

Health Status, Health Care Use, Medication Use, and Medication Adherence Among Homeless and Housed People Living With HIV/AIDS

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Homeless people are at a disproportionate risk for negative health consequences. For instance, they typically have more chronic diseases and more physical and mental health problems than do the general population, and they are at greater risk for infectious diseases.^{1–13} Homelessness is often coincident with poverty, mental illness, and alcohol and drug use, compounding the other health problems experienced by these individuals.^{14–17}

Homeless people are also more likely than other groups to engage in behaviors that place them at risk for HIV infection, including risky sexual practices, injection drug use and needle sharing, and performing sexual acts in exchange for money, drugs, or a place to stay.^{18–25} Perhaps not surprisingly, previous research has shown that HIV is 3 to 9 times more prevalent among homeless individuals than among individuals in stable housing situations.^{18,20,21,26–29}

It may be difficult for homeless people, who are often faced with immediate subsistence needs (e.g., finding adequate food and shelter), to obtain medical care and adhere to treatment regimens.^{30,31} As a result, homeless individuals are less likely than are the general population to have stable sources of care, and they often rely on emergency departments or ambulatory care settings for their health care needs.^{32,33} Delayed medical care or lack of care has negative effects such as delayed HIV diagnoses and higher rates of serious opportunistic infections.^{7,31,34}

People who are living with HIV/AIDS and are homeless face additional burdens not faced by homeless people without HIV/AIDS. For instance, individuals with HIV/AIDS need greater access to comprehensive health care, and barriers to care—including lack of financial resources, lack of transportation, and insufficient (or nonexistent) health insurance

Objectives. We sought to compare health status, health care use, HIV antiretroviral medication use, and HIV medication adherence among homeless and housed people with HIV/AIDS.

Methods. Data were obtained from a cross-sectional, multisite behavioral survey of adults (N=7925) recently reported to be HIV positive.

Results. At the time interviews were conducted, 304 respondents (4%) were homeless. Self-ratings of mental, physical, and overall health revealed that the health status of homeless respondents was poorer than that of housed respondents. Also, homeless respondents were more likely to be uninsured, to have visited an emergency department, and to have been admitted to a hospital. Homeless respondents had lower CD4 counts, were less likely to have taken HIV antiretroviral medications, and were less adherent to their medication regimen. Homeless respondents needed more HIV social and medical services, but nearly all respondents in both groups had received needed services. Housing status remained a significant predictor of health and medication outcomes after we controlled for potential confounding variables.

Conclusions. Homeless people with HIV/AIDS are at increased risk of negative health outcomes, and housing is a potentially important mechanism for improving the health of this vulnerable group. (*Am J Public Health.* 2007;97:2238–2245. doi:10.2105/AJPH.2006.090209)

coverage—may be compounded among homeless people living with the disease.^{30,34}

People with HIV/AIDS also may have difficulty adhering to prescribed HIV antiretroviral medication regimens.^{35,36} These regimens can be complex and often involve restrictions on when and how the medications should be taken and stored.^{31,34} In addition, these medications can have side effects, such as recurring diarrhea, that are especially problematic for homeless individuals. Medical providers may believe that homeless individuals will not be adherent, and thus they may be reluctant to prescribe antiretroviral medications for these individuals³⁷ given that inadequate adherence can lead to drug resistance.³⁴ Despite its importance, few studies have investigated the issue of adherence to antiretroviral medication regimens in this population.^{35,36,38–42}

Overall, minimal research has been conducted on the health of homeless people living with HIV/AIDS.^{15,43,44} We used data from a large, multisite investigation to (1) assess

differences between homeless and housed persons living with HIV/AIDS regarding sociodemographic, health care, and medication adherence variables and (2) examine associations between housing status and health, and medication adherence outcomes after controlling for potential confounding factors.

METHODS

We derived data for this study from the Centers for Disease Control and Prevention's Supplement to HIV/AIDS Surveillance (SHAS) project, a cross-sectional, multisite study that collected behavioral surveillance data from adults with HIV.⁴⁵ Recruitment took place at 19 surveillance sites: the state health departments of Arizona, Colorado, Connecticut, Delaware, Florida, Georgia, Illinois, Kansas, Maryland, Michigan, Minnesota, New Jersey, New Mexico, South Carolina, Texas, and Washington and the city health departments of Houston, Tex; Los

Angeles, Calif; and Philadelphia, Pa. Eligible respondents were recruited from individuals recently reported to have HIV or AIDS.

Recruitment was either facility based (i.e., from selected health care facilities; 9 sites) or population based (i.e., from defined geographical areas; 10 sites). Potential participants had been reported to local HIV/AIDS surveillance systems within the previous 2 years. Respondents were recruited using printed materials (e.g., flyers in clinics and HIV/AIDS service organizations), provider referrals, and reviews of clinic lists and HIV/AIDS surveillance registries. Participant compensation was determined individually at the different sites; a majority offered participants up to \$25.

Trained interviewers conducted individual interviews with people 18 years or older. The interviews were approximately 45 minutes in duration and were conducted in either English or Spanish. Questionnaire modules included demographic information and data on alcohol and drug use, sexual behaviors, reproductive history (among women), HIV testing and medical therapy, and use of health care and social services.

The data used in our study were collected between May 2000 and December 2003. During this period, 20944 men and women were eligible for interviews; 8732 of these individuals could not be located or were deceased (or there was no attempt made to contact them). Among the 12212 eligible individuals offered enrollment, 8129 (67%) completed an interview and 4083 (33%) refused. A total of 7925 individuals had valid data on housing status (41% of those at population-based sites and 59% of those at facility-based sites) and were included in the study.

Measures

In terms of housing status, respondents were categorized as homeless if they reported living in a shelter or on the streets at the time they were interviewed. Respondents were considered housed if, at the time of their interview, they were living in (1) a house or apartment, either alone or with a spouse, partner, friends, or family; (2) a medical care facility; or (3) a correctional institution.

Data were gathered on gender, race/ethnicity, age, highest level of education completed, marital status, employment status, annual

household income, and primary source of income. Primary source of income was categorized as public (including public assistance and Social Security supplemental income or disability income) or private (including salaries, savings, pensions, retirement funds, and assistance from spouse, partner, family, or friends). Risk categories associated with HIV transmission or acquisition were based on lifetime behaviors (i.e., behaviors that could have occurred either before or after HIV diagnosis).

An item focusing on drug use assessed illicit injection or noninjection drug use (e.g., marijuana, heroin, cocaine, methamphetamine) in the past 12 months. Potential problem drinking was assessed with the 4-item CAGE scale (Cut-Annoyed-Guilt-Eye Opener; score range: 0–4)^{46,47}; scores of 2 to 4 indicated a potential lifetime drinking disorder.

Items focusing on health insurance coverage included type of coverage and primary method of payment for HIV-related prescription medications. Respondents were asked whether they had ever received medical care for HIV. Those who answered “yes” were asked about the most frequent source of that care, frequency of care, number of emergency department visits for HIV/AIDS care, and number of hospital admissions (all in the past 12 months). Numbers of emergency department visits and hospital admissions were recategorized into dichotomous variables (0 or ≥ 1).

Self-rated health items were derived from the Centers for Disease Control and Prevention’s health-related quality of life measures.⁴⁸ Overall health status was assessed on a 5-point scale (possible responses ranged from poor to excellent). Respondents also reported the number of days in the past 30 days during which (1) they felt very healthy and full of energy; (2) they were not able to engage in their usual activities as a result of poor physical or mental health; (3) their physical health (physical illness and injury) was not good; (4) pain made it difficult for them to engage in their usual activities; (5) they did not rest or sleep enough; (6) their mental health (stress, depression, and problems with emotions) was not good; (7) they felt sad, blue, or depressed; and (8) they felt worried, tense, or anxious.

Items focusing on health conditions and HIV progression asked whether participants had ever had hepatitis, *Pneumocystis carinii*

pneumonia, a positive tuberculosis skin test, a CD4 count test, and a viral load test. If they had undergone CD4 testing, viral load testing, or both, they were asked their most recent results.

Respondents were shown a list of 26 HIV antiretroviral medications and asked which, if any, they had ever taken and were currently taking. Those who had never taken antiretrovirals were asked why they had not. Responses to this open-ended question were coded into predetermined categories.

Medication adherence questions were asked only of respondents who reported currently taking HIV antiretroviral medications. The primary HIV medication adherence item focused on whether respondents had missed or skipped any doses of any HIV antiretroviral medication in the previous 48 hours. They were also asked how often they took HIV medications exactly as their doctor had told them. Respondents who did not answer “always” were asked the main reason why they did not do so. In addition, respondents were asked whether they had stopped taking any HIV medicines prescribed by a doctor and, if so, to choose from a list of reasons why they had done so.

Respondents were asked whether they had needed each of 13 types of social and medical services related to HIV in the past 12 months. In the case of each service needed, respondents were asked whether they had been able to obtain the service in the preceding 12 months.

Data Analyses

We used the χ^2 test (for categorical variables) and *t* test (for continuous variables) to conduct bivariate analyses comparing homeless and housed respondents. We used the nonparametric Wilcoxon test for ordinal categorical variables. The α level was set at $< .05$.

To investigate the independent effects of homelessness, we conducted separate logistic regression analyses involving 6 self-reported dependent variables: (1) health status (poor/fair vs good/very good/excellent), (2) most recent CD4 count ($< 200/\mu\text{L}$ vs $\geq 200/\mu\text{L}$), (3) most recent viral load (< 500 viral copies per milliliter [undetectable] vs ≥ 500 viral copies per milliliter), (4) emergency department use in past 12 months, (5) current use of HIV antiretroviral medications, and

(6) complete adherence to HIV antiretroviral medication regimen in preceding 48 hours. The analyses of most recent CD4 count and viral load count included only respondents who had ever undergone a CD4 test and a viral load test, respectively. The medication

adherence analysis included only respondents currently taking HIV antiretroviral medications. The remaining analyses included all respondents.

Several separate logistic regression analyses were conducted for each dependent variable.

In the first analysis, housing status was the single predictor. We selected the predictor variables used in the second set of analyses, including housing status, sociodemographic characteristics, drug use, and alcohol use, on the basis of previous research suggesting associations with the dependent variables.

In a third set of logistic regression analyses, we repeated the previous analyses focusing on health care use with the addition of self-reported CD4 count and self-rated health as markers of health status. The purpose of these analyses was to examine the effects of homelessness on health care use after we controlled for individual differences in need for health care. These analyses were conducted for 3 of the dependent variables (emergency department use, current use of HIV antiretroviral medications, and adherence to HIV antiretroviral medication regimen in preceding 48 hours) but were not conducted for the other health status measures, because we hypothesized that they would be highly related to self-reported health and CD4 count.

RESULTS

Sociodemographic Characteristics, Drug Use, and Alcohol Use

Of the 7925 respondents included in the analyses, 304 (3.8%) were homeless. More than 70% were male (homeless respondents were significantly more likely to be male), and more than half were Black (Table 1). Respondents' mean age was 40 years (SD=9.3), and nearly two thirds had never been married. Homeless respondents had less education than housed respondents and were less likely to be employed. In addition, they had lower incomes and were more likely to receive public assistance or to have no identified source of income.

In terms of risk categories associated with HIV transmission or acquisition, more men in the housed group than in the homeless group had had sexual intercourse with other men. By contrast, the percentage of respondents who reported injection drug use and the percentage of men who reported engaging in both sexual intercourse with other men and injection drug use were higher in the homeless group.

TABLE 1—Sociodemographic Characteristics, Drug Use, and Alcohol Use Among Homeless and Housed Respondents: Supplement to HIV/AIDS Surveillance Project, 2000–2003

	Homeless Respondents, No. (%)	Housed Respondents, No. (%)	χ^2
Total	304 (100)	7621 (100)	
Men	236 (77.6)	5478 (71.9)	4.8*
Race/ethnicity			4.1
Black	182 (59.9)	4217 (55.3)	
White	54 (17.8)	1664 (21.8)	
Hispanic	60 (19.7)	1467 (19.3)	
Other	8 (2.6)	272 (3.6)	
Age, y			6.8
18–29	26 (8.6)	998 (13.1)	
30–39	116 (38.2)	2794 (36.7)	
40–49	123 (40.5)	2746 (36.0)	
≥50	39 (12.8)	1083 (14.2)	
Educational level			48.1***
Less than high school	138 (45.4)	2349 (30.9)	
High school	111 (36.5)	2497 (32.8)	
More than high school	55 (18.1)	2764 (36.3)	
Marital status			16.4**
Single	203 (66.8)	5017 (65.8)	
Married	15 (4.9)	842 (11.1)	
Divorced	44 (14.5)	1038 (13.6)	
Separated	31 (10.2)	503 (6.6)	
Widowed	11 (3.6)	221 (2.9)	
Employed	32 (10.5)	2770 (36.4)	85.4***
Annual household income, \$			154.6***
<10 000	242 (87.1)	3443 (49.0)	
≥10 000	36 (13.0)	3579 (51.0)	
Source of income			378.9***
Public	148 (50.9)	3286 (44.1)	
Private	59 (20.3)	3841 (51.6)	
No identified source	84 (28.9)	322 (4.3)	
HIV risk category			65.4***
MSM	82 (27.2)	3024 (40.0)	
IDU	72 (23.9)	1150 (15.2)	
Both MSM and IDU	53 (17.6)	589 (7.8)	
Heterosexual	45 (15.0)	1580 (20.8)	
Other	49 (16.3)	1243 (16.4)	
Illicit drug use in past 12 months	177 (58.2)	2558 (33.6)	78.6***
Potential alcohol abuse	166 (54.6) ^a	2688 (35.3) ^a	47.4***

Note. MSM = men who have sex with men; IDU = injection drug user.

^aThis is the percentage meeting CAGE (Cut-Annoyed-Guilt-Eye Opener) criteria for potential lifetime drinking disorder.

* $P < .05$; ** $P < .01$; *** $P < .001$.

TABLE 2—Health Care Coverage and Use, Physical and Mental Health, and HIV Medication Use and Adherence Among Homeless and Housed Respondents: Supplement to HIV/AIDS Surveillance Project, 2000–2003

	Homeless Respondents	Housed Respondents	χ^2 or t^a
Health care coverage, no. (%)			54.0***
None	96 (31.7)	1627 (21.4)	
Public insurance	148 (48.8)	3774 (49.7)	
Private insurance	2 (0.7)	1037 (13.7)	
Other	57 (18.8)	1153 (15.2)	
Main method of medication payments, no. (%)			23.4***
AIDS Drug Assistance Program	103 (34.3)	2259 (30.3)	
Personal health care coverage	81 (27.0)	2994 (40.2)	
Public clinic	37 (12.3)	666 (8.9)	
Self-pay	1 (0.3)	44 (0.6)	
None (not taking any medications)	78 (26.0)	1484 (19.9)	
Ever received medical care for HIV, no. (%)	300 (98.7)	7545 (99.1)	0.6
Frequency of visiting facility for HIV care, ^b no. (%)			55.6***
No receipt of medical care	8 (2.8)	153 (2.1)	
Once	9 (3.1)	187 (2.5)	
Every 3 months or less	55 (19.1)	2536 (34.3)	
Every other month	41 (14.2)	1410 (19.1)	
Monthly	104 (36.1)	2145 (29.0)	
More than monthly	71 (24.7)	969 (13.1)	
Most frequent source of medical care for HIV, ^b no. (%)			36.7***
Community clinic	240 (80.5)	5213 (69.1)	
Private physician	31 (10.4)	1848 (24.5)	
Emergency room	7 (2.4)	66 (0.9)	
No care received	8 (2.7)	153 (2.0)	
Other	12 (4.0)	261 (3.5)	
Use of emergency room for HIV/AIDS care at least once, ^b no. (%)	121 (40.7)	1952 (25.9)	32.2***
Admission to hospital for HIV/AIDS care at least once (not including emergency department), ^b no. (%)	110 (37.2)	1597 (21.3)	42.3***
Health status, no. (%)			7.4***
Excellent	15 (4.9)	1015 (13.3)	
Very good	44 (14.5)	1689 (22.2)	
Good	104 (34.2)	2574 (33.8)	
Fair	93 (30.6)	1878 (24.7)	
Poor	48 (15.8)	452 (5.9)	
Ever had hepatitis, no. (%)	132 (43.4)	2179 (28.6)	30.9***
Ever had <i>Pneumocystis carinii</i> pneumonia, no. (%)	74 (25.1)	1419 (19.1)	6.6*
Ever had a positive tuberculosis skin test, no. (%)	63 (21.9)	879 (12.6)	21.0***
Ever had a CD4 count test, no. (%)	274 (96.1)	6917 (97.3)	1.4
Most recent CD4 count, no. (%)			-3.7***
< 200	90 (43.3)	1590 (32.1)	
200–499	78 (37.5)	1973 (39.8)	
≥ 500	40 (19.2)	1397 (28.2)	
Ever had a viral load test, no. (%)	246 (91.5)	6267 (93.2)	1.2

Continued

In comparison with housed respondents, homeless respondents were more likely to have used illicit drugs in the past 12 months and to meet CAGE criteria for lifetime alcohol problems (Table 1).

Health Care, Physical and Mental Health, and HIV Medication Use and Adherence

Homeless respondents were more likely to be uninsured and less likely to have private health insurance coverage (Table 2). For about one third of the members of each group, their main method of paying for medications was the AIDS Drug Assistance Program. A greater percentage of housed respondents had medications paid for through their own health care coverage.

Nearly all respondents (99%) had received HIV medical care, with no difference between the homeless and housed groups (Table 2). Frequency of HIV care differed between the 2 groups; a higher percentage of homeless respondents had received care at least monthly.

Community clinics were the most frequent source of HIV care among both homeless and housed respondents. A larger percentage of respondents in the housed group than in the homeless group received care from private physicians. Homeless respondents were more likely to have used an emergency department for HIV care and to have been admitted to the hospital because of HIV in the past 12 months.

Self-ratings of mental, physical, and overall health status revealed that the health of homeless respondents was poorer than that of housed respondents (Table 2). Also, homeless respondents reported significantly more days in the past 30 days during which (1) physical or mental health problems prevented their usual activities, (2) they were in poor physical health, (3) pain limited their activities, (4) they did not rest or sleep enough, (5) they were in poor mental health, (6) they were depressed, and (7) they were worried. Finally, they reported fewer days on which they were very healthy.

Homeless respondents were more likely than housed respondents to have had hepatitis, *Pneumocystis carinii* pneumonia, and a positive tuberculosis skin test (Table 2). More than 90% of both groups had undergone CD4 or viral load tests, with no between-group

TABLE 2—Continued

Most recent viral load, no. (%)			3.6 ^c ***
<500 (undetectable)	53 (35.3)	1970 (48.6)	
500–5000	36 (24.0)	862 (21.3)	
5001–50 000	27 (18.0)	701 (17.3)	
>50 000	34 (22.7)	520 (12.8)	
Ever used HIV antiretroviral medications, no. (%)	217 (72.3)	6128 (80.6)	12.6***
Was currently using HIV antiretroviral medication, no. (%)	151 (69.6)	5253 (85.7)	44.3***
Had skipped any pills in past 48 hours, no. (%)	47 (31.3)	899 (17.1)	19.7***
Frequency of taking HIV/AIDS medication exactly as prescribed in past 30 days, no. (%)			–3.8 ^c ***
Rarely or never	11 (7.4)	108 (2.1)	
Sometimes	16 (10.7)	295 (5.6)	
Usually	39 (26.2)	1269 (24.3)	
Always	83 (55.7)	3562 (68.1)	
Had stopped taking any prescription HIV/AIDS medications, no. (%)	134 (62.3)	3308 (54.2)	5.6*
Primary reason for stopping medications, ^d no. (%)			
Instructions from doctor	59 (44.4)	1963 (59.7)	12.4***
Doctor switched drugs	41 (31.1)	1569 (47.7)	14.1***
Went back on the street	33 (25.2)	182 (5.6)	82.4***
Drugs quit working	19 (14.6)	807 (24.8)	7.0**
Partner suggested stopping	5 (3.8)	43 (1.3)	5.7*
No. of days physical or mental health problems prevented usual activities, ^e mean (SD)	9.2 (11.4)	5.9 (9.5)	6.0***
No. of days physical health was not good, ^e mean (SD)	9.9 (10.7)	6.7 (9.5)	5.8***
No. of days pain made it difficult to do usual activities, ^e mean (SD)	8.1 (10.8)	5.9 (9.6)	4.0***
No. of days without enough sleep or rest, ^e mean (SD)	14.1 (12.4)	9.7 (11.4)	6.6***
No. of days mental health not good, ^e mean (SD)	12.8 (12.4)	8.7 (11.0)	6.2***
No. of days sad, blue, or depressed, ^e mean (SD)	13.8 (12.2)	9.0 (10.9)	7.4***
No. of days worried, ^e mean (SD)	15.2 (12.5)	10.4 (11.6)	7.4***
No. of days very healthy, ^e mean (SD)	11.6 (11.0)	16.3 (11.6)	6.9***

Note. As a result of rounding, percentages may not sum to 100%.

^a χ^2 values for percentages; *t* values for means.

^bIn past 12 months.

^cWilcoxon test for trend, *z* approximation.

^dParticipants could choose multiple responses.

^eIn past 30 days.

P* < .05; *P* < .01; ****P* < .001.

differences. However, there were differences in self-reported test results. Homeless respondents were more likely to report that their most recent CD4 count was less than 200 and less likely to report an undetectable viral load.

A lower percentage of homeless respondents reported having ever taken HIV antiretroviral medications, and they were also less likely to currently be taking these medications (Table 2). Among those taking antiretrovirals,

there was no difference between groups (housed: 83%; homeless: 85%; $\chi^2=0.29$, *P* = .59) in the percentage taking 3 or more, which is sometimes used as a basic measure of a sufficient treatment regimen.

In addition, among the respondents taking HIV antiretroviral medications, self-reported adherence was significantly lower in the homeless group. More than 30% of homeless respondents had missed doses in the past 48 hours, as compared with less than 20% of the

housed respondents. Homeless respondents were also less likely to report that they had always taken their HIV medications exactly as prescribed in the past 30 days.

A higher percentage of homeless respondents than housed respondents reported they had stopped taking prescribed HIV/AIDS medications. Among the respondents who had stopped taking their medications, the primary reason was that a doctor had told them to do so, and a higher percentage of housed respondents reported this reason. However, the largest difference between groups involved reports of going “back on the street,” with more of the homeless respondents mentioning this reason.

HIV-Related Services Needed and Received

Homeless respondents were more likely than housed respondents to have needed 11 of the 13 HIV-related services assessed (Table 3). Despite differences between groups in need for services, there were no differences regarding service receipt; nearly all respondents (more than 90%) in both groups received services in the category in which they reported having a need.

Logistic Regression Analyses

Housing status, as a single predictor, was significant for all 6 dependent variables in the bivariate logistic regression analyses (Table 4). Homeless respondents were less likely than housed respondents to report good or excellent health, less likely to have a self-reported CD4 count of 200 or above, less likely to have a self-reported undetectable viral load, more likely to have visited an emergency department in the past year, less likely to be taking HIV medications, and less likely to have been treatment adherent in the past 48 hours.

Multivariate analyses controlled for socio-demographic, drug use, and alcohol use variables. In these analyses, housing status remained a significant predictor of health status, most recent viral load, emergency department use, current use of HIV medications, and HIV medication adherence. Housing status did not remain a significant predictor for most recent CD4 count. When most recent CD4 count and self-rated health

TABLE 3—HIV-Related Services Needed and Received in Past 12 Months Among Homeless and Housed Respondents: Supplement to HIV/AIDS Surveillance Project, 2000–2003

	Services Needed, No. (%)			Services Received, No. (%)		
	Homeless Respondents	Housed Respondents	χ^2	Homeless Respondents	Housed Respondents	χ^2
HIV case management services	226 (74.3)	4078 (53.7)	50.2***	201 (93.1)	3793 (94.3)	0.54
Social services	181 (59.7)	3243 (42.7)	34.6***	164 (90.6)	2834 (87.9)	1.21
Mental health counseling	131 (43.1)	2195 (28.9)	28.5***	110 (85.9)	1831 (84.2)	0.27
Finding a doctor	107 (35.2)	1900 (25.0)	16.1***	99 (93.4)	1804 (95.5)	1.01
Finding dental services	128 (42.2)	2195 (28.9)	25.2***	104 (82.5)	1729 (79.4)	0.75
Finding shelter or housing	223 (73.4)	1362 (17.9)	560.8***	169 (77.9)	1028 (76.2)	0.31
Finding meals or food	156 (51.3)	1734 (22.8)	130.7***	137 (89.0)	1525 (88.5)	0.04
Child care	4 (1.3)	162 (2.1)	1.3	3 (75.0)	99 (61.9)	0.29
Transportation	178 (58.8)	2214 (29.1)	121.3***	152 (85.9)	1923 (87.5)	0.39
Local volunteer support services	96 (31.7)	1201 (15.8)	53.5***	82 (85.4)	1059 (88.7)	0.93
Education or information on HIV risk reduction	110 (36.3)	1700 (22.4)	32.1***	92 (92.0)	1553 (93.1)	0.18
Home health services	24 (7.9)	399 (5.3)	4.1*	18 (75.0)	314 (79.3)	0.25
Homemaker services	9 (3.0)	377 (5.0)	2.5	6 (66.7)	255 (68.4)	0.01

* $P < .05$; *** $P < .001$.

without data from these respondents. The findings were the same as those for the entire sample.

DISCUSSION

Our results showed that homeless respondents were more likely than those in stable housing situations to report a wide range of negative health outcomes. For example, homeless respondents had more medical and social service needs, suggesting that they may have been sicker than housed respondents. Although nearly all of the respondents in both groups reported receiving the services they needed, homeless respondents reported poorer health on a variety of mental and physical health measures, including markers of HIV disease progression. In addition, more homeless respondents received care from emergency departments, they were hospitalized more often, and they had more frequent visits for medical care relative to housed respondents.

Although HIV treatment appeared to be indicated for a larger percentage of homeless respondents, they were less likely to have ever taken or to currently be taking HIV antiretroviral medications and more likely to

were included in the multivariate analyses as additional predictors, housing status remained a significant predictor of emergency department use, current use of HIV medications, and HIV medication adherence.

Some of the respondents who were hospitalized ($n=152$) or in a correctional facility ($n=15$) at the time of interview may have been homeless before entering these facilities. Thus, all multivariate analyses were repeated

TABLE 4—Housing Status as a Predictor in Logistic Regression Analyses of Health Status, Health Care Use, and HIV Medication Use and Adherence: Supplement to HIV/AIDS Surveillance Project, 2000–2003

	Self-Reported Health Status Good to Excellent	Most Recent CD4 ≥ 200	Most Recent Viral Load Undetectable	Used Emergency Department in Past 12 Months	Was Currently Taking HIV Medications	Was Adherent to HIV Medications in Past 48 Hours
Bivariate, OR (95% CI)						
Housed (Ref)	1	1	1	1	1	1
Homeless	0.51 (0.41, 0.64)	0.62 (0.47, 0.82)	0.58 (0.41, 0.81)	1.97 (1.55, 2.49)	0.45 (0.36, 0.57)	0.46 (0.32, 0.65)
Multivariate, ^a AOR (95% CI)						
Housed (Ref)	1	1	1	1	1	1
Homeless	0.72 (0.56, 0.93)	0.83 (0.61, 1.12)	0.69 (0.48, 0.99)	1.60 (1.24, 2.07)	0.43 (0.33, 0.55)	0.49 (0.33, 0.71)
Multivariate including CD4 and self-rated health status, ^a AOR (95% CI)						
Housed (Ref)	...	...	...	1	1	1
Homeless	...	...	...	1.57 (1.14, 2.15)	0.37 (0.27, 0.50)	0.52 (0.33, 0.85)

Note. OR = odds ratio; CI = confidence interval; AOR = adjusted odds ratio.

^aIn the multivariate analyses, we controlled for HIV risk group, age, gender, race/ethnicity, marital status, education, annual household income, employment status, use of illicit drugs in past 12 months, and lifetime alcohol abuse.

have stopped taking these medications. In the case of respondents who were taking anti-retrovirals, rates of self-reported adherence were lower among those who were homeless. This finding indicates a clear need to improve access to antiretroviral medications among homeless people living with HIV/AIDS and to provide further assistance with medication adherence.^{40,49} This is not an easy task, but it may be cost effective in the long term because it will decrease the burden on hospitals and emergency departments and improve the health of homeless people with HIV/AIDS.

These results suggest that many homeless people living with HIV/AIDS do not receive the quality of care that is optimal for managing HIV. The extent to which this situation is because of limitations in access to care, the medication prescribing practices of physicians, and problems in regard to medication adherence is an important issue that should be addressed in future research.

Our multivariate analyses indicated that housing status was a significant predictor of health status, health care and emergency department use, use of HIV medications, and HIV medication adherence. Housing status remained significant even after we controlled for demographic, drug use, and alcohol use variables. This is an important finding because it indicates that stable housing may improve the health of people living with HIV/AIDS. This intuitive result is not a new concept in the literature, given that having a place to stay can improve people's mental and physical health by decreasing their stress and fatigue and allowing them to focus on other health care needs, such as medical appointments and adherence to medications.^{4,11}

In addition, the connection between physical health and mental health is well established,⁵⁰ suggesting that providing housing to homeless individuals might improve both their mental and physical health. Yet, most previous studies have examined the relationship between health status and inadequate housing rather than lack of housing. Ours is one of the first large-scale studies to demonstrate the association between lack of housing and the health status of people living with HIV/AIDS.

Limitations

There were some limitations of this study. For example, it was cross sectional, and thus cause-and-effect conclusions regarding homelessness and health could not be drawn. It is possible that those who reported being homeless were in poorer health when they became homeless or that factors associated with poorer health (e.g., substance use, mental illness) contributed to their homelessness. However, other research has shown that improvements in housing status result in improvements in health status and decreased HIV risk behaviors.²

Furthermore, although SHAS was a large, multisite project, its participants may not be representative of all people in the United States with HIV/AIDS, and we do not know how the individuals who refused to take part may have affected the results. However, to our knowledge, this is the largest data set that has been used to examine housing status and health among HIV-positive individuals. Because this study was not specifically designed to investigate homelessness issues, certain concepts related to homelessness, such as mental illness, were not assessed. In addition, data were self-reported and were thus subject to socially desirable responding and recall biases. Also, the time periods used in assessing drug and alcohol use behaviors (i.e., "ever" and "in the past 12 months") may not have accurately reflected current behaviors.

The numbers of people living with HIV/AIDS and experiencing homelessness were probably underestimated in this study. SHAS recruitment methods did not target homeless individuals, who are typically more difficult to locate. Thus, our study may have included a lower percentage of homeless people with HIV/AIDS than in the general population.

However, it is difficult to determine whether percentages of homeless people were actually lower in this study, given that determining the number of homeless individuals in the general population is difficult as a result of the episodic nature and typically short duration of homelessness.¹³ Using a wider time-frame than current housing status to categorize homeless individuals might result in a larger, more accurate estimate of HIV-positive people who have experienced homelessness. Even taking what is likely to be a conservative

estimate from this study (4%), tens of thousands of the estimated 1 million people in the United States who are HIV positive⁵¹ may be homeless at any given time.

Conclusions

Homeless people living with HIV/AIDS are members of 2 marginalized groups, yet little research has been conducted to understand the health status and health behaviors of this vulnerable population. Even less research has been conducted on the effects of interventions designed to improve the health of homeless people with HIV/AIDS.

One intervention concept that has been gaining empirical support is provision of housing as a structural intervention to improve health and prevent the spread of HIV.⁵² Providing housing to homeless people living with HIV/AIDS not only may allow them to address their health care needs but could also result in improved mental and physical health outcomes (e.g., decreased viral load) and reduced risk behaviors, which could reduce their likelihood of transmitting HIV.^{52,53} The health of homeless people with HIV/AIDS is an important public health and social justice issue that requires increased attention at both the local and national levels given the accumulating evidence that these individuals are at greater risk of numerous health problems while they remain unhoused. ■

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Note. The findings and conclusions are those of the authors and do not necessarily represent the views of the Centers for Disease Control and Prevention.

Contributors

D.P. Kidder and R.J. Wolitski originated the analysis idea. D.P. Kidder, R.J. Wolitski, and M.L. Campsmith refined the article idea and interpreted findings. D.P. Kidder led the writing. G.V. Nakamura analyzed the data.

Human Participant Protection

The Supplement to HIV/AIDS Surveillance project was approved by Centers for Disease Control and

Prevention and local institutional review boards. Participants provided informed consent.

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