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ORIGINAL PAPER

# Community Screening, Identification, and Referral to Primary Care, for Hepatitis C, B, and HIV Among Homeless Persons in Los Angeles

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## Abstract

People experiencing homelessness are disproportionally affected by drug and alcohol use and by their serious health consequences. In this study, 137 adults from the "UCLA/ARG/RAND Homeless Hepatitis Study" who were sampled from shelters and meal programs in the Skid Row of Los Angeles and screened for HIV or HCV or HBV infection. Those who tested positive for these infections were counseled about their infections and referred to primary care. They were followed-up at 1 month with interviews to identify rates, and predictors, of seeking primary care. Participants were 87.5% male, mean age of 48.6 years (SD: 8.2); most were Black (77.4%) and were chronically homeless (> 12 months). A majority (70%) had a regular source of care; 78% were lifetime marijuana users, 56% were lifetime cocaine users and 51% had injected intravenously during the past year. Among this sample, 118 participants (86.1%) tested seropositive for HCV infection, 79 (57.7%) HBV infection and 18 (13.1%) HIV infection. At 1-month follow-up, 102 participants (74.5%) attended the clinic they were referred to. The only variable associated with attending the clinic was having slept in a shelter during the previous night versus other sleeping conditions [Odds ratio (95% CI): 3 .0 (1.07–8.42), $p = 0.03$]. This model offers a simple and efficacious approach to seeking, testing, counseling, and referral to treatment of community-based adults experiencing homelessness with HIV, HCV and/or HBV infection and linking them to primary care. Being sheltered may be the key facilitator for homeless seeking primary care.

**Keywords** Homeless · HIV · HCV · HBV

## Introduction

Homelessness affects more than half a million people in any given night in the U.S. [1] Being homeless is associated with high rates of physical and mental health morbidity and higher risk of mortality [2]. People experiencing homelessness are disproportionally affected by drug and alcohol use and by their health consequences, which negatively impacts their general well-being [3]. They also have a higher prevalence of viral hepatitis and HIV (human immunodeficiency virus) infection than the general population [4, 5]. Homelessness is also associated with a higher incidence of new hepatitis C infection among drug users [6].

Despite this higher risk, people experiencing homelessness are less likely than housed patients to make primary care visits and have high emergency department utilization [7]. Primary care for the homeless population remains inadequate even when insurance is available [8], and people experiencing homelessness report significant negative experiences when they do seek care. [9, 10] Tailoring resources to people experiencing homelessness is associated with a superior service experience [11].

Accessing proper primary and specialty medical care, and treatment, for HIV, chronic hepatitis C Virus (HCV), and/or hepatitis B Virus (HBV) can be challenging in this population [12]. Urgent interventions are needed to screen, counsel and treat urban adults experiencing homelessness for HIV, HCV and HBV infection, as they have characteristics that could negatively impact the cascade of care. In fact, Veterans

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experiencing homelessness and persons with substance use, and/or mental health issues are less likely to receive HCV treatment [13–15]. Further we know that in the interferon-ribavirin era, few people experiencing homelessness had received counseling regarding HCV and few had received treatment [4], and there is a push for more inclusive models of care [16] and models that are based in primary care [17].

A model tailored to populations experiencing homelessness of community-based screening, identification, and counseling with referral to primary care could be a novel model of enhancing secondary prevention and treatment for HIV, HCV and HBV. Receipt of primary care can facilitate monitoring and treatment for these infections, administer HBV and hepatitis A vaccines where appropriate, and promote strategies to prevent transmission to others.

In this study, we aimed to assess the usefulness of a pilot program to test a model of community-based screening, and referral to primary care for patients experiencing homelessness from the Skid Row area in Downtown Los Angeles (California) who screened positive for HIV, HCV and/or HBV infection. We assessed the rate and correlates of participants visiting those primary clinics at 1-month follow-up post return for test results, and identified barriers to seeking primary care.

## Methods

The University of California at Los Angeles (UCLA)/Alcohol Research Group (ARG)/RAND "UCLA/ARG/RAND Homeless Hepatitis Study," was a community-based probability survey of 534 adults experiencing homeless recruited from 41 shelters and/or meal programs that were not all shelter-based in the Skid Row area of Los Angeles between June 2003 and February 2004. The fieldwork was conducted by the RAND Survey Research Group [18]. Fieldworkers underwent 12 6–7 h days of training in all study procedures. The study was approved by the UCLA, RAND, and ARG Institutional Review Boards.

### Eligibility Criteria of the Sample

Eligibility criteria included: ≥ 18 years of age; homeless [having spent the previous night in a public or private shelter or in the outdoors (i.e., in a public or private place not designed for, or ordinarily used as, regular sleeping accommodations for humans)]; [19] English-speaking; and cognitively competent to consent and to complete the surveys, assessed as needed [20]. Interviewers were carefully trained to recognize when a potential subject was not able to give an informed consent, and when this occurred, interviewers were told not to seek consent or proceed with an interview.

### Sampling Design

For details of the study design see Gelberg, Robertson, et al [4]. We adapted the service-sector approach to probability sampling, which has been used successfully in previous work with homeless populations [21]. We constructed a sampling frame of shelters and free meal programs throughout LA's Skid Row area which consisted of 41 service programs: 19 shelter programs at ten locations and 22 meal programs at nine locations.

A two-stage representative sampling design was employed: (1) the sampling frame was stratified by site and site-use days (i.e., days of the week on which target services were provided) as sampling units. (2) Clients were sampled on selected site-use days using sampling strategies that were tailored to each site (either simple random or systematic random sampling). One site (2% of eligible sites) declined participation.

### Data Collection

#### Baseline Survey

Interviewers screened each sampled client for eligibility. Data collection took about 90 min and included informed consent, a structured baseline interview (60 min), pretest counseling, and blood testing. Participant incentives were $30 for completing the interview and blood testing.

#### Notification of Blood Test Results

To provide participants with their blood test results, they were given an appointment for 1 week later at the same site at which they were recruited and enrolled into the main study, or they could receive their test results by phone using a toll-free telephone number. Incentives for returning for blood test results were $25. Overall, 92% received their blood test results.

#### Primary Care Referral—One Month Medical Follow-Up Survey

At the time of notification of their test results, participants who tested seropositive for HCV, HBV, or HIV infection were given post-test counseling and were given the opportunity to enroll in the 1 month medical follow-up study. If they enrolled, they were provided with referrals and appointments for follow-up medical care at one of three primary care clinics in the Skid Row area. The three clinics that participants were referred to were close to the shelters and street locations in the Skid Row area. There was no public

transportation in the area and generally participants walked to the clinics. The referrals were facilitated to a minimal degree in that relationships were built with the three clinics, participants were given a letter to take to the clinic explaining their blood test results and that they were being referred for primary care by the study.

All enrolled respondents were given a blue Reminder Card, the size of a business card with a date to return or call for a follow-up interview (post return for the test results) 30 days from notification. They were asked to call us on or around that date. We also asked enrollees to complete a detailed Tracking and Locating form. We allowed interviews as early as 27 days. There was no "closing window", meaning we accepted interviews until the data collection period ended, whenever the respondent called in or they were located, to allow for maximal follow-up of this homeless sample, which are often difficult to follow up. The average number of days to a completed follow-up was 56 days from notification (maximum 257 days).

Follow-up interviews were either done in person (in the field office, or elsewhere in the Skid Row Area—e.g. street corners, parking lots, or at other facilities) or by phone. Incentives for the one-month follow-up interview were $20. Tracking and locating methods to find respondents for the follow-up survey included: calling and mailing contacts listed on the tracking and locating form; conducting weekly jail searches; leaving personal notes on the shelter message boards; checking shelter resident rosters; at bi-weekly meetings, circulating a list of respondents due for follow-up with site of baseline interview, baseline and notification interviewer names, and dates of interview and notification to trigger interviewer memories and stimulate discussion about "lost-to-follow-up" respondents. When at facilities sampling and baselining, or when walking around Skid Row, interviewers would see overdue respondents and either do the follow-up right there or encourage the respondent to come by the field office.

Overall, 91.3% (N = 137) completed the one-month follow-up survey, 104 completed it in person and 33 on the phone. Figure 1 shows the flow-chart of study participants.

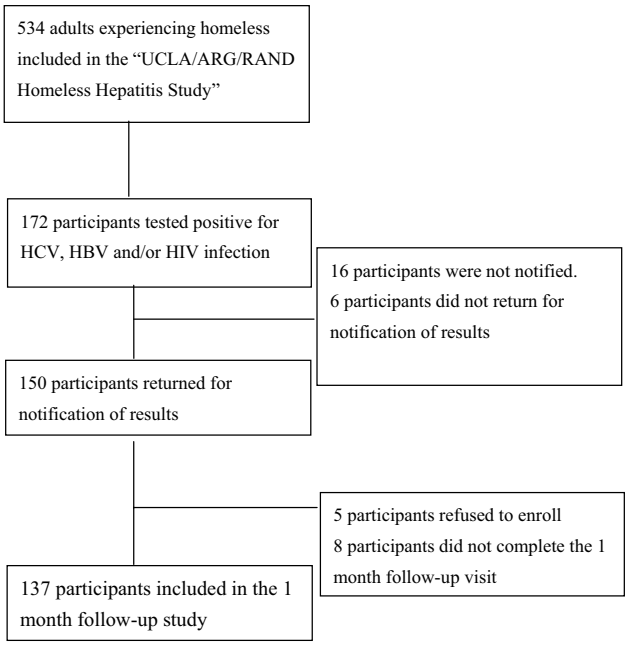


**Fig. 1** Flow chart of study participants

## Measures

### Background Measures

Baseline survey data were collected through structured face-to-face 60-min computer-assisted personal interviews (about 400 questions). Biological sex was operationalized by sex attributed at birth. Current homelessness was operationalized by having been literally homeless during the previous night, and chronic homelessness was defined by an accumulation of 12 months or longer spent homeless since age 18 [4]. Prison stays and psychiatric hospitalizations, lifetime transfusion of blood or blood products before 1990 and number of tattoos were assessed.

### Diagnostic Measures

Lifetime and current (12 month) major mental and substance-use disorders were assessed by selected modules from a computerized version of the Diagnostic Interview Schedule, Version IV (DIS-IV) [22]. To reduce respondent burden, a standardized, shortened version of the DIS-IV was used. For each module, questions were asked only until the participant either met minimum criteria for a specific diagnosis or was excluded from the diagnosis. Modules included assessment of major affective disorders (including depression and bipolar disorders), schizophrenia, alcohol use disorders, and drug use disorders. Drug use disorders were assessed in aggregate as well as by specific classes of drugs including opiates, cocaine, amphetamines and other stimulants, sedatives, and hallucinogens.

### Self-Reported Substance Use

Alcohol measures included recent frequent heavy drinking ("binge drinking"), defined as five or more drinks at least once per month in the previous 12 months. Drug use measures included lifetime and recent (12 month) use of marijuana, cocaine, ecstasy or other hallucinogens, sedatives and hypnotics, methamphetamine or other stimulants, heroin (alone or combined with other drugs), and other opiates. Mode of use was also assessed. Lifetime injection of

illicit drugs and injections of specific drugs or combinations of drugs were also assessed. Injectors were also asked whether they had ever used previously used or potentially contaminated injection paraphernalia (including needles or syringes, water for rinsing needles, cotton for filtering drug solutions, "cookers"); or injected drugs in a "shooting gallery" or in another place where the participant did not know who else had used the injection paraphernalia. We also assessed history of overdose while using injection drugs. Regarding non-injection drug use, questions covered lifetime smoking of crack or any other drugs, intranasal use of cocaine or other drugs (i.e., snorting), and sharing straws for intranasal drug use.

Lifetime pattern of drug use was created as a variable with five categories, which were adapted from the three-category drug-use variable that Armstrong and colleagues used to predict HCV [23]. The five categories in the new variable were mutually exclusive, with participants assigned to the pattern of their most severe drug-use. We divided non-injectors into those reporting (1) no drug use, (2) non-injection drug use (e.g., cocaine, methamphetamine, or hallucinogens) including marijuana, and (3) non-injection drug use excluding marijuana. Injection drug use was divided into two subgroups based on the number of different types of drugs ever injected: (4) single-drug injection; and (5) multiple-drug injection, (whether separately or simultaneously) [24]. Separately, mixed-drug injection identified participants who had ever injected a mixture of two or more drugs [23, 25, 26].

### Sexual Behaviors and Conditions

Assessment of lifetime sexual risk behaviors included asking biological males if they had ever had sex of any kind with another man. Lifetime sex risk also included sex work and a prior diagnosis of syphilis, gonorrhea, or Chlamydia. Recent (past 12 months) sexual risk behavior included sex with five or more partners [24].

### Medical Referral Measures

In the 1 month follow-up survey, patients were asked if they followed the referral to one of the primary care clinics, and the name of the clinic that they attended. The primary outcome was self-reports of attending one of the three primary care clinics. For participants who did not follow the referral to the primary care clinic, they were asked for the reason for not following the referral, and whether they attended another healthcare facility. For those who did follow the referral, participants were asked whether they saw a doctor or a nurse at the clinic, discussed HIV, HCV and/or HBV infection during the medical visit, and experienced barriers to seeing a health care provider at the clinic. The Institutional Review Boards of UCLA, PHI, and the RAND Corporation approved the study.

### Data Analysis

Descriptive statistics were expressed as mean and standard deviation (SD) for quantitative variables and as absolute frequencies and percentages for qualitative variables. We performed bivariate analyses to detect associations between baseline characteristics and making a visit to the referral primary care clinic as reported in their one-month follow-up. We used the Chi square test to detect significant differences in categorical variables and *t* test for mean differences in continuous variables. Logistic regression models were used to analyze predictors of following through on referrals to a primary care clinic within 1 month of referral. Potential predictors of following referrals were selected a priori according to the literature around outreach for patients experiencing homelessness. Test results were considered to be statistically significant if the resulting one-tailed *p-value* was $<.05$. Statistical analysis was performed using the SPSS software version 15.0.1 (SPSS, Chicago, IL, USA).

## Results

Of 903 program clients screened for study eligibility, 586 were initially identified as eligible, and among these, 41 refused to be enrolled in the study, one could not be located, ten were later identified as repeaters (their second interviews were excluded). The final initial sample consisted of 534 adults experiencing homelessness: the response rate was 83.0%. In the initial overall sample of 534 patients, 26.7% of the sample tested HCV-positive, 2.6% tested positive for current HBV infection and 4.0% tested HIV-positive.

A total of 172 participants (32% of the baseline study sample of 534) were eligible for enrollment in the medical follow-up study. To be considered eligible for enrollment into the medical follow-up study, respondents had to test seropositive to at least one of the following infections: (1) *HCV*. HCV + with a HCV Elisa test cutoff > = 3.8 (N = 119; 79%), *or* HCV + with a HCV Elisa test cutoff < 3.8 AND RIBA positive (N = 12; 8%). (2) *HIV*. HIV + with Western Blot confirmation positive (N = 19; 12.6%). (3) *HBV*. HBV surface antigen + AND HBV surface antibody negative AND HBV core antibody negative (N = 0), *or* HBV surface antigen + AND HBV surface antibody negative AND HBV core antibody positive (N = 11; 7.3%).

We enrolled 87% of all respondents who tested positive for HBV, HCV, or HIV into the 1-month follow-up study. However, not all eligible participants returned for notification of their test results; of those eligible who returned to be

notified, we enrolled 96%. Very few people (N = 5) refused to enroll.

Of the 150 enrolled in the 1-month follow-up, ten had multiple infections: two with HIV/HBV, four with HIV/HCV, three with HBV/HCV, and one had all three infections.

Table 1 shows the baseline characteristics of the study population (N = 137). Each category was stratified according to the main outcome, that is, whether or not they followed through on the referral to one of the three primary care clinics. The majority of the study participants (87.5%) were

**Table 1** Sample characteristics of 137 homeless individuals referred to primary care for HIV, HCV and/or HBV, and correlates of obtaining primary care within 1 month

| Factor | Attended the clinic | | Total |
|---|---|---|---|
| | No<br>N = 35<br>25.5% | Yes<br>N = 102<br>74.5% | N = 137 |
| Demographic characteristics | | | |
| Male gender, n (%) | 31 (88.5) | 89 (87.3) | 120 (87.6) |
| Age, mean (SD) | 48.9 (7.9) | 48.3 (9.7) | 48.6 (8.2) |
| Race/ethnicity, n (%) | | | |
| White | 8 (22.9) | 10 (9.8) | 18 (13.1) |
| Black | 25 (71.4) | 81 (79.4) | 106 (77.4) |
| Latino/hispanic | 1 (2.9) | 3 (2.9) | 4 (2.9) |
| Other | 1 (2.9) | 8 (7.8) | 9 (6.6) |
| Education (> 12th grade), n (%) | 22 (59.5) | 66 (64.7) | 88 (64.2) |
| Veteran, n (%) | 7 (20) | 24 (23.5) | 31 (22.6) |
| Homeless history | | | |
| Chronic homelessness (> 12 months in lifetime), n (%) | 29 (82.8) | 77 (75.5) | 106 (77.4) |
| Slept in a shelter the night before enrollment, vs all others, n (%) (*Difference between groups significant at P = 0.03*) | 5 (14.2) | 34 (33.3) | 39 (28.5) |
| Prison, ever, n (%) | 14 (40) | 43 (42.2) | 57 (41.6) |
| Regular source of healthcare, n (%) | 23 (65.7) | 70 (68.6) | 93 (67.8) |
| Earned income, last 30 days, n (%) | 6 (17.1) | 26 (25.5) | 32 (23.4) |
| Health insurance, last year, n (%) | 15 (44.1) | 47 (46.1) | 62 (45.3) |
| Transfusion of blood products < 1990, n (%) | 7 (20) | 10 (9.8) | 17 (12.4) |
| Substance use | | | |
| Cocaine use, ever, n (%) | 20 (57.1) | 57 (55.9) | 77 (75.5) |
| Heroin use, ever, n (%) | 18 (51.4) | 45 (44.1) | 63 (45.9) |
| Marijuana use, ever, n (%) | 28 (80.0) | 79 (77.4) | 107 (78.1) |
| Alcohol binge drinking prior 12 months, n (%) | 16 (45.7) | 51 (50.0) | 67 (48.9) |
| Alcohol dependence, lifetime, n (%) | 14 (40.0) | 39 (38.2) | 53 (38.7) |
| Depression, lifetime, n (%) | 11 (31.4) | 39 (38.2) | 50 (36.5) |
| Family history of mental health and substance use problems: | | | |
| Mental health problems | 7 (20.0) | 30 (29.4) | 37 (27) |
| Alcohol use problems | 20 (57.1) | 51 (50.0) | 71 (51.8) |
| Drug use problems | 7 (20.0) | 20 (19.6) | 27 (19.7) |
| Prevalence of Viral Infections (seropositive on blood tests) | | | |
| HIV infection, n (%) | 6 (17.1) | 12 (11.8) | 18 (13.1) |
| HCV infection, n (%) | 30 (85.7) | 88 (86.7) | 118 (86.1) |
| HBV infection, n (%) | 21 (60.0) | 58 (56.9) | 79 (57.7) |
| Sexual history: | | | |
| Sex with men (among men reporting), ever, n (%) | 7 (20.0) | 21 (20.6) | 28 (25.3) |
| Sex for cash, ever, n (%) | 13 (37.1) | 30 (29.4) | 43 (31.6) |
| Sex for drugs, ever, n (%) | 7 (20.0) | 20 (19.6) | 27 (19.8) |
| > 5 Sexual partners, prior 12 months, n (%) | 8 (22.9) | 17 (16.7) | 25 (18.2) |
| Syphilis infection, ever, n (%) | 6 (17.1) | 13 (12.7) | 19 (13.2) |
| Gonorrhea infection, ever, n (%) | 10 (28.6) | 31 (30.4) | 41 (29.9) |
| Chlamydia infection, ever, n (%) | 1 (2.9) | 10 (98.0) | 11 (8.1) |

male, with a mean age of 48.6 years (SD: 8.2). Most of the study population was Black (77.4%) and were chronically homeless (> 12 years). A majority (70%) reported having a regular source of care. In terms of drug use, 78% were lifetime marijuana users, 56% were lifetime cocaine users and 51% had injected intravenously during the past year. Regarding the distribution of viral infections among the study sample of patients with these infections who had a one month follow-up visit (N = 137): 118 participants (86.1%) tested seropositive for HCV, 79 (57.7%) for HBV, and 18 (13.1%) for HIV.

Table 2 shows clinic visit data at 1-month follow-up. At 1-month follow-up, 102 participants (74.5% of the final study population) reported that they attended the primary care clinic that they were referred to. If we include the 15 participants who sought care to an outside clinic, 85% (117/137) sought care for their infection. However, a conservative estimate for the outcome of obtaining primary care

**Table 2** One month follow-up data results for 137 homeless individuals referred to primary care for HIV, HCV, and/or HBV: seeking care at the primary care clinic they were referred to

| Factor | n (%) |
|---|---|
| Sought medical care at one of three primary care clinics referred to within 1-month of referral (n = 137) | |
| Made a least one visit to one of the three primary care clinics referred to, past month (n = 137) | 102 (74.45) |
| Primary clinic visited (n = 102) | |
| Clinic A | 36 (35.29) |
| Clinic B | 17 (16.17) |
| Clinic C | 49 (48.03) |
| Did not seek medical care at one of three primary care clinics referred to within 1-month of referral (n = 35) | |
| Among people who did not go to a referral clinic (n = 35): | |
| Went anywhere else for health care: | 15 (42.9) |
| Clinic or hospital | 5 (30) |
| Community or neighborhood clinic | 7 (46.7) |
| Shelter, soup kitchen | 2 (13.3) |
| Other place | 1 (6.7) |
| Barriers to visiting a primary care clinic referred to | |
| Among people who did not go to a referral clinic (n = 35)*, reported barriers for not going, n (%): | |
| Too long to get there | 35 (100) |
| Could not afford to get there | 35 (100) |
| Felt too sick to go | 4 (35) |
| Forgot | 9 (25.7) |
| Would have to wait too long in the office | 4 (11.4) |
| Would not be treated with respect and understanding | 5 (14.3) |
| Didn't have time | 9 (25.7) |
| Afraid to find out bad news | 1 (2.9) |
| Didn't think needed medical care | 1 (2.9) |
| Other reasons for not going | 12 (34.3) |
| Saw Health Care Provider at Referral Clinic (among those attending a referral clinic, n = 102) | |
| Among the people who went to the clinic (n = 102): Saw a doctor or nurse at the clinic | 87 (85.29) |
| Among the people who saw a clinician at the clinic (n = 87): Talked with clinician about infection: | |
| Talked about HIV infection: | |
| Overall (n = 87) | 43 (49.43) |
| Among HIV only (n = 37) | 37 (100) |
| Talked about Hepatitis C infection | |
| Overall (n = 86) | 79 (91.86) |
| Among HCV only (n = 75) | 71 (94.7) |
| Talked about Hepatitis B infection (n = 87) | |
| Overall | 64 (73.56) |
| Among HBV only (n = 49) | 34 (69.4) |

*Reasons are not mutually exclusive

for the infections at one of the three study clinics would be if we assumed that the infected participants for whom we did not have a 1 month follow-up survey did not seek medical attention for their infections. Then the rate of seeking primary care would be 59% (102 who reported that they sought care/172 total infected participants), as seen in Table 3.

Those who did not attend a clinic visit expressed a variety of reasons for not attending, among them, "too long to get there", "could not afford to get there," felt too sick to go, and "forgot" were the most frequent. Among the 35 patients who did not attend one of the three primary care clinics, 15 (42.9%) patients went somewhere else for health care for their infections. Among the 102 participants who attended one of the three primary clinics they were referred to, most (85%) saw a doctor or a nurse at the clinic, and most of those testing seropositive for an infection talked with the clinician about their infection (HIV 100%, HCV 95%, and HBV 69%). Among the 15 who did not see a doctor or nurse at the clinic, the primary barrier they reported to seeing a medical provider were no openings that day (n = 9), not shown). Fewer did not see a provider for the following barriers: too long of a wait to see a provider (n = 3), thought they would not be treated with respect and understanding (n = 5), and afraid to find out bad news (n = 1).

We performed an unadjusted analysis of all potential predictors (see Table 1) of attending the clinic they were referred to as reported on the one-month follow-up survey, which is shown in Table 4. Only type of living situation during the night before being enrolled in the study (i.e., having slept in a shelter vs. other) was positively associated with attending the primary care clinic [Odds ratio (95% CI): 3.0 (1.07–8.42), $p = 0.03$]. No other baseline predictor was associated with following the referral to a primary care clinic including chronic homelessness, mental illness, alcohol or drug use. In the logistic regression analysis adjusted by age, sex, regular source of care and by the presence of HCV, HIV and/or HBV infection, the association between having slept in a shelter the night before and attending the primary care clinic remained statistically significant [OR (95% CI): 3.0 (1.06–8.49), $p = 0.04$].

## Discussion

This is a prospective observational study of a community-based intervention linking homeless individuals at risk of HIV and viral hepatitis to primary care. The strengths of the study are the sampling design and relatively low-intensity nature of the community-based intervention (brief contacts and low monetary incentives to encourage follow-up for receipt of test results when they received referrals to primary care). The study findings suggest that homeless populations in large urban areas (that have good primary care availability) can be linked to primary care.

A vast majority, 74.5%, of study participants followed the referral to primary care, as measured at one-month post return for test results. In addition, no baseline characteristic other than sleeping in a shelter the night before enrollment was positively associated with following the referral to primary care. A person's chronicity of homelessness, mental illness, and drug or alcohol use did not affect care seeking.

People experiencing homelessness have poor access to health care. [27, 28] The literature suggests that being homeless negatively impacts receiving proper medical care for HIV, HCV and/or HBV infection. [12] In addition, continued alcohol or other drug use is often listed as a reason to exclude patients from HCV antiviral treatment, [13]. Homelessness is also associated with lower quality of HIV care, HIV treatment initiation and adherence and poorer retention in care, leading to suboptimal viral control and immune recovery [29, 30].

Several strategies have been evaluated for how to increase treatment rates for these infections in difficult-to-reach populations, including directly observed therapy in one-stop shops, and combining HIV or HCV infection care with addiction treatment for homeless individuals [31, 32]. Other

**Table 3** Sensitivity analysis of rates of care seeking at 1 month for HCV/HBV/HIV

| Subsample for denominator | Sought medical care at one of the study clinics | |
|---|---|---|
| | N | % |
| Tested positive for HCV/HBV/HIV* | 102/172 | 59 |
| Returned for notification of test results at 1 month* | 102/150 | 68 |
| Enrolled in the 1 month follow-up study (Referred to one of the three primary care referral clinics)* | 102/145 | 70 |
| Had 1 month follow-up research assessment: Went to one of the three primary care referral clinics | 102/137 | 74 |
| Had 1 month follow-up research assessment: Went to one of the three primary care referral clinics or to another clinic for the infection | 117/137 | 85 |

*If participant did not have a 1 month follow-up assessment, we assumed the participant did not make a 1 month follow-up visit to one of the three primary care clinics

**Table 4** Factors associated with attending a primary care clinic referred to for HIV, HBV and/or HCV in past month, among 137 homeless adults

| Factor | Unadjusted OR (95% CI) | *p*-value |
|---|---|---|
| Female gender | 0.88 (0.27–2.91) | 0.84 |
| Age (per year extra) | 0.91 (0.42–1.98) | 0.82 |
| Education < 12th grade | 1.08 (0.49–2.40) | 0.84 |
| Veteran | 0.82 (0.32–2.09) | 0.67 |
| Homeless history | | |
| Chronic homelessness (> 1 year) | 1.57 (0.58–4.22) | 0.81 |
| Shelter last night versus all other | 3.0 (1.07–8.42) | 0.03 |
| Prison, ever | 0.88 (0.40–1.94) | 0.76 |
| Regular source of care | 0.88 (0.39–1.98) | 0.75 |
| Transfusion blood products < 1990 | 2.30 (0.80–6.62) | 0.11 |
| Substance use | | |
| No lifetime cocaine use | 0.67 (0.12–3.85) | 0.66 |
| No injection drug use prior 12 months | 0.67 (0.12–3.85) | 0.66 |
| No lifetime marijuana use | 0.86 (0.33–2.22) | 0.75 |
| No binge drinking last 12 months | 1.18 (0.55–2.56) | 0.66 |
| Sexual history | | |
| MSM lifetime | 1.15 (0.43–3.07) | 0.78 |
| Lifetime sex for cash | 1.40 (0.39–3.13) | 0.41 |
| Lifetime sex for drugs | 1.01 (0.39–2.65) | 0.98 |
| Lifetime syphilis | 1.42 (0.49–4.63) | 0.52 |
| Lifetime gonorrhea | 1.09 (0.42–2.54) | 0.51 |
| Lifetime chlamydia | 0.26 (0.03–2.15) | 0.18 |
| > 5 sex partners past 12 months | 1.48 (0.58–3.82) | 0.41 |

authors have reported that primary care programs specifically tailored to homeless individuals are more likely than standard care (non-tailored clinic) to achieve higher patient rated quality of care [11].

Our results show that a community-based sample of homeless patients do show up for primary care referrals to address their HBV, HCV, and HIV viral infections. The fact that only sleeping in a shelter the night before was positively associated with following the medical referral suggests that despite having many markers of barriers to accessing health care, those markers did not have an impact on our main outcome of seeking primary care within 1 month of screening and provision of their test results. It is plausible that sleeping in a shelter provides certain stability and/or shelter staffing that facilitate accessing health services if they are accessible. Therefore, this model of community-based screening and identification and facilitated referral to primary care should be explored as a useful approach for this disadvantaged homeless population who are infected with HBV, HCV, and HIV. In addition, our intervention might be useful for other settings to implement, that are hoping to increase linkage to primary care for community-based homeless individuals who test positive for HBV/HCV/HIV.

The strengths of the present study of the study are the sampling design and relatively low-intensity nature of the community intervention. The intervention included community outreach for serotesting, use of ancillary staff to do blood testing, laboratory analysis of the blood tests, meeting the participants at community settings to provide them with their blood test results and post test counseling (including a financial incentive to show up for their blood test results), and a referral to the study's primary care clinics with whom we had built relationships. Three-quarters (75%) of the homeless persons attended one of the three primary care clinics; however, 85% sought care for their infection including attending clinics outside our three study clinics. Had we had patient navigation to the clinics, it is likely that even higher rates would have attended. The study suggests that homeless populations in large urban areas (that have good primary care availability) can be linked to primary care for HIV or viral hepatitis infections using this community-based approach.

Our study has some limitations that should be acknowledged: (1) We do not know whether or not the infected participants who did not have a 1 month follow-up interview obtained health care for their infections; thus our estimates may be overly optimistic. A conservative estimate for our outcome of obtaining care for the infections is 59% if we assume that the infected participants for whom we do not have a 1-month follow-up survey did not seek medical attention for their infections. It is still promising that more than half of the sample with this conservative estimate would

have sought care for their infections if they were identified and referred. (2) The follow-up period was rather short (1 month) and we were not able to assess long term outcomes of engaging in primary care, including receipt of antivirals for their infection or other primary care interventions. (3) We cannot generalize these findings to communities outside of the service rich area of the Skid Row are of Los Angeles. (4) The outcome and predictors are based on self-reports and self-report is susceptible to response bias [33, 34]. (5) While some of the patients in this study may have cleared their virus and may no longer have been infectious, they have high rates of risky behaviors and would still benefit from linkage to primary care for ongoing counseling on reduction of risky behaviors to prevent recurrence of these infections, for surveillance of recurrence of the infections, and to administer hepatitis A and B vaccinations where appropriate. (6) The monetary incentives at two steps (initial interview and follow-up for blood test results) in the process of identification and referral might have influenced the results obtained. In addition, given that 70% of the study population reported having a regular source of care, some of them might have attended a primary care clinic even if not included in the medical follow-up study. (7) Since these data were collected in 2003–2004, several policy and practice changes have taken place. First, it is possible that with the Affordable Care Act (ACA), rates of visit making based on receipt of referral to primary and specialty care for these serious infections might be even higher than what we found in this study in the preACA era. However, should health care reform be repealed, we might be looking at similar rates of visit making in response to receipt of referrals to primary care. Second, by the time the data were obtained, Housing First was starting, and while providing a home for this disadvantaged population would increase their stability and even their access to care, if that housing is inaccessible to their clinics this could have a detrimental effect on their access to care for their infections. Third, in the current interferon-free era of HCV antiviral therapy with the advent of more tolerable direct acting antivirals [35] it is possible that HCV-infected patients would be even more likely to seek medical care than they were during the more complicated and symptomatic interferon-ribavirin era of this study. Fourth, regarding HIV care, the current widespread use of HAART treatment protocols and use of pre-exposure prophylaxis for HIV may have affected our findings. Despite these limitations, the findings from this study are informative regarding the benefit of a community-based outreach program for the seek, test, and refer to treatment components of the treatment cascade for a most vulnerable population, the homeless populations, whose infections place them as well as others at risk. In many ways, caring for patients experiencing homelessness is as challenging nowadays as it was when the data were collected, and no other recent studies have addressed the needs of this underserved group. Therefore, our results can inform policy makers in terms of tailoring services for homeless patients with life-threatening conditions that require proper long-term care as little steps in this very low resourced population might yield some benefit.

In summary, despite being a difficult to target population, with a high prevalence of factors associated with poor outcomes, patients experiencing homelessness in the Skid Row area of Los Angeles do follow referrals to primary care clinics to address their HIV, HCV and/or HBV infection. Future work will be needed to assess if besides following a referral, more specific treatments for their infections are initiated and continued in this vulnerable population. Further, future work is indicated to test in other settings this community-based outreach model of screening, identification, and counseling, with primary care referral for HBV, HCV, and HIV. Being sheltered may be the key facilitator for homeless persons' seeking primary care.

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## Compliance with Ethical Standards

**Conflict of interest** The authors declare that they have no conflict of interest.

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