS housing in America. Paper presented at: Third National HIV/AIDS Housing Conference; September 16–18, 1998; Atlanta, GA.

15. Low G, Shelter Partnership, Incorporated. *A Report on Housing for Persons Living with HIV/AIDS in the City and the County of Los Angeles.* Los Angeles, CA: Shelter Partnership; 1999:3.

16. Weissman JS, Makadon HJ, Seige BR, Massagli HP, Gatsonis CA, Craven DE, et al. Changes in insurance status and access to care for persons with AIDS in the Boston Health Study. *Am J Public Health.* 1994;84:1997–2000.

17. Link BG, Susser E, Stueve A, et. al. Lifetime and five-year prevalence of homelessness in the United States. *Am J Public Health.* 1994;84:1907–1912.

18. Rossi PH, Wright JD, Fisher GA, Willis G. The urban homeless: estimating composition and size. *Science.* 1987;235:1336–1341.

19. McMurray-Avila M. *Organizing Health Services for Homeless People: a Practical Guide.* Nashville, TN: National HCH Council; 1997:81–82.

20. Burt MR. Homelessness: definitions and counts. In: Baumohl J, ed. *Homelessness in America.* Phoenix, AZ: Oryx Press; 1996:15–23.

21. Phelan JC, Link BG. Who are "the homeless"? Reconsidering the stability and composition of the homeless population. *Am J Public Health.* 1999;89(9):1334–1338.

22. Vlahov D, Anthony JC, Munoz A, et al. The ALIVE Study: a longitudinal study of HIV-1 infection in intravenous drug users: description of methods. *J Drug Issues.* 1991; 21:759–776.

23. Solomon L, Stein M, Flynn C, et al. Health services use by urban women with or at risk for HIV-1 infection: the HIV Epidemiology Research Study (HERS). *J Acquir Immune Defic Syndr Hum Retrovirol.* 1998;17:253–261.

24. Hartz D, Banys P, Hall SM. Correlates of homelessness among substance abuse patients at a VA medical center. *Hosp Community Psychiatry.* 1994;45:491–493.

25. Beardsley M, Clatts MC, Deren S, Davis WR, Tortu S. Homelessness and HIV-risk behaviors in a sample of New York City drug injectors. *AIDS Public Policy J.* 1992;7: 162–171.

26. Samet JH, Libman H, Steger KA, et al. Compliance with zidovudine therapy in patients infected with human immunodeficiency virus, type 1: a cross-sectional study in a municipal hospital clinic. *Am J Med.* 1992;92:495–501.

27. Patrick DM, Strathdee SA, Archibald CP, et al. Determinants of HIV seroconversion in injection drug users during a period of rising prevalence in Vancouver. *Int J STD AIDS.* 1997;8:437–445.

28. Gallagher TC, Anderson RM, Koegel P, Gelberg L. Determinants of regular source of care among homeless adults in Los Angeles. *Med Care.* 1997;35:814–830.

29. Robertson MJ, Cousineau MR. Health status and access to health services among the urban homeless. *Am J Public Health.* 1986;76:561–563.

30. Wood D, Valdez RB. Barriers to medical care for homeless families compared with housed poor families. *Am J Dis Child.* 1991;145:1109–1115.

31. Bangsberg D, Tulsky DP, Hecht FM, Moss AR. Protease inhibitors in the homeless. *JAMA.* 1997;278:63–65.

32. Arno PS, Bonuck K. The impact of housing status on health care utilization among persons with HIV disease. *J Health Care Poor Underserved.* 1996;7:36–49.