



Response to culturally competent drug treatment among homeless persons with different living arrangements

Erick G. Guerrero^{a,*}, Ahyoung Song^b, Benjamin Henwood^a, Yinfei Kong^c, Tina Kim^d

^a *Suzanne Dworak-Peck School of Social Work, and Marshall School of Business, University of Southern California, Los Angeles, CA, 90089, USA*

^b *Department of Social Welfare, Gachon University, Seongnam, South Korea*

^c *Mihaylo College of Business and Economics, California State University, Fullerton, Fullerton, CA, 92834, USA*

^d *Los Angeles County Department of Public Health, Substance Abuse Prevention and Control, Alhambra, CA, 91803, USA*

ARTICLE INFO

Keywords:

Homelessness
Cultural competence
Drug use
Drug treatment

ABSTRACT

This study investigated the association between program cultural competence and homeless individuals' drug use after treatment in Los Angeles County, California. Los Angeles County has the largest and most diverse population of homeless individuals in the nation. We randomly selected for analysis 52 drug-treatment programs and 2158 participants who identified as homeless in the Los Angeles County Participant Reporting System in 2011. We included their living arrangements (indoors and stable, indoors and unstable, and outdoors) and individual and program characteristics (particularly whether their programs used six culturally competent practices) in multilevel regression analyses. The outcome was days of primary drug use at discharge. Results showed that higher levels of staff personal involvement in minority communities (IRR = 0.437; 95% CI = 0.222, 0.861) and outreach to minority communities (IRR = 0.406; 95% CI = 0.213, 0.771) were associated with fewer days of drug use at discharge. Homeless individuals living outdoors used their primary drug more often than any other group. Yet, compared to individuals with other living arrangements, when outdoor homeless individuals were treated by programs with the highest community resources and linkages (IRR = 0.364; 95% CI = 0.157, 0.844), they reported the fewest days of drug use. We discuss implications for program evaluation and community engagement policies and practices.

1. Introduction

Substance use is one of the most commonly observed health risks among people experiencing homelessness (Johnson, Freels, Parsons, & Vangeest, 1997; National Coalition for the Homeless, 2009; Substance Abuse and Mental Health Services Administration, 2013). Homeless persons are considered individuals without permanent housing who may live on the streets; stay in a shelter, mission, single room occupancy facilities, abandoned building or vehicle; or in any other unstable or non-permanent situation. [Section 330 of the Public Health Service Act (42U.S.C., 254b). Some studies reporting that most homeless persons experience substance use disorders (SUDs; Baumohl & Huebner, 1991; Folsom et al., 2005). Substance use among individuals who are homeless is associated with increased morbidity of physical and mental health conditions (Burt, 2001; McCarty, Argeriou, Huebner, & Lubran, 1991; Rhoades et al., 2011; Substance Abuse and Mental Health Services Administration, 2013) and early mortality (Henwood, Byrne, & Scriber, 2015; O'Connell, 2005; Zivanovic et al.,

2015). Due to the scope of the problem, there have been continuous efforts to deliver effective SUD treatment to homeless populations (Drake, O'Neal, & Wallach, 2008; Hwang, Tolomiczenko, Kouyoumdjian, & Garner, 2005; Milby et al., 1996). Yet, there is a dearth of research on the most effective approaches to SUD treatment for homeless individuals.

Experts have suggested considering homeless individuals' racial and ethnic culture when tailoring services, given that minorities disproportionately experience chronic homelessness (Padgett, Gulcur, & Tsemberis, 2006; Padgett, Stanhope, Henwood, & Stefancic, 2011). Hence, the delivery of evidence-informed culturally competent SUD treatment may be key to improving substance-use outcomes for homeless individuals (Amodeo, Chassler, Oettinger, Labiosa, & Lundgren, 2008; Amodeo et al., 2011). Cultural competence has been generally defined as a series of policies, practices and attitudes that allow providers and programs to effectively respond to the cultural services needs of individuals (Cross, Bazron, Dennis, & Isaacs, 1989). SUD treatment programs with culturally competent practices and

* Corresponding author.

E-mail addresses: erickg@usc.edu (E.G. Guerrero), woodstock@gachon.ac.kr (A. Song), bhenwood@usc.edu (B. Henwood), yikong@fullerton.edu (Y. Kong), tkim@ph.lacounty.gov (T. Kim).

<http://dx.doi.org/10.1016/j.evalprogplan.2017.10.005>

Received 10 February 2017; Received in revised form 30 September 2017; Accepted 2 October 2017

Available online 12 October 2017

0149-7189/ © 2017 Published by Elsevier Ltd.

policies, such as matching providers and clients based on their cultural and linguistic background have shown greater retention for African American and Latino clients (Guerrero & Andrews, 2011; Guerrero, 2013). Yet, there has been limited research on the role of culturally responsive practices in SUD treatment for homeless populations.

In the state of California, Los Angeles County seeks to reduce homelessness by funding, regulating, and supporting health and human services (County of Los Angeles Homeless Initiative, 2016), including SUD treatment. This study assesses whether culturally responsive practices of treatment programs can reduce drug use among homeless persons. We investigated substance use outcomes for 2158 individuals who received SUD treatment in 2011 from programs funded by the Los Angeles County Department of Public Health. Los Angeles County has the largest unsheltered homeless population in the United States, with an estimated 57,794 people experiencing homelessness on any given day (Los Angeles Homeless Services Authority, 2017). This number represents nearly 10 percent of the homeless population in the United States any given night in 2016 (National Alliance to End Homelessness, 2016). Although the overall U.S. homeless population has decreased in recent years, that in Los Angeles County increased (Los Angeles Homeless Services Authority, 2017). Because residential instability can compromise the effectiveness of SUD treatment (Robertson, Zlotnick, & Westerfelt, 1993), we investigated whether the type of homelessness—i.e., living with friends or family (indoors and stable), in a shelter (indoors and unstable), or on the streets (outdoors)—affects the relationship between culturally responsive practices and substance use outcomes. This relationship has been rarely considered in the literature (Kashner, Rosenheck, Campinell, Surís, & the CWT Study Team, 2002; Slesnick & Erdem, 2013; Slesnick, Kang, Bonomi, & Prestopnik, 2008).

1.1. Conceptual framework

Most organizational cultural competence frameworks outline a diverse set of practices, attitudes, and services for enhancing the sensitivity and responsiveness of health care organizations (Brach & Fraser, 2000; Harper et al., 2009; Lewin Group, 2001; Prince Inness, Nessman, Mowery, Callejas, & Hernandez, 2009; Weech-Maldonado, 2002). There are several health care practices for effectively responding to the service needs of racial and ethnic minority clients (Brach & Fraser, 2000; Guerrero & Kim, 2013; Mason, 1995). The most common practices reported in the literature are, a) having providers with knowledge of community needs in racial and ethnic minority communities, b) personal involvement in racial and ethnic minority communities, c) development of resources and linkages to serve racial and ethnic minorities, d) hiring and retention of staff members with racial and ethnic minority backgrounds, e) reaching out to racial and ethnic minority communities, and f) developing policies and health service practices (e.g., bilingual treatment).

Preliminary studies have shown a strong relationship between staff cultural sensitivity and knowledge of minority communities and shorter wait time with greater retention among Latinos and African American clients (Guerrero & Andrews, 2011; Guerrero, 2013). Spanish-language translation of treatment materials was associated with higher odds of treatment completion among Latinos in California (Guerrero, Campos, Urada, & Yang, 2012). When interpreters or bilingual providers are not available, clients may wait longer to commence treatment (González, Vega, & Tarraf, 2010; Office of Minority Health, 2001). To date, however, there is limited evidence of the impact of culturally sensitive practices on treatment outcomes (i.e., post treatment drug use) among homeless individuals.

Poor response to SUD treatment among homeless clients may be due to programs' limited knowledge and understanding of and response to community context and individual service needs (Padgett et al., 2006; Padgett et al., 2011). Culturally competent treatment include practices, such as delivering services in a bilingual, culturally diverse, and

inclusive setting, are associated with minority clients experiencing effective communication, more accurate diagnosis, a positive therapeutic alliance, and greater satisfaction with treatment (Brach & Fraser, 2000; González et al., 2010; Saha et al., 1999; Saha, Taggart, Komaromy, & Bindman, 2000; Sue, Fujino, Hu, Takeuchi, & Zane, 1991; Wells, Klap, Koike, & Sherbourne, 2001).

This suggests that by (a) understanding and investing in the minority communities SUD treatment programs serve homeless individuals and (b) integrating hiring, training, and service practices and policies that are most responsive to client service needs in local communities (Guerrero & Kim, 2013), SUD treatment organizations may be more likely to reduce substance use among homeless individuals. SUD treatment effectiveness may vary by exactly where the homeless live (Padgett et al., 2006; Padgett et al., 2011). Hence, program personnel must understand and respond to the unique service needs of individuals with different living conditions and service needs. This work considers three hypotheses about homelessness and SUD treatment.

Hypothesis 1. Homeless individuals living outdoors will report more days of drug use at discharge than those living in stable indoor settings.

Hypothesis 2. Among all homeless individuals, higher degree of implementation of the six culturally competent program practices identified above will be associated with fewer days of primary drug use at discharge.

Hypothesis 3. Living arrangements (outdoors, indoors and unstable, or indoors and stable) will moderate the relationship between the degree of implementation for culturally competent program practices and days of primary drug use at discharge.

2. Methods

2.1. Sampling frame and data collection

The data were collected by accessing a fully concatenated program and client dataset involving all 408 nonprofit SUD treatment programs funded by the Los Angeles County Department of Public Health. Through the Los Angeles County Participant Reporting System, researchers can access all data entered by each provider on every client served on an ongoing basis. These data capture the treatment experiences, substance use, and individual characteristics of 15,100 individuals who participated in treatment from July 1, 2010 to December 30, 2011. Ethical and human protection practices were followed in data collection based on the Institutional Review Board of the Los Angeles County Department of Public Health and the based research institution. The dataset features 141 items, more than half of which are standardized scales following the guidelines of the California Outcomes Measurement System and the federal Treatment Episode Data Set system.

2.2. Analytic sample

To access program-level information, we obtained a random sample of 147 publicly funded and nonprofit programs from among 350 programs located in communities at least 40 percent Latino or African American. Of these 147 programs, 95 did not provide services to homeless individuals and were excluded from analysis. The final analytic sample included 52 programs serving 2158 individuals self-identified as homeless at admission.

2.3. Individual-level independent variables

We analyzed three types of homelessness, identifying clients by whether they were staying indoors in a stable setting with family or friends (coded as 0), living indoors but in an unstable setting (staying in a shelter, hotel, motel, car, or van; coded as 1), or living outdoors

(coded as 2). This categorization is consistent with the U.S. Department of Health and Human Services, and the National Health Care for the Homeless Council ([Substance Abuse and Mental Health Services Administration, 2013](#)), which considers a homeless person an individual without permanent housing who may live on the streets; stay in a shelter, mission, single room occupancy facilities, abandoned building or vehicle; or in any other unstable or non-permanent situation. [Section 330 of the Public Health Service Act (42U.S.C., 254b)]

We measured history of mental health by clients' response to the question, "Have you ever been diagnosed with a mental illness?" Clients responded yes (1) or no (0).

We assessed duration in treatment based on admission and discharge dates. To control for baseline differences in frequency of drug use at admission, we included a variable on the primary drug participants reported using in the 30 days prior to intake.

Demographic characteristics included age (continuous), race and ethnicity (1 = *Latino*, 0 = *other*), gender (1 = *female*, 0 = *male*), years of education (continuous), employment at admission (1 = *not employed*, 2 = *sometimes employed*, 3 = *often employed*, and 4 = *fully employed*), eligibility for Medicaid (1 = *eligible*, 0 = *not eligible*), and social support (Likert scale of degree of social support in peer groups from 1 = *low* to 5 = *high*).

2.4. Program-level independent variables

A cultural competence measure included six domains (practices) across 57 items ([Mason, 1995](#)). For each item, we measured supervisors' report on their program staff's (1) knowledge of racial and ethnic minority community needs; (2) personal involvement in racial and ethnic minority communities; (3) development of resources and linkages to serve racial and ethnic minorities; (4) reaching out to racial and ethnic minority communities; (5) hiring and retention of staff members from racial and ethnic minority backgrounds; and (6) development of policies and procedures to effectively respond to the service needs of racial and ethnic minority patients. Staff rated items on a 4-point Likert scale (1 = *not at all* to 4 = *often*). Cronbach's α coefficients on these items ranged from 0.72 to 0.98. This measure of cultural sensitivity and responsiveness has been effectively used in other studies ([Guerrero & Kim, 2013](#); [Guerrero, 2013](#)).

The survey measured state licensure by asking, "Is your program licensed by the state?" and accreditation by the Joint Commission by asking, "Is your program accredited by the Joint Commission?" Answers to both items were coded as yes (1) or no (0). We also measured whether the program accepts Medicaid payments and percent of public funded received in prior fiscal year. These four variables have been used in previous studies as program regulation and funding measures associated with treatment outcomes ([Campbell & Alexander, 2002](#); [Guerrero & Andrews, 2011](#); [Guerrero, 2013](#)).

2.5. Dependent variable

Our dependent variable is primary drug used during the 30 days prior to discharge. Program participants were first asked to identify their primary drug of choice and then "How many days in past 30 days you have used this primary drug?" This variable was analyzed as a continuous variable with a range of 0–30 days. This measure has been used in other studies as well ([Frimpong, Guerrero, Kong, & Kim, 2016](#)).

2.6. Analytic plan

We used Stata/SE (version 12) to conduct all analyses. We used analysis of variance and chi-square global tests to compare homeless individuals by their living arrangement (outdoors, indoors unstable, and indoors stable). We used multiple imputation to fill missing values, assuming data to be missing at random ([Little & Rubin, 1987](#)). Each missing value was replaced with 20 plausible values using the Markov

chain Monte Carlo method ([Schaefer, 1997](#)). We conducted imputation for program and client variables independently. The highest rate of missing data for any variable in the sample was 16 percent. We developed, merged, and analyzed twenty imputed datasets using Stata's MI IMPUTE and MI ESTIMATE commands.

We also relied on Stata to conduct three multilevel negative binomial regression analyses models using MI ESTIMATE: NBREG with a log link function ([Stata Press, 2012](#)). The first model includes all program and individual variables except cultural competence and interactions with living arrangements. The second model adds cultural competence to the analysis, whereas the third and full model includes cultural competence and interactions with living arrangements. To obtain accurate estimates of standard errors, we controlled for the multilevel structure of the data (clients in programs) using the CLUSTER option ([Blakely & Woodward, 2000](#)). We relied on negative binomial regression with robust standard errors to analyze days of drug use, a measure that was overdispersed, with much greater than its mean ([Cameron & Trivedi, 2009](#)). We expressed the parameters presented in negative binomial regression as incidence rate ratios (IRRs). IRRs can be interpreted as the estimated rate ratio for a 1-unit increase in the independent variable, given other variables are held constant. For example, if a score for implementation of personal involvement in minority communities (range = 0–50) increased by 1 point, the ratio for number of days of drug use would decrease by an IRR factor of 0.437, holding all other variables in the model constant. We provide standardized IRRs in the results tables to identify and compare effect size, evaluated as the positive or negative distance from zero. For example, as [Table 2](#) indicates, the standardized IRR for program staff personal involvement in racial and ethnic minority communities is 0.673.

3. Results

3.1. Descriptive analyses

[Table 1](#) depicts the results of descriptive analyses by three types of living arrangement: outdoors ($n = 622$), indoors and unstable ($n = 508$), and indoors and stable ($n = 1028$). Individuals living indoors but unstable had the highest rate (28.15%) of history of mental illness. About 40 percent of participants living indoors were women. Most living indoors in stable settings identified their race and ethnicity as Latino or other. Blacks are predominant among those with unstable indoors arrangements and Whites among those living outdoors. Among respondents in all living arrangements the mean number of years of education completed was less than 12.

3.2. Hypotheses

We found partial support for Hypothesis 1, which posited that Homeless individuals living outdoors would report more days of drug use at discharge than those living in stable indoor settings. As [Table 1](#) shows, homeless people living outdoors reported the highest mean of 11.21 days of drug use in the 30 days prior to treatment, compared to 3.02 for those with unstable indoors living arrangements and 6.41 for those with stable indoors arrangements. However, after accounting for cultural competence and interactions with living arrangements in Model 3, we found a non-significant relationship between living arrangements and days of primary drug use (IRR = 1.272; 95% CI = 0.907, 1.784). See [Table 2](#).

We found partial support for Hypothesis 2, which posited that among all homeless individuals, higher degree of implementation of the six culturally competent program practices identified above will be associated with fewer days of primary drug use at discharge. Model 2, in [Table 2](#) shows two of the six practices related to the outcome. Higher levels of personal involvement in minority communities (IRR = 0.437; IRR standardized = 0.673; 95% CI = 0.222, 0.861) and outreach to minority communities (IRR = 0.406; IRR standardized = 0.665; 95%

Table 1
Sample Characteristics by Living arrangement (Type of homeless) (N = 2158).

Variables	Living Arrangement (Type of homeless)		
	Living outside (n = 622)	Living indoors but unstable (n = 508)	Living with friends and families (n = 1028)
Outcome			
Days of primary drug use at discharge (M, SD) [†]	11.21, 11.67	3.02, 7.56	6.41, 10.11
Individual Level Variables			
Race			
White [*]	32.74	20.92	46.33
Black [*]	27.74	35.73	36.53
Latino [*]	27.00	18.88	54.12
Other [*]	19.05	20.24	60.71
Female [*]	21.54	39.57	41.54
Years of education (M, SD)	11.37, 2.41	11.47, 2.71	11.35, 2.55
History of mental illness [*]	25.08	28.15	21.11
Treatment duration (M, SD) [†]	48.34, 65.18	84.85, 78.52	71.27, 76.94
Employed at admission	1.29	2.56	2.43
Primary drug used			
Heroin [*]	41.35	11.41	47.24
Alcohol	31.98	23.35	44.67
Methamphetamine [*]	20.35	23.68	55.96
Cocaine/Crack [*]	30.12	37.89	31.99
Marijuana/Hashis [*]	17.13	34.26	48.61
Others [*]	14.74	22.11	63.16
Social support (M, SD) [†]	1.96, 6.19	6.39, 11.11	2.91, 7.25
Eligible for medical	22.83	20.28	12.64
Program Level Variables			
Accredited by JCAHO [†]	34.36	22.09	36.19
Public funding	73.06	69.94	73.26
Medicaid [†]	80.42	67.00	72.66
Culture competence			
Knowledge [*]	26.05	22.88	35.83
Personal involvement [*]	19.87	57.8	32.32
Resources and linkages [*]	7.05	17.28	15.18
Staffing [*]	43.25	52.3	39.86
Policies and procedures [*]	32.97	41.96	44.64
Outreach [†]	13.75	50.65	27.38

Note. Figures represent percentage unless otherwise noted.

^{*} Means or frequencies are different across homelessness groups at $p < 0.05$.

CI = 0.213, 0.771) were associated with fewer days of drug use at discharge.

We found partial support for Hypothesis 3, which states that living arrangements (outdoors, indoors and unstable, or indoors and stable) will moderate the relationship between the degree of implementation for culturally competent program practices and days of primary drug use at discharge. Receiving treatment from programs with high levels of implementation of resources and linkages to minority communities was associated with fewer days of drug use among homeless individuals living outdoors (IRR = 0.364; IRR standardized = 0.867; 95% CI = 0.157, 0.844). See Model 3 in Table 2 and Fig. 1.

Beyond the hypothesized relationships, we note several individual variables associated with days of drug use at discharge. The strongest [positive] effect was on days of drug use at admission and days of drug use at discharge (IRR = 1.064; IRR standardized = 2.236; 95% CI = 1.045, 1.084). Treatment duration had a negative effect on days of drug use at discharge (IRR = 0.989; IRR standardized = 0.427; 95% CI = 0.985, 0.993), whereas history of mental illness had a strong positive effect on days of drug use (IRR = 1.574; IRR standardized = 1.214; 95% CI = 1.004, 2.469).

4. Discussion

Our findings underscore the need to consider living arrangements and delivering community-based culturally competent care to reduce

drug use among homeless individuals in SUD treatment. Homeless people living outdoors used their primary drug more days after discharge than other homeless individuals, as hypothesized. However, community-based culturally responsive practices played an important role in decreasing days of drug use among individuals in all living arrangements. Treatment staff's personal involvement in minority communities and outreach activities were associated with fewer days of drug use for homeless individuals with different living arrangements, partially supporting hypotheses 2. This is an important finding because it suggests that to improve treatment outcomes for homeless individuals, treatment programs need to be more embedded in their communities.

Our study also shows that evaluating differences by living arrangements in response to treatment is key to improving homeless client outcomes. When homeless individuals living outdoors were served by programs with high resources and linkages to health and social services, this group showed a decreased in days of drug use compared to indoor homeless individuals and low resource and linkage programs. This suggests that living arrangements moderate the effects of program resources and linkages on homeless individuals' drug use, an important preliminary finding as well. See Fig. 1.

The organizational cultural competence framework highlighted the significant value of programs learning about and connecting with minority communities to help improve homeless persons' recovery. Although internal culturally responsive program practices such as hiring, training, and services may boost treatment responsiveness, our findings show that external community practices (investing in communities and outreach) are critical to promoting sobriety among homeless individuals in general. In specific, linking community providers to outdoor homeless individuals was the only culturally responsive practice associated with reduced days of drug use. This finding is critical because programs serving the most vulnerable homeless individuals (i.e., living outdoors) reported the lowest implementation of community-based culturally competent practices (i.e., personal involvement, resources and linkages and outreach). This is an area where SUD treatment programs can improve and make a difference.

This is an important recommendation because persons living outdoors are most likely to face significant psychosocial stressors that compromise their response to treatment (Ibabe, Stein, Nyamathi, & Bentler, 2014) and their recovery efforts (Padgett et al., 2011). Using a culturally responsive framework based on racial and ethnic minority communities was helpful to understanding the service needs of homeless persons in Los Angeles County, where Latinos and African Americans are highly represented (Los Angeles Homeless Services Authority, 2017).

Our results also indicate differences between homeless people living with friends and relatives and those with other living arrangements. Homeless individuals living with family or friends used their primary drug more often than those living indoors in other venues such as shelters, cars, or motels. This could reflect increased surveillance and restrictions on drug use at shelters or motels on the one hand, and relatives and friends allowing or even promoting drug use on the other (Neaigus et al., 2006).

Consistent with previous research, our findings highlight the large effects of prior drug use, mental health, and treatment engagement on drug use at discharge (Frimpong, Guerrero, Kong, & Kim, 2016; Marsh, Cao, Guerrero, & Shin, 2009). These findings also suggest that treatment program officials should seriously consider homeless persons' living arrangements and drug use severity and psychosocial status in supporting recovery efforts.

4.1. Study limitations

Our findings have some limitations. First, the Los Angeles County Participant Reporting System does not focus on the treatment process or provide a comprehensive assessment of the availability of ancillary

Table 2
Negative binomial model of days of primary drug use after multiple imputation with fully conditional specification.

Individual level variables	IRR	IRRstd	SE	95% CI	IRR	IRRstd	SE	95% CI	IRR	IRRstd	SE	95% CI
Days of primary drug use at admission	1.070***	2.385	0.010	1.051, 1.089	1.065***	2.253	0.010	1.045, 1.085	1.064***	2.236	0.010	1.045, 1.084
Homeless ^a												
Living indoors unstable	1.096	1.040	0.274	0.669, 1.794	1.027	1.011	0.240	0.649, 1.626	1.154	1.063	0.298	0.694, 1.921
Living outside	1.415*	1.170	0.241	1.013, 1.977	1.184	1.079	0.198	0.852, 1.644	1.272	1.115	0.219	0.907, 1.784
Female	1.350*	1.154	0.201	1.007, 1.808	1.585*	1.246	0.312	1.078, 2.331	1.626*	1.261	0.344	1.074, 2.461
Race ^b												
Black	0.606	0.809	0.156	0.366, 1.003	0.832	0.925	0.234	0.479, 1.444	0.877	0.946	0.254	0.497, 1.547
Latino	1.174	1.081	0.207	0.831, 1.659	1.264	1.121	0.223	0.893, 1.788	1.259	1.119	0.225	0.887, 1.788
Other	1.834	1.124	1.067	0.536, 6.280	1.811	1.122	0.932	0.621, 5.284	1.815	1.122	0.936	0.620, 5.310
Years of education	1.050	1.134	0.033	0.987, 1.118	1.021	1.053	0.032	0.960, 1.085	1.016	1.041	0.031	0.957, 1.079
History of Mental illness	1.501	1.189	0.346	0.948, 2.376	1.586*	1.217	0.365	1.007, 2.499	1.574*	1.214	0.359	1.004, 2.469
Treatment duration	0.989***	0.449	0.002	0.986, 0.993	0.989***	0.429	0.002	0.985, 0.993	0.989***	0.427	0.002	0.985, 0.993
Employed	1.504	1.061	0.682	0.618, 3.661	1.294	1.038	0.530	0.579, 2.890	1.263	1.034	0.511	0.572, 2.790
Primary drug ^c												
Alcohol	0.602	0.822	0.177	0.338, 1.070	0.637	0.840	0.174	0.372, 1.089	0.623	0.833	0.173	0.361, 1.076
Methamphetamine	0.485*	0.727	0.164	0.249, 0.945	0.559	0.774	0.185	0.291, 1.074	0.567	0.779	0.184	0.299, 1.075
Cocaine/Crack	0.436*	0.744	0.178	0.195, 0.973	0.470	0.764	0.202	0.202, 1.093	0.459	0.757	0.197	0.197, 1.066
Marijuana/Hashis	0.541	0.832	0.201	0.261, 1.123	0.602	0.859	0.229	0.285, 1.273	0.562	0.841	0.216	0.263, 1.198
Others	0.740	0.940	0.263	0.367, 1.493	0.663	0.919	0.250	0.315, 1.394	0.666	0.920	0.248	0.320, 1.389
Social support	0.997	0.975	0.011	0.976, 1.019	0.997	0.973	0.009	0.980, 1.014	0.995	0.963	0.009	0.978, 1.013
Eligible for medical	0.984	0.994	0.196	0.666, 1.453	0.863	0.946	0.178	0.576, 1.294	0.853	0.941	0.174	0.571, 1.272
Program level variables												
Accreditation	1.160	1.072	0.382	0.608, 2.212	1.140	1.063	0.594	0.410, 3.165	1.124	1.056	0.585	0.405, 3.121
Public funding	2.361	1.279	1.072	0.969, 5.751	2.151	1.245	0.958	0.899, 5.148	2.130	1.241	0.949	0.889, 5.102
Medicaid	1.128	1.055	0.526	0.453, 2.811	0.931	0.969	0.381	0.418, 2.077	0.931	0.969	0.380	0.418, 2.070
Cultural competence												
Knowledge					0.838	0.922	0.221	0.501, 1.405	0.832	0.918	0.222	0.492, 1.405
Personal involvement					0.441*	0.676	0.153	0.223, 0.870	0.437*	0.673	0.151	0.222, 0.861
Resources and linkages					1.608	1.172	0.898	0.538, 4.805	2.285	1.318	1.376	0.701, 7.445
Staffing					1.828	1.350	0.650	0.910, 3.672	1.842	1.354	0.642	0.929, 3.650
Policies and procedures					0.461*	0.681	0.177	0.217, 0.982	0.467	0.685	0.181	0.218, 1.003
Outreach					0.421**	0.676	0.136	0.224, 0.792	0.406**	0.665	0.133	0.213, 0.771
Cross level interactions												
Resources and linkages* indoor unstable ^a									0.386	0.833	0.195	0.143, 1.041
Resources and linkages* outdoor ^a									0.364*	0.867	0.156	0.157, 0.844
Alpha	3.08		1.709	1.038, 9.136	2.699		1.487	0.917, 7.945	2.679		1.473	0.912, 7.869

^a Living indoor stable.
^b White as reference.
^c Heroin as reference.
 ** p < 0.01.
 *** p < 0.001.

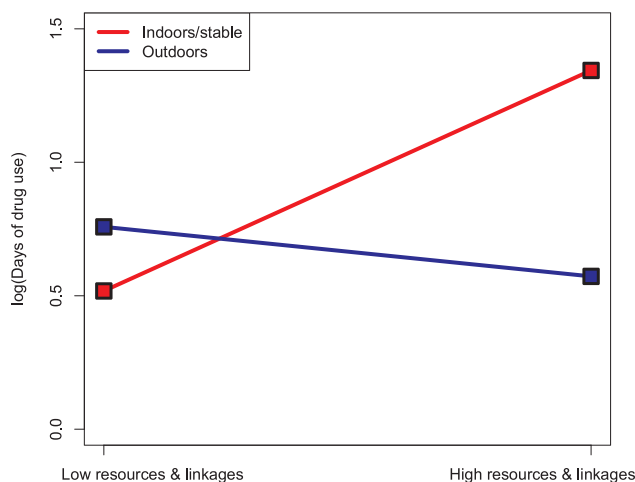


Fig. 1. Influence of interaction of homeless persons' living arrangements (indoors and stable; outdoors) and program cultural competence (low or high resources and linkages) on days of primary drug use.

services. Therefore, we could not analyze the effects of ancillary services, including their capacity or the quality of care on drug use at discharge. In particular, housing and mental health and primary care services, in addition to drug treatment, are very important for homeless

persons seeking to achieve sobriety and therefore require extensive consideration in future analyses.

Second, these data, which is from 2011 did not permit causal assessments of the relationships between key covariates and days of primary drug use at discharge. For example, the observed associations between involvement in minority communities and clients' subsequent reduced drug use could be due to reverse causality. Clients referred to programs that were more invested in minority communities may have had access to additional services and oversight that decreased their drug use at discharge. We could not isolate the causal effects of programs' culturally competent practices (and other covariates) because the data were not longitudinal. Measuring causal effects would require panel data and sophisticated econometric techniques.

Third, our categorization of homeless individuals also may not be comprehensive regarding the structure of living arrangements and the chronicity of homelessness. These limitations do not offset the strengths of this study. These include examination of one of the largest samples of urban homeless people in drug treatment and the highlighting of the relationship of different living arrangements, program quality (as measured by culturally competent practices) and client drug use. Nevertheless, there is a clear need for longitudinal approaches and refined measures to explicate the treatment processes that are most effective for homeless individuals living in urban settings.

4.2. Implications for program evaluation and planning

Our results have several implications for program evaluation and planning. Previous research suggests that living conditions can have critical effects on recovery among homeless people (Padgett et al., 2006; Padgett, Stanhope, Henwood, & Stefancic, 2011). Our findings suggest homeless individuals living outdoors are at a greater risk of continued drug use, and that treatment programs should focus on linking them to health and social services to improve their drug use outcomes. Our work provides preliminary evidence of differences by type of homelessness in reduction of drug use at discharge. Individuals living outdoors greatly benefited from providers who were personally involved in racial and ethnic minority communities and conducted outreach in those communities. These are critical practices to establish a trusting relationship with homeless individuals and support their recovery. Providers have a unique opportunity to connect with a population with a history of disenfranchisement and isolation and with immediate need for care and support. Although it was not clear to what extent providers were responsive to unique homeless culture, our findings suggest that recovery efforts among homeless individuals living outdoors are best supported by programs with greater resources and linkages with minority communities. As Los Angeles County begins developing structural strategies to coordinate housing, health, and social services efforts to combat homelessness (County of Los Angeles Homeless Initiative, 2016), our findings provide much-needed detail on promising SUD treatment practices for homeless persons in varying living arrangements.

Declaration of interest

No conflict of interest declared.

Acknowledgements

Support for this research and manuscript preparation was provided by funding from the National Institute on Drug Abuse grant [blinded]. We appreciate [blinded] for support related to accessing administrative data. We also thank the treatment providers for their participation in this study. We also would like to acknowledge [blinded] for proof-reading this paper.

References

- Amodeo, M., Chassler, D., Oettinger, C., Labiosa, W., & Lundgren, L. M. (2008). Client retention in residential drug treatment for Latinos. *Evaluation and Program Planning*, 31(1), 102–112.
- Amodeo, M., Lundgren, L., Cohen, A., Rose, D., Chassler, D., Beltrame, C., et al. (2011). Barriers to implementing evidence-based practices in addiction treatment programs: Comparing staff reports on motivational interviewing, adolescent community reinforcement approach, assertive community treatment, and cognitive-behavioral therapy. *Evaluation and Program Planning*, 34(4), 382–389.
- Baumohl, J., & Huebner, R. B. (1991). Alcohol and other drug problems among the homeless: Research, practice, and future directions. *Housing Policy Debate*, 2, 837–866. <http://dx.doi.org/10.1080/10511482.1991.9521074>.
- Blakely, T. A., & Woodward, A. J. (2000). Ecological effects in multi-level studies. *Journal of Epidemiology & Community Health*, 54, 367–374. <http://dx.doi.org/10.1136/jech.54.5.367>.
- Brach, C., & Fraser, I. (2000). Can cultural competency reduce racial and ethnic health disparities a review and conceptual model. *Medical Care Research and Review*, 57(Suppl. 1), 181–217. <http://dx.doi.org/10.1177/1077558700057001S09>.
- Burt, M. R. (2001). What will it take to end homelessness. Retrieved from <http://www.urban.org/sites/default/files/alfresco/publication-pdfs/310305-What-Will-It-Take-To-End-Homelessness-.PDF>.
- Cameron, A. C., & Trivedi, P. K. (2009). *Microeconometrics using stata*. College Station, TX: Stata Press.
- Campbell, C. I., & Alexander, J. A. (2002). Culturally competent treatment practices and ancillary service use in outpatient substance abuse treatment. *Journal of Substance Abuse Treatment*, 22, 109–119. [http://dx.doi.org/10.1016/S0740-5472\(02\)00221-0](http://dx.doi.org/10.1016/S0740-5472(02)00221-0).
- County of Los Angeles Homeless Initiative. (2016). Draft recommended strategies to combat homelessness. Retrieved from <http://priorities.lacounty.gov/wp-content/uploads/2016/01/Draft-Recommendations.pdf>.
- Cross, T., Bazron, B., Dennis, K., & Isaacs, M. (1989). *Towards a culturally competent system of care*. Washington, DC: Georgetown University Child Development Center, CASSP Technical Assistance Center.
- Drake, R. E., O'Neal, E. L., & Wallach, M. A. (2008). A systematic review of psychosocial research on psychosocial interventions for people with co-occurring severe mental and substance use disorders. *Journal of Substance Abuse Treatment*, 34, 123–138. <http://dx.doi.org/10.1016/j.jsat.2007.01.011>.
- Folsom, D. P., Hawthorne, W., Lindamer, L., Gilmer, T., Bailey, A., Golshan, S., et al. (2005). Prevalence and risk factors for homelessness and utilization of mental health services among 10,340 patients with serious mental illness in a large public mental health system. *American Journal of Psychiatry*, 162, 370–376. <http://dx.doi.org/10.1176/appi.ajp.162.2.370>.
- Frimpong, J. A., Guerrero, E. G., Kong, Y., & Kim, T. (2016). Abstinence at successful discharge in publicly funded addiction health services. *The Journal of Behavioral Health Services & Research*, 43(4), 661–675.
- González, H. M., Vega, W. A., & Tarraf, W. (2010). Health care quality perceptions among foreign-born Latinos and the importance of speaking the same language. *Journal of the American Board of Family Medicine*, 23, 745–752. <http://dx.doi.org/10.3122/jabfm.2010.06.090264>.
- Guerrero, E. G., & Andrews, C. M. (2011). Cultural competence in outpatient substance abuse treatment: Measurement and relationship to wait time and retention. *Drug & Alcohol Dependence*, 119, e13–e22. <http://dx.doi.org/10.1016/j.drugalcdep.2011.05.020>.
- Guerrero, E. G., & Kim, A. (2013). Organizational structure, leadership and readiness for change and the implementation of organizational cultural competence in addiction health services. *Evaluation and Program Planning*, 40, 74–81. <http://dx.doi.org/10.1016/j.evalprogplan.2013.05.0>.
- Guerrero, E. G., Campos, M., Urada, D., & Yang, J. C. (2012). Do cultural and linguistic competence matter in Latinos' completion of mandated substance abuse treatment. *Substance Abuse Treatment Prevention and Policy*, 7, 34. <http://dx.doi.org/10.1186/1747-597X-7-34>.
- Guerrero, E. G. (2013). Enhancing access and retention in substance abuse treatment: The role of Medicaid payment acceptance and cultural competence. *Drug & Alcohol Dependence*, 132, 555–561. <http://dx.doi.org/10.1016/j.drugalcdep.2013.04.005>.
- Harper, M., Hernandez, M., Nessman, T., Mowery, D., Worthington, J., & Issacs, M. (2009). *Organizational cultural competence: A review of assessment protocols*. Tampa, FL: University of South Florida, Louis de la Parte Florida Mental Health Institute, College of Behavioral and Community Sciences, Department of Child and Family Studies, Research and Training Center for Children's Mental Health.
- Henwood, B. F., Byrne, T., & Scriber, B. (2015). Examining mortality among formerly homeless adults enrolled in Housing First: An observational study. *BMC Public Health*, 15, 1209. <http://dx.doi.org/10.1186/s12889-015-2552-1>.
- Hwang, S. W., Tolomiczenko, G., Kouyoumdjian, F. G., & Garner, R. E. (2005). Interventions to improve the health of the homeless: A systematic review. *American Journal of Preventive Medicine*, 29. <http://dx.doi.org/10.1016/j.amepre.2005.06.017>.
- Ibabe, I., Stein, J. A., Nyamathi, A., & Bentler, P. M. (2014). Predictors of substance abuse treatment participation among homeless adults. *Journal of Substance Abuse Treatment*, 46, 374–381.
- Johnson, T. P., Freels, S. A., Parsons, J. A., & Vangeest, J. B. (1997). Substance abuse and homelessness: Social selection or social adaptation. *Addiction*, 437–445.
- Kashner, T. M., Rosenheck, R., Campinell, A. B., & Suris, A. (2002). Impact of work therapy on health status among homeless, substance dependent veterans: A randomized controlled trial. *Archives of General Psychiatry*, 59, 938–944. <http://dx.doi.org/10.1001/archpsyc.59.10.938>.
- Lewin Group. (2001). Health Resources and Services Administration study on measuring cultural competence in health care delivery settings. Retrieved from <http://www.lewin.com/publications/publication/251>.
- Little, R. J. A., & Rubin, D. B. (1987). *Statistical analysis with missing data*. New York, NY: John Wiley and Sons.
- Los Angeles Homeless Services Authority. (2017). 2015 Greater Los Angeles Homeless Count. Retrieved from <https://www.lahsa.org/homeless-count/reports>.
- Marsh, J., Cao, C., Guerrero, D., & Shin, H.-C. (2009). Need-service matching in substance abuse treatment: Racial/ethnic differences. *Evaluation and Program Planning*, 32, 43–51. <http://dx.doi.org/10.1016/j.evalprogplan.2008.09.003>.
- Mason, J. L. (1995). *Cultural competence self-assessment questionnaire: A manual for users*. Portland, OR: Portland State University, Research and Training Center on Family Support and Children's Mental Health.
- McCarty, D., Argeriou, M., Huebner, R. B., & Lubran, B. (1991). Alcoholism, drug abuse, and the homeless. *American Psychologist*, 46, 1139–1148. <http://dx.doi.org/10.1037/0003-066X.46.11.1139>.
- Milby, J. B., Schumacher, J. E., Raczynski, J. M., Caldwell, E., Engle, M., Michael, M., et al. (1996). Sufficient conditions for effective treatment of substance abusing homeless persons. *Drug and Alcohol Dependence*, 43, 39–47. [http://dx.doi.org/10.1016/S0376-8716\(96\)01286-0](http://dx.doi.org/10.1016/S0376-8716(96)01286-0).
- National Alliance to End Homelessness. (2016). The State of Homelessness in America. <https://endhomelessness.org/homelessness-in-america/homelessness-statistics/state-of-homelessness-report/>.
- National Coalition for the Homeless. (2009). Substance abuse and homelessness. Retrieved from <http://www.nationalhomeless.org/factsheets/addiction.pdf>.
- Neaigus, A., Gyarmathy, V. A., Miller, M., Frajzyngier, V. M., Friedman, S. R., & Des Jarlais, D. C. (2006). Transitions to injecting drug use among noninjecting heroin users: Social network influence and individual susceptibility. *Journal of Acquired Immune Deficiency Syndromes*, 41, 493–503. <http://dx.doi.org/10.1097/01.qai.0000186391.49205.3b>.
- O'Connell, J. J. (2005). *Premature mortality in homeless populations: A review of the literature*. Nashville, TN: National Health Care for the Homeless Council.

- Office of Minority Health. (2001). National standards for culturally and linguistically appropriate services in health care: Final report. Retrieved from <http://minorityhealth.hhs.gov/assets/pdf/checked/finalreport.pdf>.
- Padgett, D. K., Gulcur, L., & Tsemberis, S. (2006). Housing First services for people who are homeless with co-occurring serious mental illness and substance abuse. *Research on Social Work Practice, 16*, 74–83. <http://dx.doi.org/10.1177/1049731505282593>.
- Padgett, D. K., Stanhope, V., Henwood, B. F., & Stefancic, A. (2011). Substance use outcomes among homeless clients with serious mental illness: Comparing Housing First with treatment first programs. *Community Mental Health Journal, 47*, 227–232. <http://dx.doi.org/10.1007/s10597-009-9283-7>.
- Prince Inniss, J. P., Nessman, T., Mowery, D., Callejas, L. M., & Hernandez, M. (2009). *Serving everyone at the table: Strategies for enhancing the availability of culturally competent mental health service*. Tampa, FL: University of South Florida, College of Behavioral and Community Sciences, Louis de la Parte Florida Mental Health Institute, Department of Child and Family Studies, Research and Training Center for Children's Mental Health.
- Rhoades, H., Wenzel, S. L., Golinelli, D., Tucker, J. S., Kennedy, D. P., Green, H. D., et al. (2011). The social context of homeless men's substance use. *Drug and Alcohol Dependence, 118*, 320–325.
- Robertson, M. J., Zlotnick, C., & Westerfelt, A. (1993). Homeless adults: A special population in public alcohol treatment programs. *Contemporary Drug Problems, 20*, 499–520.
- Rubin, D. B. (1987). *Multiple imputation for nonresponse in surveys*. New York, NY: John Wiley & Sons.
- Saha, S., Komaromy, M., Koepsell, T. D., & Bindman, A. B. (1999). Patient-physician racial concordance and the perceived quality and use of health care. *Archives of Internal Medicine, 159*, 997–1004. <http://dx.doi.org/10.1001/archinte.159.9.997>.
- Saha, S., Taggart, S. H., Komaromy, M., & Bindman, A. B. (2000). Do patients choose physicians of their own race. *Health Affairs, 19*, 76–83. <http://dx.doi.org/10.1377/hlthaff.19.4.76>.
- Schaefer, J. L. (1997). *Analysis of incomplete multivariate data*. New York, NY: Chapman & Hall/CRC.
- Slesnick, N., & Erdem, G. (2013). Efficacy of ecologically-based treatment with substance-abusing homeless mothers: Substance use and housing outcomes. *Journal of Substance Abuse Treatment, 45*, 416–425. <http://dx.doi.org/10.1016/j.jsat.2013.05.008>.
- Slesnick, N., Kang, M. J., Bonomi, A. E., & Prestopnik, J. L. (2008). Six- and twelve-month outcomes among homeless youth accessing therapy and case management services through an urban drop-in center. *Health Services Research, 43*, 211–229. <http://dx.doi.org/10.1111/j.1475-6773.2007.00755.x>.
- StataCorp. (2012). Stata 12 help for nbreg. Retrieved from <http://www.stata.com/help.cgi?nbreg>.
- Substance Abuse and Mental Health Services Administration. (2013). The 2013 Annual Homeless Assessment Report (AHAR) to Congress. Retrieved from <https://www.hudexchange.info/resources/documents/AHAR-2013-Part1.pdf>.
- Sue, S., Fujino, D. C., Hu, L., Takeuchi, D. T., & Zane, N. W. S. (1991). Community mental health services for ethnic minority groups: A test of the cultural responsiveness hypothesis. *Journal of Consulting and Clinical Psychology, 59*, 533–540. <http://dx.doi.org/10.1037/0022-006X.59.4.533>.
- Weech-Maldonado, R. (2002). *Organizational support standards for culturally and linguistically appropriate services (CLAS): Core concepts, content knowledge, and core skills*. Washington, DC: U.S. Department of Health and Human Services, Office of Minority Health.
- Wells, K. B., Klap, R., Koike, A., & Sherbourne, C. D. (2001). Ethnic disparities in unmet need for alcoholism, drug abuse, and mental health care. *American Journal of Psychiatry, 158*, 2027–2032. <http://dx.doi.org/10.1176/appi.ajp.158.12.2027>.
- Zivanovic, R., Milloy, M. J., Hayashi, K., Dong, H., Sutherland, C., Kerr, T., et al. (2015). Impact of unstable housing on all-cause mortality among persons who inject drugs. *BMC Public Health, 15*, 106. <http://dx.doi.org/10.1186/s12889-015-1479-x>.
- Erick G. Guerrerois** an Associate Professor at Suzanne Dworak-Peck School of Social Work and Marshall School of Business. His research focuses on building organizational capacity to implement culturally responsive and evidence-based practices and eliminate health disparities.
- Ahyoung Song** is an Assistant Professor at Department of Social Welfare, Gachon University, Seongnam, South Korea. Her research focuses on the socio-cultural and epidemiological aspects of homelessness.
- Benjamin Henwood** is an Assistant Professor at Suzanne Dworak-Peck School of Social Work. His research focuses on the evaluation of the complex service environment for individuals with serious mental illness who have experienced homelessness.
- Yinfei Kong** is an Assistant Professor at Mihaylo College of Business and Economics, California State University, Fullerton. His research focuses on multilevel statistical models, variable selection methods and models to analyze big data.
- Tina Kim** is the Chief of the Epidemiology and Science Division at Los Angeles County Department of Public Health, Substance Abuse Prevention and Control. Her research interest is in acculturation and quality of care for racial and ethnic minority groups