

# Housing Need, Housing Assistance, and Connection to HIV Medical Care

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**Abstract** HIV infection has become a chronic condition that for most persons can be effectively managed with regular monitoring and appropriate medical care. However, many HIV positive persons remain unconnected to medical care or have less optimal patterns of health care utilization than recommended by good clinical practice standards. This paper investigates housing status as a contextual factor affecting access and maintenance in appropriate HIV medical care. Data provided from 5,881 interviews conducted from 1994 to 2006 with a representative sample of 1,661 persons living with HIV/AIDS in New York City demonstrated a strong and consistent relationship between housing need and remaining outside of or marginal to HIV medical care. In contrast, housing assistance increased access and retention in medical care and appropriate treatment. The relationship between housing and medical care outcomes remain controlling for client demographics, health status, insurance coverage, co-occurring mental illness, and problem drug use and the receipt of supportive services to address co-occurring conditions. Findings provide strong evidence that housing needs are a significant

barrier to consistent, appropriate HIV medical care, and that receipt of housing assistance has an independent, direct impact on improved medical care outcomes.

**Keywords** Housing · Homelessness · HIV/AIDS · Medical care · Socioeconomic factors

## Introduction

With the introduction of effective antiretroviral treatments in the mid-1990s, a comprehensive primary care approach to HIV-infected patients has evolved. HIV infection has become a chronic condition that for most persons can be effectively managed with regular monitoring and appropriate medical care. However, many HIV positive persons remain unconnected to medical care or have less optimal patterns of health care utilization than recommended by good clinical practice standards (Conviser & Pounds 2002; Ikard et al. 2005; Messeri et al. 2002; Meyerson, Klinkenberg, Perkins and Laffoon 2007; Uphold and Mkanta 2005). This paper investigates housing status as a contextual factor affecting access and maintenance in appropriate HIV medical care.

Considerable research has shown a lack of access to primary care and/or inappropriate use of health care services among general samples of homeless or unstably housed persons (Aday 2001; D'Amore, Hung et al. 2001; Douglass et al. 1999; Gelberg et al. 1997; Kushel et al. 2001; Lim et al. 2002; Robertson and Cousineau 1986). Limited or inadequate health care utilization has also been reported among unstably housed persons living with HIV (Arno et al. 1996; Conover and Whetten-Goldstein 2002; Cunningham et al. 2007; Douaihy et al. 2005; Masson et al. 2004; Pulvirenti et al. 2003; Smith et al. 2000; Stewart

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et al. 2005). However, prior studies of housing status and HIV care have been limited by non-probability samples recruited primarily from clinic settings, small sample size, cross-sectional designs or short follow-up periods.

Samples recruited from conventional medical care settings pose a special challenge for examining homelessness or unstable housing and connection to primary care. For example, the best known study of health care utilization among persons living with HIV, the national HIV Cost and Services Utilization Study (HCSUS), likely excluded substantial numbers of PLWH most at risk for unstable housing or inconsistent use of health services. HCSUS sampled HIV-infected adults who had visited a private doctor's office, community clinic, or hospital based clinic within an 8-week recruitment period (Frankel et al. 1999). Persons receiving HIV care from medical providers in veterans facilities, or in jail or prison, drug treatment or homeless service settings were excluded. Thus, persons living with HIV who were not in medical care or receiving care in settings with substantial proportions of transient patients were not represented; those making infrequent or irregular visits to any provider were likely under represented (Cunningham et al. 2006).

Other methodological limitations have included using single indicators such as number of outpatient visits or absence of emergency room use to represent broader constructs of access and connection to appropriate HIV medical care, and the absence of important variables that may confound the relationship between patient characteristics, housing status, and medical care outcomes. Particularly challenging is the need to isolate the effect of housing status from lack of economic resources, substance abuse, and mental health needs, all of which increase the risk of homelessness as well as affect access to medical care (see discussions in Kim et al. 2006; Mkanta and Uphold 2006).

Another difficulty is the use of limited indicators for housing status. The most common approach is to use a dichotomous categorization (e.g., homeless/not homeless) which is treated as a more or less fixed characteristic of persons. However, literal homelessness is but the most extreme among a range of unstable and inadequate living arrangements which are associated with poor access to care (Kushel et al. 2006; Smith et al. 2000). More importantly, housing status is not an individual trait but rather a situation or condition within which individuals may find themselves, a situation that can vary over time. Research has shown that substantial proportions of adults experience a single or limited number of episodes of housing instability; relatively few are homeless for protracted periods of time. Even among the 'chronic' homeless, most have had intermittent periods of stable housing (Kuhn and Culhane 1998; Phelan and Link 1999; Shinn 1997).

An adequate understanding of the relationship between housing and HIV medical care is especially important given current policy debates about the changing structure and funding of HIV services. The newly enacted Ryan White HIV/AIDS Treatment Modernization Act of 2006 includes a provision which requires that 75% of CARE Act funds be used for specifically defined 'core medical services' (HRSA 2006). Housing assistance is excluded from the core service category, which limits funds available to address housing needs. Further, an amendment has been proposed which would limit (retroactively) the amount of time a client can receive housing assistance through the CARE Act to a cumulative lifetime total of 24 months. In addition to these constraints on use of Ryan White funds, the primary source of funding specifically designated for housing for HIV positive persons, the Housing Opportunities for Persons With AIDS (HOPWA) program, has not increased substantially in recent years and is currently funded at below 2004 levels (HUD Office of AIDS Housing 2006).

There is great concern among provider and consumer communities that changes in the availability of funds for assistance with housing needs will have a negative impact on people living with HIV/AIDS and create (or fail to remove) significant barriers to HIV treatment and care. Most persons living with HIV/AIDS face considerable challenges to maintaining regular employment that would provide income sufficient to cover housing costs (Goldman and Bao 2004; Messeri and Hart 2007; Rabkin et al. 2004). PLWH relying upon disability income (SSI or SSDI) face even greater challenges maintaining adequate housing. According to a recent analysis of federal statistics on entitlement levels and rental costs, there are few jurisdictions nationally where the government determined fair market rent for a modest one-bedroom apartment does not exceed the *total* monthly disability income (Pelletiere et al. 2006).

This report on medical care among HIV-positive adults in New York City is the first examination of housing and connection to care in a large, probability sample of HIV-infected individuals whose housing status and medical care utilization were assessed over an extended time period. We consider housing status a contextual factor, a state or condition that can vary over time and that can promote or inhibit medical care use. Specific research questions are: What are the patterns of homelessness or housing instability among PLWH in New York City and have rates changed over time? What is the relationship between housing status and receipt of any HIV medical care, and receipt of care that meets good clinical practice standards? Does the relationship between housing and medical care remain controlling for co-occurring mental illness and problem drug use and the receipt of supportive services to

address co-occurring conditions? Does receipt of housing assistance have an effect on entry into care and continuity of care among persons who are outside or marginally connected to medical care?

## Methods

### Sources of data

This analysis makes use of pooled data from all available interviews conducted with cohorts enrolled in 1994–95, 1998–99, and 2002–03 as part of the Community Health Advisory & Information Network (CHAIN) Project, an ongoing longitudinal study of persons living with HIV/AIDS in New York City.

Each cohort includes members recruited from among clients of health and social service agencies and those outside of agency settings. The agency-based sample was recruited through a two-stage stratified sampling strategy designed to enroll a representative sample of HIV positive individuals, age 20 and older, who had some contact with the service system. A listing was compiled of known HIV service providers, and equal numbers of medical and social service sites were sampled. Staff in selected agencies assisted with recruitment of a random sample of clients, proportional to total client enrollment, either drawn from agency rosters or using sequential enrollment procedures. During each enrollment period, agency-based recruitment was supplemented with a small sample of PLWH unconnected to care, operationally defined as having had no contact with HIV medical services for 6 months or more. These ‘unconnected’ individuals were contacted at outreach sites and through acquaintance sampling from among enrolled CHAIN participants (Aidala et al. 1995; Aidala et al. 1999; Aidala et al. 2005).

The original cohort was composed of 648 HIV positive individuals recruited from 43 primary sampling sites, and 52 PLWH unconnected to care. Baseline interviews were completed in 1994–1995, with the seventh and last follow-up interview conducted in 2001. In 1998, in response to cohort attrition due primarily to mortality, the original sample was refreshed with 253 PLWH diagnosed after 1994, randomly selected from the original agency and clinic sampling sites. A small number ( $n = 24$ ) of PLWH unconnected to care were also recruited using the original acquaintance sampling and outreach protocol. Members of the refresher cohort were interviewed a total of four times at ~12-month intervals. In 2002 a new sampling frame was drawn of medical and social service providers currently serving the NYC HIV positive population. Thirty-four agencies were randomly selected as primary sampling sites, and agency staff assisted with enrollment of a random

selection of clients. As before, the agency-recruitment effort was supplemented with a small sample of persons unconnected to care contacted through referral and outreach efforts. The new cohort included 684 HIV positives recruited from agency settings, and 23 PLWH unconnected to care. Baseline and two follow-up interviews have been conducted.

Detailed information on sampling and recruitment methods have been previously published (Messerli et al. 1995, 2003). The original CHAIN cohort was comparable to the total population of persons living with AIDS in New York City in terms of race/ethnicity and age breakdown within gender. For the cohort enrolled in 2002, white males are under-represented—19% of NYC persons living with HIV compared to 6% of the new cohort baseline sample. A likely explanation is that white men living with HIV/AIDS at the current stage of the epidemic in New York City are more likely to be receiving care at private physician offices which are not in the CHAIN sampling frame, and less likely to need social services, than men of color. Thus, while not absent, they are less likely to be included among the most recent study cohort (for comparison to NYC AIDS surveillance data see Abramson et al. 2003; Lee and Abramson 2005).

Sample attrition for reasons other than death or migration out of New York City has remained low. At each interview period, 80–90% of persons completing a prior interview were located and re-interviewed. Excluding individuals who had died or had moved away from New York City, 85% of the original cohort completed four or more interviews; 88% of the new cohort completed all three interviews fielded to date. Individuals lost to follow-up over the course of study showed few statistically significant differences when compared with those who continued to participate. For the original and refresher cohorts, attrition was higher among Hispanics and those who were literally homeless at baseline. Among the new cohort, follow-up rates are lower among men and those homeless at baseline, but there are no ethnic differences in cohort attrition. The current report is based on a total of 1,661 HIV infected persons who have been interviewed up to eight times each for a total of 5,881 observation points (23 individuals with limited data are not included).

CHAIN interviews take ~2 h to complete, and are conducted in person by trained community interviewers. Interview topics cover the full range of experiences with need, access and use of medical and social services. Approximately 10% of interviews are conducted in Spanish. CHAIN participants have received 20–\$25 in transportation or food vouchers for each completed interview. All CHAIN Project activities have received approval for research on human subjects from the Institutional Review Boards of the health sciences campus of Columbia

University, the New York City Department of Health and Mental Hygiene, and the Medical and Health Research Association of New York, Inc.

## Measures

### *Dependent variables*

**Connection to medical care** Respondents are asked at each interview to identify a current medical provider in charge of their overall HIV care, when they first saw this provider, and the date of the most recent visit. Similar information is obtained for other medical providers they may have seen between interviews. Information is also obtained on the number of visits for outpatient services during the 6 months prior to interview, diagnostic services received, and current medications. A number of data collection strategies have been implemented to improve accuracy of self-report utilization data. Standardized questions developed for AIDS patients were used to measure service utilization (Berk et al. 1993). Time-structuring using follow-back calendars, keying into landmark events, standardized probes, and other techniques shown to increase accurate recall are an integral part of the survey protocol (Bhandari and Wagner 2006).

We developed two separate operational definitions of being ‘in care.’ At a minimum, a participant was considered in any medical care if he or she names a current medical provider and has had at least one visit to that provider in the 6 months prior to interview. Conversely a respondent is considered not in care if he or she does not have a current medical provider or has not visited his or her provider within the past 6 months. For respondents receiving medical care in a clinic or a group practice, ‘medical provider’ refers to the agency and not the individual practitioner. For office-based practices, provider and organization are the same. Using this analytical formulation, we consider continuity of care as having at least one visit at the same medical provider organization as was reported at the prior interview. A respondent is considered to have entered medical care between two interviews when he or she was out of medical care at the earlier interview and in medical care at the later one.

The second medical care measure is characterized by whether the care reported by the respondent meets minimal clinical practice standards. The following criteria were used for coding appropriate HIV medical care: For interviews conducted pre-1996, (a) two visits to primary care provider in the past 6 months for PLWH who were symptomatic or had been diagnosed with AIDS; or (b) one visit in the past 6 months for individuals who were asymptomatic. For interviews conducted in 1996 or later,

(a) two visits in the past 6 months if on antiretroviral medications, or symptomatic, or had received an AIDS diagnosis; (b) two visits in the past 6 months if CD4+ count below 500 cells/mm<sup>3</sup>, and viral load above 10,000 copies/ml; or (c) one visit in the past 6 months for individuals who were asymptomatic and not on antiretroviral therapy (ART). In addition to the number of primary care visits, appropriate care had to include specific services received within the past 6 months, including a comprehensive physical examination, a blood test, and at least one CD4 check. This set of indicators was developed based on published standards for HIV medical care put forth by the New York State Department of Health (NYS DOH) AIDS Institute between 1995 and 2003, and personal interviews with key program staff at the AIDS Institute (NY AIDS Institute 1995, 2003).

A CHAIN respondent is considered to be in appropriate medical care at each interview in which all indicators for these minimal clinical practice standards are met; entry into appropriate care is defined as movement from a state of not experiencing appropriate medical care to a state in which the respondent did report receiving appropriate medical care. Continuity of appropriate care is defined as receipt of appropriate HIV care at successive interviews, whether or not services had been received at the same provider as previously reported.<sup>1</sup>

### *Independent variables*

**Housing need** In order to encompass the multiple aspects of housing that may affect connection to HIV medical care, we have chosen an indicator that reflects both ‘objective’ housing status regarding adequacy and stability of living arrangements, and ‘subjective’ experience of housing problems. To code housing status, we ask a series of questions about current and recent (past 6 months) living arrangements. Persons who describe sleeping on the street, in a drop-in center or shelter for homeless persons, a limited-stay SRO or welfare hotel with no services, in an abandoned building, or in a public or private place not intended for sleeping (e.g., subway station) are coded as ‘homeless.’ Residence in a temporary or transitional housing program, in jail, halfway house, drug treatment or medical housing with no other place to live, or temporarily doubled up with others in someone else’s home, is coded as

<sup>1</sup> Current standards recommend that HIV-infected patients should have follow-up visits at least every 3–4 months whether receiving antiretroviral (ARV) therapy or not, with more frequent visits at entry into care, when starting or changing ARV regimens, or for management of acute problems (AIDS Institute 2007). The number of visits per 6 months was selected as a minimal indicator, allowing for the occasional missed appointment or appointment delay for any clinical, provider, or logistical reason.

‘unstably housed.’ Housing status is classified as ‘own place/stably housed’ only if they had secure, permanent housing in an apartment, house, or group quarters, living alone or with others, but with no time limit or restrictions on residency other than what would be found in a conventional lease or ownership agreement.

A separate set of questions asks about housing problems or the need for assistance in the area of housing, the nature of the problem, and whether or not any attempt was made to obtain assistance. Self-reported housing problem is a broader category than current housing status since individuals can be currently housed but facing housing loss due to inability to pay rent, facing eviction for any number of tenant or landlord reasons, or being discharged from a residential program with no resources to secure housing; or being in an intolerable or unhealthy situation due to domestic violence or other dangers, or lack of basic services such as heat and hot water. Our analyses of housing and connection to medical care will focus on ‘housing need’ which includes not only PLWH who are literally homeless or unstably housed at the time of interview, but also those who report housing problems they consider beyond their individual ability to resolve. As the HRSA Bureau of Primary Care has emphasized, current and anticipated stability and adequacy of living arrangements are crucial to understanding the role of housing in the lives of persons infected with HIV/AIDS (Song 1999).

**Co-morbidities** Current problem drug use is indicated by any use of heroin, cocaine, crack, methamphetamine or problem drinking as indicated by the CAGE instrument (Ewing 1984) or drinking five or more drinks weekly or more often—currently or within the past 6 months. The Mental Component Summary Score (MCS) of the MOS-SF36 (McHorney et al. 1993) is used to measure mental health functioning. Items measure symptoms of depression or anxiety within the past 4 weeks, and impaired functioning due to emotional problems. Scale reliabilities for the sample were excellent (Cronbach  $\alpha > 0.8$  for all rounds of interviews). Following established clinical cut points, individuals with scores below 37.0 on this scale, the mean score seen in psychiatric inpatient populations, were categorized as very low mental health functioning.

**Housing assistance** Receipt of housing assistance is indicated by either receipt of rental assistance, or respondent report that within the past 6 months he or she received help for a housing problem from an agency or paid provider in the form of direct housing assistance (e.g., provision of housing, housing placement assistance), application for assistance, a service referral, or information or advice about solving the problem.

**Supportive services** Each interview asked about services received in the previous 6 months. Mental health services included any visit to a mental health professional (psychiatrists, psychologists, therapists or clinical social workers) seen for mental health treatment or psychological counseling. Substance abuse services included professional alcohol or drug treatment including detoxification; inpatient, outpatient or residential treatment; or methadone maintenance. Medical case management was indicated by answers to a series of questions about different types of services a respondent’s case manager(s) may have provided. Those who answered that a case manager helped them to get specific medical services, or who referred them to, or coordinated medical services, were coded as having received medical case management. Medical case management can be provided by case managers located in non-medical as well as medical settings. Receipt of social services case management was indicated by reports that a case manager developed or revised a care plan, helped to get or referred a client to specific social services, periodically checked on the status of the client’s needs to see that services were being obtained, coordinated social services, or helped fill out forms for entitlements.

#### *Covariates*

A number of covariates were included in the multivariate analyses, to control for individual characteristics and contextual factors that other research has shown to affect use of HIV medical services (Messeri et al. 2002; Uphold and Mkanta 2005). Models control for socio-demographics (age, gender, and race/ethnicity) risk exposure group (injection drug user (IDU), men who have sex with men (MSM), heterosexual transmission/other); SES (education, income, living in poverty neighborhood); health status (t-cell count), insurance status (any insurance versus none), length of time since HIV diagnosis, and secular trend. We also included whether or not the respondent had a regular source of medical care at the time of HIV diagnosis as an indicator of possible enduring dispositional characteristics that might affect engagement with medical care (Gelberg et al. 2000). Table 1 presents specific variables entered as covariates.

#### *Data analysis*

To answer the question about patterns of housing instability and need for housing assistance, we examined housing status and rates of housing problems at baseline interview for each of the cohorts: 1994–95; 1998–99, and 2002–03. We tracked cross-sectional rates over time for the earliest and most recent cohort. We also examined answers to open-ended questions describing housing needs.

**Table 1** Unstable housing or need for housing assistance at baseline interview by sociodemographic, risk, health, mental health and substance use characteristics

	n	Total % <sup>a</sup>	Unstable housing or report need for housing assistance <sup>b</sup>		
			No %	Yes %	$\chi^2$
<b>Age</b>					
20–34 years	(355)	21	44	56	22.38***
35–49 years	(990)	60	50	50	
50+ years	(316)	12	62	38	
Mean (SD) age: 41.7 (8.9) years					
<b>Race/ethnicity</b>					
White, Non-hispanic	(206)	12	62	38	13.30**
Black, Non-hispanic	(883)	53	51	49	
Hispanic, Latino	(550)	33	47	53	
Other <sup>c</sup>	(22)	2	45	55	
<b>Gender</b>					
Male <sup>d</sup>	(994)	60	52	48	0.95
Female	(667)	40	49	51	
<b>Educational Level</b>					
Less than high school	(701)	42	47	53	8.27**
High school/ GED	(960)	58	54	46	
<b>Annual income</b>					
\$0–\$7,500	(801)	57	43	57	33.35***
\$7,500+	(848)	43	58	42	
<b>Poverty neighborhood<sup>e</sup></b>					
Poverty rate greater than 30%	(789)	48	43	57	37.71***
Poverty rate under 30%	(872)	53	59	42	
<b>Risk exposure group</b>					
MSM	(317)	23	65	35	54.02***
IDU	(699)	33	42	58	
MSM + IDU	(151)	5	44	56	
Heterosexual/other	(494)	39	56	44	
<b>CD4, cells/mm<sup>3</sup></b>					
0–200	(585)	31	45	55	6.99*
201–500	(684)	43	52	48	
Above 500	(382)	26	53	47	
<b>Year of HIV diagnosis</b>					
1991 or earlier	(694)	36	52	48	5.00
1992–1995	(598)	42	47	53	
1996–2002	(369)	22	53	47	
<b>Insurance</b>					
No medical insurance	(74)	4	26	74	19.30***
Has medical insurance	(1,587)	96	52	48	
<b>Mental health functioning</b>					
Very low mental health score <sup>f</sup>	(583)	35	45	55	10.19***
Higher mental health score	(1,077)	65	53	47	
<b>History of substance use</b>					
Problem drug use past 6 months <sup>g</sup>	(490)	30	39	61	58.99***
Problem drug use >6 month ago	(760)	46	51	49	
Never problem drug use	(411)	25	64	36	

**Table 1** continued

	n	Total % <sup>a</sup>	Unstable housing or report need for housing assistance <sup>b</sup>		
			No %	Yes %	$\chi^2$
CHAIN study enrollment					
1994–1995	(700)	42	46	54	11.97**
1998–1999	(268)	16	51	49	
2002–2003	(693)	42	55	45	

\*  $P \leq 0.05$ \*\*  $P \leq 0.01$ \*\*\*  $P \leq 0.001$ <sup>a</sup> Percentages may not add to 100 due to rounding<sup>b</sup> Row percentages shown<sup>c</sup> Includes Asian, Pacific Islander, Native American, Alaskan, Hawaiian, Other and Mixed<sup>d</sup> Includes eight transgendered individuals in transition<sup>e</sup> Based on zipcode of address—2000 Census<sup>f</sup> MOS-SF36 mental component summary score <37.0, mean score among psychiatric inpatient populations<sup>g</sup> Use of heroin, cocaine, crack, or methamphetamine, or problem drinking (CAGE)

To examine the relationship between housing need and connection to HIV medical care, a series of multiple logistic regression models were estimated, pooling data for all the CHAIN cohorts. Since both housing situation and medical service use can vary over time, each interview with each CHAIN study participant constituted an opportunity to examine the relationship between housing need and receipt of housing assistance for medical care outcomes, controlling for mental illness and substance abuse and the receipt of supportive services to address co-occurring conditions. Random effects logistic regression models were constructed using Stata 9.0, adjusting standard errors of the estimates of the regression coefficients to account for the dependency among multiple observations contributed by the same individual. All models control for age, race/ethnicity, education, income, poverty neighborhood, insurance status, risk exposure group, most recent t-cell count, transportation services, year of HIV diagnosis, regular source of medical care prior to HIV diagnosis, and year of cohort enrollment. All variables refer to the same time period as the medical care outcomes (currently or in the 6 months prior to interview) except for invariant characteristics such as race/ethnicity, year of HIV diagnosis, and risk exposure group.

We examine the contemporaneous and prospective relationships between housing and medical care. The first models tested the relationship between housing need, comorbidities, and the receipt of housing and other supportive services at each interview period as these factors increase or decrease the likelihood that the individual is currently in care, or is in care that meets clinical practice standards. The case base for both the ‘any care’ and ‘adequate care’ analyses is 1,651 respondents, interviewed up to eight times each for a total of 5,865 observation points.

The next models we examined entry into care and retention or continuity of care over time, comparing the effects of housing status at one period on subsequent movement either into or out of medical care. For these analyses, we created separate pools of observations for respondents who are ‘at risk’ for each of the different outcomes. For entry into care, we included observations when respondents are unconnected to medical care at one interview and determine whether or not they entered medical care at the next interview. For retention in care, we included observations when respondents are in medical care and determine whether or not they are retained in care at the next interview. Prediction of entry into any care is based on 557 respondents who were out of care at one or more interview periods, 720 observation points. The model predicting entry into appropriate medical care among respondents who were not receiving appropriate care at the previous interview period is based upon 639 respondents who were not receiving appropriate care at one or more interview periods, 988 observation points. The analysis of continuity of any medical care is based on 1,295 respondents who were in care and had subsequent interview data available for the continuity analysis, providing 3,795 observation points.

## Results

### Sample descriptives

The sample is predominantly male (60%) and non-white (53% Black and 33% Hispanic). At baseline interview, most participants were between the ages of 35 and 49

(mean age 41.7 years). The majority (58%) had graduated from high school; however, about half had annual incomes of less than \$7,500. Rates of substance use were high; three-fourths of the sample reported lifetime history of heroin, crack/cocaine, or methamphetamine use and/or problem drinking. Most were diagnosed with HIV prior to 1996, regardless as to when they were recruited. Health status at cohort enrollment was variable as indicated by CD4 count. Rates of reported insurance coverage are almost universal (96%). Table 1 describes the sample of 1,661 men and women at cohort enrollment.

#### Unstable housing and need for housing assistance

Table 1 also presents correlates of housing status assessed at study enrollment. PLWHs who are older, white, men who have sex with men, and who have never used drugs

were less likely than others to be homeless or unstably housed at baseline interview or to have reported a need for assistance with a housing problem. However, even among these groups with the lowest rates, 36–40% had some housing need.

Table 2 examines components of the housing need measure at baseline assessment. For each cohort, the majority of persons with housing need at study enrollment were those who were homeless or unstably housed—38% of the 1994–95 cohort and 31% and 30% of the 1998–99 and 2002–03 cohorts, respectively. An additional 15–18% were in stable housing by our definition but reported housing problems or need for housing assistance. Problems described in response to open-ended questions include being homeless; not having a regular place to live; not being able to pay rent; being asked to leave a ‘doubled up’ situation; facing eviction or being discharged from a housing program, treatment facility or other institution with

**Table 2** Housing status and housing problems at baseline interview: CHAIN study cohorts 1994, 1998, and 2002

	Total sample n = (1661)	1994–95 cohort (700)	1998–99 cohort (268)	2002–03 cohort (693)	$\chi^2$
Housing status at baseline interview					
Stable, own place	67	63	70	70	42.52***
Unstable, temporary/transitional housing <sup>a</sup>	18	16	19	20	
Homeless <sup>b</sup>	15	22	12	10	
Self-reported housing problems at baseline					
No report of housing problems past 6 months	64	62	64	65	1.33
Housing problems or need for housing assistance <sup>c</sup>	36	38	36	35	
Homeless, housing insecure, can't pay rent, facing eviction for any reason, asked to leave shared housing, being discharged from program with no resources to obtain housing, no heat or no plumbing, domestic violence or other dangerous situation, need accessible unit, lost/problems with rental subsidy, etc.					
Any indicator of housing need at baseline					
No housing need	49	46	51	55	11.97**
Homeless, unstable housing, or report housing problems	51	54	49	45	
Any indicator of housing need during study period					
Never housing need	30	24 <sup>d</sup>	31 <sup>e</sup>	36 <sup>f</sup>	25.89**
Housing need at one or more interviews	70	76	69	64	

\*  $p < 0.05$

\*\*  $p < 0.01$

\*\*\*  $p < 0.001$

<sup>a</sup> Residence in a temporary or transitional housing program; in jail, halfway house or drug treatment housing; in a hospice, or temporarily doubled up with others in someone else's home—currently or during the 6 months prior to interview

<sup>b</sup> Sleeping in the street; in a drop in center or shelter for homeless persons; in a limited stay SRO with no services; in an abandoned building, a public or private place (e.g., subway station) not intended for sleeping—currently or during the 6 months prior to interview

<sup>c</sup> Percent answering “YES” in response to the question: “In the last 6 months, have you had a problem or needed assistance in the area of housing?” and examples of housing problems described

<sup>d</sup> Eight rounds of interviews conducted 1994–2001

<sup>e</sup> Four rounds of interviews conducted 1998–2001

<sup>f</sup> Three rounds of interviews conducted 2002–2006

no resources to secure housing; inadequacy of housing (e.g., no heat, severe overcrowding); domestic violence or other dangerous situation; needing to change housing due to a medical condition (e.g., neuropathy limits ability to climb stairs).

More members of the original cohort were literally homeless at their baseline interview in 1994–95 than we have seen among cohorts enrolled at the later dates. The combined index of housing need representing homelessness, unstable housing, or self-reported housing problems shows the same pattern. However, after the earlier drop off, rates of housing need have remained fairly constant over time, never falling below 34% for any year during which interviews were conducted.

The relative constancy of need for housing at the service system level reflects considerable fluidity at the individual level. Overall, 70% of the entire sample has had one or more episodes of housing need during the study period (Table 2). However, far fewer have been persistently homeless or housing insecure. Considering lifetime experience, 20% have been homeless or unstably housed for two or more years *or* have had five or more episodes of housing instability. The longitudinal data illustrate that as some persons get their housing needs met, others developed housing problems due to both personal and structural factors. Housing challenges described include: The growing disparities between income and rent requirements; loss of income due to inability to maintain employment; relationship breakup including leaving abusive situations; loss of spouse/partner due to HIV related death or disability; loss of shared housing options subsequent to disclosure of HIV status; landlord removal of unit from the rental market; disease progression requiring accessible facilities; and policy requirements that limit residence in housing programs.

### Housing need and HIV medical care

Table 3 presents the first of a series of analyses examining the association between housing needs, housing assistance, and connection to HIV medical care. Model 1 examines any medical care, regardless of the level or type of clinical service reported, testing the relationship between housing need, mental health and substance abuse co-morbidities, and the receipt of housing assistance and other supportive services at each interview period as these factors increase or decrease the likelihood that the individual reports a regular source of medical care and at least one outpatient visit for HIV in the past 6 months. Model 2 examines predictors of receiving appropriate HIV medical care—care that meets minimum clinical practice standards.

Considering the unadjusted odds, persons who are homeless, unstably housed, or experiencing other housing

needs are significantly less likely to have had any medical care for HIV in the 6 months prior to interview (Table 3). This relationship is reduced when co-morbidities, receipt of housing assistance and/or supportive services and the controls for client characteristics, health status, insurance etc. are added to the model (Model 1). The significant relationship between housing need and receipt of appropriate medical remains controlling for all other variables in the model (AOR 0.74, CI 0.64, 0.86). Low-mental health functioning and current problem drug use are also independently associated with lower odds of receiving appropriate medical care for HIV (Model 2). The odds of having any visits for HIV medical care or of receiving medical care that meets clinical practice guidelines are substantially higher for persons who receive housing assistance compared to persons not receiving such assistance (any care: AOR 2.20, CI 1.70, 2.87; appropriate care: AOR 1.45, CI 1.25, 1.68). Professional mental health services and case management oriented toward arranging or co-ordinating social services also increased the odds that HIV positive persons were receiving appropriate medical care. Medical case management, focused on arranging or referring to medical services, is associated with health services utilization in the bivariate analysis but is not a significant predictor when housing needs, co-morbidities, and services designed to address these needs, are in the models.

### Entry and retention in HIV medical care

The next models examine entry into care and retention or continuity of care, utilizing over time data to examine the effects of housing need and housing assistance received at one period on subsequent medical care outcomes (Table 3). In the unadjusted analysis, PLWH who were not receiving any medical care and who were homeless, unstably housed, or experiencing other housing needs were about a third as likely to have accessed care by the next interview than those without housing needs. The importance of housing need as a barrier to accessing care among the unconnected was reduced somewhat by adding the other variables to the model. Nonetheless, in the full adjusted model, unconnected persons with housing needs were only half as likely to enter care by the next interview as persons outside of care who did not have housing needs. Housing need is not associated with entry into appropriate HIV care among those not receiving appropriate care at prior interview.

Receipt of housing assistance is a strong and consistent predictor of entry into care among the unconnected, regardless of client characteristics or other services received. In the adjusted model (Model 3), persons outside of any care who received housing assistance were twice as

**Table 3** Unadjusted and adjusted odds ratios for receipt of HIV medical Care and receipt of appropriate HIV medical care, entry and maintenance in any medical care and appropriate HIV medical care

	Model 1				Model 2			
	Receipt of any medical care for HIV				Receipt of appropriate HIV medical care			
	Unadjusted	95% CI	AOR	Adjusted <sup>a</sup>	Unadjusted	95% CI	AOR	Adjusted <sup>a</sup>
<b>Housing Need</b>								
Unstably housed or report need for housing assistance	<b>0.69**</b>	<b>(0.55, 0.88)</b>	0.78	(0.60, 1.02)	<b>0.79***</b>	<b>(0.69, 0.90)</b>	<b>0.74***</b>	<b>(0.64, 0.86)</b>
<b>Comorbidities</b>								
Very low mental health functioning <sup>b</sup>	0.80	(0.62, 1.04)	0.86	(0.66, 1.14)	<b>0.79***</b>	<b>(0.68, 0.91)</b>	<b>0.80***</b>	<b>(0.69, 0.93)</b>
Current problem drug use <sup>c</sup>	<b>0.57***</b>	<b>(0.44, 0.74)</b>	0.84	(0.63, 1.11)	<b>0.68***</b>	<b>(0.59, 0.80)</b>	<b>0.77***</b>	<b>(0.65, 0.90)</b>
<b>Housing Assistance</b>								
Assistance with housing needs or receipt of rental assistance	<b>2.55***</b>	<b>(2.00, 3.26)</b>	<b>2.20***</b>	<b>(1.70, 2.87)</b>	<b>1.61***</b>	<b>(1.40, 1.85)</b>	<b>1.45***</b>	<b>(1.25, 1.68)</b>
<b>Supportive Services</b>								
Mental health services <sup>d</sup>	<b>2.71***</b>	<b>(1.96, 3.73)</b>	<b>1.94***</b>	<b>(1.40, 2.70)</b>	<b>1.52***</b>	<b>(1.30, 1.78)</b>	<b>1.38***</b>	<b>(1.18, 1.62)</b>
Substance abuse services <sup>e</sup>	0.81	(0.61, 1.08)	0.91	(0.67, 1.25)	<b>1.22*</b>	<b>(1.02, 1.46)</b>	<b>1.25*</b>	<b>(1.04, 1.51)</b>
Medical case management <sup>f</sup>	<b>2.46***</b>	<b>(1.81, 3.34)</b>	1.40	(0.96, 2.03)	<b>1.55***</b>	<b>(1.33, 1.81)</b>	1.10	(0.91, 1.32)
Social services case management <sup>g</sup>	<b>3.01***</b>	<b>(2.35, 3.85)</b>	<b>2.30***</b>	<b>(1.69, 3.13)</b>	<b>1.90***</b>	<b>(1.66, 2.18)</b>	<b>1.66***</b>	<b>(1.41, 1.96)</b>
<b>Model 3</b>								
<b>Entry into any medical care</b>								
Unadjusted			Adjusted <sup>a</sup>		Unadjusted		Adjusted <sup>a</sup>	
OR	95% CI	AOR	95% CI	OR	95% CI	AOR	95% CI	
<b>Housing Need</b>								
Unstably housed or report need for housing assistance	<b>0.36***</b>	<b>(0.23, 0.59)</b>	<b>0.52*</b>	<b>(0.30, 0.90)</b>	0.81	(.59, 1.10)	0.77	(0.55, 1.08)
<b>Comorbidities</b>								
Very low mental health functioning <sup>b</sup>	0.62	(0.38, 1.01)	0.82	(0.47, 1.44)	0.75	(0.54, 1.05)	0.75	(0.53, 1.05)
Current problem drug use <sup>c</sup>	<b>0.22***</b>	<b>(0.14, 0.37)</b>	<b>0.43**</b>	<b>(0.24, 0.76)</b>	<b>0.62**</b>	<b>(0.45, 0.86)</b>	0.72	(0.51, 1.02)
<b>Housing Assistance</b>								
Assistance with housing needs or receipt of rental assistance	<b>3.09***</b>	<b>(1.91, 5.00)</b>	<b>2.04*</b>	<b>(1.16, 3.58)</b>	<b>1.87***</b>	<b>(1.36, 2.55)</b>	<b>1.79***</b>	<b>(1.27, 2.51)</b>
<b>Supportive Services</b>								
Mental health services <sup>d</sup>	<b>4.20***</b>	<b>(2.13, 8.30)</b>	<b>2.54*</b>	<b>(1.20, 5.37)</b>	1.33	(0.94, 1.90)	1.23	(0.85, 1.78)
Substance abuse services <sup>e</sup>	1.20	(0.69, 2.10)	1.54	(0.79, 2.99)	1.31	(0.89, 1.96)	1.40	(0.91, 2.17)
Medical case management <sup>f</sup>	<b>2.90***</b>	<b>(1.61, 5.21)</b>	1.41	(0.67, 3.00)	1.27	0.88, 1.83)	0.81	(0.52, 1.25)
Social services case management <sup>g</sup>	<b>4.54***</b>	<b>(2.80, 7.37)</b>	<b>1.96*</b>	<b>(1.01, 3.79)</b>	<b>1.85***</b>	<b>(1.35, 2.52)</b>	<b>1.80***</b>	<b>(1.22, 2.65)</b>

**Table 3** continued

	Model 5			Model 6		
	Continuity of Any Medical Care			Continuity of Appropriate HIV Medical Care		
	Unadjusted	Adjusted <sup>a</sup>	95% CI	Unadjusted	Adjusted <sup>a</sup>	95% CI
OR	AOR	95% CI	OR	AOR	95% CI	
<b>Housing Need</b>						
Unstably housed or report need for Housing assistance	<b>0.85*</b>	<b>0.83*</b>	<b>(0.72, 0.99)</b>	0.84	<b>0.78*</b>	<b>(0.70, 1.01)</b>
<b>Comorbidities</b>						
Very low mental health functioning <sup>b</sup>	0.84	0.85	(0.71, 1.01)	0.88	0.84	(0.72, 1.07)
Current problem drug use <sup>c</sup>	0.93	0.98	(0.78, 1.12)	0.85	0.84	(0.70, 1.05)
<b>Housing Assistance</b>						
Assistance with housing needs or receipt of rental assistance	1.16	<b>1.20*</b>	(0.98, 1.37)	<b>1.30**</b>	1.21	<b>(1.08, 1.57)</b>
<b>Supportive Services</b>						
Mental health services <sup>d</sup>	1.12	1.12	(0.94, 1.33)	<b>1.61***</b>	<b>1.56***</b>	<b>(1.30, 1.99)</b>
Substance abuse services <sup>e</sup>	0.94	0.97	(0.77, 1.15)	<b>1.28*</b>	1.16	<b>(1.01, 1.63)</b>
Medical case management <sup>f</sup>	0.95	0.89	(0.79, 1.14)	<b>1.50***</b>	1.23	<b>(1.21, 1.87)</b>
Social services case management <sup>g</sup>	1.11	1.17	(0.95, 1.30)	<b>1.52***</b>	<b>1.32*</b>	<b>(1.27, 1.82)</b>

Note: OR = odds-ratio; AOR = adjusted odds ratio; CI = confidence interval. Values in boldface type are significant at  $p < .05$ ; \*  $p \leq .05$ ; \*\*  $p \leq .01$ ; \*\*\*  $p \leq .001$

<sup>a</sup> Logistic regression equations using random effects procedure to adjust for the dependency among multiple observations contributed by the same individual. Model 1 tests the relationship between housing need, co-morbidities, and the receipt of housing and other supportive services at each interview period as these factors increase or decrease the likelihood that the individual reports any medical care in the past 6 months; Model 2 examines predictors of receipt of appropriate HIV medical care that meets minimum clinical practice standards (n = 1651 respondents interviewed up to 8 times each for a total of 5,865 observation points). Model 3 examines predictors of entry into care among respondents who were not in care at the previous interview period (n = 557 respondents who were out of care at one or more interview periods, 720 observation points). Model 4 examines predictors of entry into appropriate care among respondents who were not receiving appropriate medical care at the previous interview period (n = 639 respondents who were not receiving appropriate care at one or more interview periods, 998 observation points). Model 5 examines continuity of any medical care at successive interviews (n = 1295 respondents with over time data, 3759 observation points). Model 6 examines continuity of appropriate care at successive interviews (n = 1229 respondents with over time data; 3199 observation points). All models control for age, race/ethnicity, education, income, poverty neighborhood, risk exposure group, insurance status, t-cell count, transportation services, year of HIV diagnosis, and year of cohort enrollment

<sup>b</sup> MOS-SF36 Mental Component Summary Score < 37.0, mean score among psychiatric inpatient populations

<sup>c</sup> Use of heroin, cocaine, crack or methamphetamine, or problem drinking (CAGE) currently or past six months

<sup>d</sup> One or more visits to a mental health professional past six months

<sup>e</sup> Methadone, residential, in-patient, out-patient, therapeutic community, or detox treatment past six months

<sup>f</sup> Case manager has helped respondent get medical services or referred to medical services

<sup>g</sup> Case manager developed a care plan, helped get or referred to specific social services, coordinated social services, filled out forms for entitlements

likely to have transitioned into care as those who had not received housing assistance (AOR 2.04, CI 1.16, 4.47). Receipt of mental health services and case management oriented toward addressing social service needs also increased the odds that an unconnected PLWH would access care. Those who were not in appropriate care were also significantly more likely to enter appropriate care if they had received assistance with housing needs (AOR 1.79, CI 1.27, 2.51). Only social services case management, in addition to receipt of housing assistance, is significantly associated with transitioning into care that meets good practice guidelines (Model 4).

Models 6 and 7 (Table 3) examine retention or continuity in medical care. PLWH in care who were homeless, unstably housed, or had other housing needs were less likely to have continuous care. Those who were receiving appropriate medical care but had housing problems at one interview were less likely to be receiving appropriate care at the next interview period. Housing assistance exerts the strongest impact on retaining people in any medical care of all the variables tested (AOR 1.20, CI 1.01, 1.44); but is less important for retention in appropriate care than receipt of mental health services and social services case management. Medical case management, specifically oriented to obtaining or coordinating medical services, is not a significant predictor of either entry or retention in care in adjusted models.

## Discussion

Findings from this analysis of contemporaneous and prospective relationships between housing and medical care outcomes support our contention that housing is an important contextual factor that promotes or inhibits connection to HIV medical care. It is misleading at best to consider housing as important for the relatively small proportion of PLWH who are literally homeless at any point in time, seen as a ‘special population.’ While it is important to understand and respond to what might be special needs of the currently homeless, it is important to understand that literal homelessness is only the most extreme form of housing need that can affect medical care and medical care outcomes. Housing needs are fluid and prevalent among persons living with HIV and the tendency to view homelessness as a trait of individuals and ‘the homeless’ as a special service population can deflect attention from the broadly shared, fundamental need for stable and adequate housing among a wide range of persons living with HIV/AIDS.

Data provided from interviews conducted from 1994 to 2006 with persons living with HIV/AIDS demonstrated a strong and consistent relationship between housing need

and remaining outside of or marginal to HIV medical care. In contrast, housing assistance increased access and retention in medical care and appropriate treatment. The relationships between housing status, housing assistance and medical care outcomes remained essentially unchanged regardless of patient demographic characteristics, risk exposure group, personal and neighborhood economic resources, current problem drug use or low mental health functioning, clinical health status, insurance coverage, length of time since HIV diagnosis, and concurrent receipt of mental health, substance abuse, or case management services. These findings provide strong evidence that housing needs are a significant barrier to consistent, appropriate HIV medical care, and that receipt of housing assistance has an independent, direct impact on improved medical care outcomes.

The longitudinal analyses also point to the importance of additional supportive services, especially case management, mental health services and to a lesser extent, substance abuse treatment, as exerting an impact on entry and retention in HIV medical care. Medical case management—providing medical referral or focusing on medical coordination—did not increase the odds of entry or maintenance in care. Findings indicate that it is the social service element of case management (often addressing housing and related needs) and not medical referrals per se that is associated with access, entry and maintenance in care, especially medical care that meets clinical practice standards.

There are a number of limitations to this study. The research was conducted in a single location, New York City, where housing costs are traditionally high. However, the differential between income potential via employment or disability payments and local housing costs makes secure housing increasingly out of reach for HIV infected persons in almost all areas of the country (Pelletiere et al. 2006). In addition, the City has developed an extensive system of housing support for persons living with HIV/AIDS which is absent in most other jurisdictions (Hudson Planning Group 2005). New York also provides relatively generous ambulatory care services. It is possible that even stronger relationships between housing need and inadequate HIV care might be expected in settings where housing and/or primary care for the HIV positive population is less accessible.

CHAIN study participants were recruited primarily in clinical and agency settings; almost all had had some contact with medical care at study enrollment. Thus, our analysis of entry into medical care is more accurately an analysis of ‘re-entry’ among persons who had one or more episodes of dropping out of care. The relationship between housing need, housing assistance, and initial entry into HIV medical care after diagnosis awaits another investigation.

Finally, medical service utilization was based on self-report. Prior research has established acceptable accuracy of self-reports of medical care by HIV infected persons (Weissman et al. 1996), and homeless persons (Gelberg and Siecke 1997), and data collection techniques were implemented to improve accuracy. A small validation study showed good results when respondent self-report of date and result of CD4 tests and medication prescriptions were compared with clinical records (Mariller et al. 2004).

None of these limitations diminish the central findings of the study regarding relationships between housing situation and connection to HIV medical care and the importance of housing assistance not only for addressing housing needs, but for medical care access and retention. In other words, meeting housing needs has medical care consequences. Housing should be understood as a 'core' service needed to achieve optimal clinical outcomes for persons living with HIV/AIDS.

The passage of the 1990 Ryan White Comprehensive AIDS Resources Emergency (CARE) Act was a signal event in domestic health policy. Among the essential elements of the CARE Act was its focus upon the role and importance of ancillary and supportive services, such as case management, housing assistance, mental health, and substance abuse services. In tandem with the CARE Act, the Housing Opportunities for People with AIDS (HOPWA) was established under the US Department of Housing and Urban Development as part of the National Affordable Housing Act. Combined, HOPWA and the CARE Act have fostered a social experiment, establishing a defined population for whom it may be examined whether access and retention in health care are improved if supportive services such as housing and case management are offered as part of an integrated health care system. The present analysis, and similar research, suggests that it could. The implications for other socially vulnerable populations suffering from complex co-morbidities is substantial.

Medical care for HIV/AIDS has clearly evolved since those two sentinel pieces of legislation were passed in the early 1990s. With the advent of ART, there has been an increasing policy shift to 'medicalize' HIV service systems so that they function as a funnel with a singular endpoint: Matching high-quality medical care and medications to patients. While the benefits of such appropriate medical treatment are incontrovertible, the successes of the comprehensive systems that developed 'pre-ART' are quickly being forgotten. Our research suggests that the need for stable and supported housing persists, and that supportive services such as housing provide a value-added effect to high-quality medical care. The reauthorization of the CARE Act in December 2006 established a sunset date for the legislation as of September 2009, thereby forcing legislators, providers, consumers, and advocates, to

re-examine the future of comprehensive HIV/AIDS care and the value of supportive services. It will clearly be worthwhile to pursue further research exploring the associations between housing and health in order to inform those policy debates and help constitute the most appropriate systems of care.

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