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Factors affecting exits from homelessness among persons with serious mental illness and substance use disorders

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Abstract

Objective—We sought to understand the housing trajectories of homeless consumers with serious mental illness (SMI) and co-occurring substance use disorders (SUD) and to identify factors that best-predicted achievement of independent housing.

Methods—Using administrative data, we identified homeless persons with SMI and SUD admitted to a residential rehabilitation program from 12/2008-11/2011. On a random sample (n=36), we assessed a range of potential predictors of housing outcomes, including symptoms, cognition, and social/community supports. We used the Residential Time-Line Follow-Back (TLFB) Inventory to gather housing histories since exiting rehabilitation and identify housing outcomes. We used recursive partitioning to identify variables that best-differentiated participants by these outcomes.

Results—We identified three housing trajectories: stable housing (n=14); unstable housing (n=15); and continuously engaged in housing services (n=7). Using recursive partitioning, two variables (symbol digit modalities test (SDMT), a neurocognitive speed of processing measure and Behavior and Symptom Identification Scale (BASIS)-relationships subscale, which quantifies

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symptoms affecting relationships) were sufficient to capture information provided by 26 predictors to classify participants by housing outcome. Participants predicted to continuously engage in services had impaired processing speeds (SDMT score<32.5). Among consumers with SDMT score≥32.5, those predicted to achieve stable housing had fewer interpersonal symptoms (BASIS-relationships score<0.81) than those predicted to have unstable housing. This model explains 57% of this sample's variability and 14% of this population's variability in housing outcomes.

Conclusion—As cognition and symptoms influencing relationships predicted housing outcomes for homeless adults with SMI and SUD, cognitive and social skills trainings may be useful for this population.

INTRODUCTION

Though substantial research explores pathways into homelessness,[1-3] few studies investigate factors influencing exits from homelessness. In particular, many homeless persons with serious mental illness (SMI) and co-occurring substance use disorders (SUD) struggle to obtain and sustain housing.[3-5] There is a dearth of knowledge about patient-level factors, e.g., social supports or cognitive functioning, that may influence exits from homelessness. Moreover, the literature lacks longitudinal descriptions of housing trajectories for homeless adults.

To date, studies of social support among homeless persons focus primarily on relationships between social network members who engage in risky behaviors, e.g., drug use, and these behaviors in homeless persons.[6-8] Though social networks may influence risky activities, the impact of supports on exits from homelessness remains largely unexplored. Though Rosenheck and colleagues[9] evaluated the relationships between social capital and service integration on housing outcomes in homeless persons with SMI, analyses were performed at the community—not individual—level. That is, instead of measuring social supports of individual consumers, environmental variables and social service integration were evaluated in their communities. With these methods, higher social capital and service integration predicted better housing outcomes.[9]

In addition, though cognition—including attention, memory, executive functioning, and processing speed—is associated with social relationships and other functional outcomes among persons with SMI,[10-14] we know little about cognition among homeless adults.[14] Though Schutt and colleagues found that neurocognition was related to functional outcomes among formerly homeless persons with SMI, this study was limited to individuals who had achieved stable housing.[13]

Moreover, exits from homelessness are often facilitated by clinical services. Traditionally, these services were offered along a continuum, with consumers progressing from shelters, to transitional housing, to residential treatment, and eventually independent housing as they grew adherent with mental healthcare.[15-17] In recent years, service paradigms grew to include “Housing First” approaches, i.e., independent housing with community-based supportive services, including non-mandated treatment referrals.[18-21] Though services now span both models, we lack clinical guidelines to personalize care for consumers and appropriately allocate resources.

This paper describes a study of homeless adults with SMI and SUD (n=36) who participated in a residential rehabilitation program along the aforementioned continuum. We sought to understand the longitudinal housing trajectories of these patients and to identify modifiable patient- and environmental-level factors that best-predicted achievement of independent housing, i.e., successful exits from homelessness. We use our results to suggest clinical interventions that may improve housing outcomes.

METHODS

Participants

Using the Veterans Health Administration Medical SAS Data, an administrative dataset of VA healthcare utilization, we identified consumers admitted to the VA Greater Los Angeles' Domiciliary—a residential rehabilitation program for homeless adults—between 12/1/2008-11/1/2011. We restricted this dataset to individuals with ≥1 SMI diagnosis (International Classification of Diseases (ICD)-9 code for major depressive disorder, bipolar disorder, post-traumatic stress disorder (PTSD), schizophrenia, schizoaffective disorder, or psychotic disorder not otherwise specified) and ≥1 SUD diagnosis (ICD-9 code for alcohol or drug abuse or dependence) from an inpatient or outpatient mental health setting within a year of Domiciliary admission. Of note, individuals with cognitive disorders, e.g., dementia, are not admitted to the Domiciliary.

We selected a random subsample (n=114) of eligible participants (n=701) to approach with letters and phone calls. Many (n=38) could not be reached, others (n=33) declined to participate, and a few (n=7) expressed interest but never presented for data collection. We enrolled 36 participants. The VA Greater Los Angeles Institutional Review Board approved all study procedures.

Conceptual Framework

To study the influence of individual- and environmental-factors on independent housing achievement, we adapted Wilson and Cleary's conceptual framework for health-related quality of life (HRQoL) to our outcome of interest (independent housing).[22,23] Figure 1 displays our model's interplay between biological and physiological factors, symptoms, functioning, and health perceptions to influence an outcome that, like HRQoL, is related, but distinct to health (independent housing).[22]

Procedure

From November 2012-July 2013, participants completed surveys and cognitive testing, as described below. Informed consent and data collection were performed in one 60-90 minute session. Research staff also reviewed participants' electronic medical records (EMR). Diagnostic information from the EMR was also abstracted for consumers in the random subsample of eligible participants who did not enroll in the study (n=78).

Measures

Potential Predictors

Table 1 summarizes the measures used to assess potential predictors of housing outcomes: To assess demographics, participants were asked their age, gender, race/ethnicity, marital status, and highest level of education. The Domiciliary discharge summary in the EMR was used to abstract SMI and SUD diagnoses for all participants and other eligible subjects in our random subsample.

Psychiatric symptoms were measured with the 24-item Behavior and Symptom Identification Scale (BASIS-24®), a measure of self-reported difficulty in six domains (depression/functioning, interpersonal relations, psychotic symptoms, alcohol/drug use, emotional lability, and self-harm) that also provides a global symptom assessment.[24] As trauma may increase risk for homelessness,[25] we administered the 17-item PTSD Checklist-Military version (PCL-M).[26,27] Screening for alcohol and/or drug misuse was performed with the Alcohol Use Disorders Identification Test-Consumption Questions (AUDIT-C)[28] and the 20-item Drug Abuse Screening Test (DAST-20),[29] respectively.

In the domain of functional status, cognition was measured with four tests: the Hopkins Verbal Learning Test-Revised (HVLT-R);[30] Symbol Digit Modalities Test (SDMT);[31] category fluency;[32] and Trail Making Test B (TMT B).[33] These measures span a breadth of neurocognitive domains, e.g., verbal fluency/learning/memory, motor/processing speeds, semantic organization, and executive functioning.

Domiciliary admission documentation in the EMR was used to identify participants who were chronically homeless,[34] i.e., continuously homeless for ≥1 year or with ≥4 episodes of homelessness within the past three years. To assess legal history, participants reported if they had ever received a felony (yes/no) and estimated their lifetime duration of incarceration.

General health perceptions were captured with the Veterans RAND 12-item Health Survey (VR-12), which assesses perceived physical and mental health.[35,36] Perceived social support was measured with the Medical Outcomes Study-Social Support Survey (MOS-SSS)[37] and the Social Capital Resource Generator[38,39] was used to assess social network resources. As a surrogate for negative supports, we measured stigma with the Perceived Devaluation and Discrimination Scale (PDD).[40,41] Community involvement was captured with the Involvement in Community Activities Scale,[39,42] adapted from a larger Independent Living Skills Scale[42] to assess engagement in common community activities, and the Community Integration Measure (CIM),[43] which quantifies persons' sense of community belonging. Moreover, participants were queried as to participation in vocational activities—stratified by type—over the past six months.

To capture use of mental healthcare (VA and community settings), we asked participants to estimate their number of individual mental health appointments over the past six months. To understand housing service utilization, we asked if participants engaged in the VA's Housing First initiative—HUDVA Supportive Housing (VASH)—or in any other housing program.[19]

Outcome Variable—Housing trajectories from Domiciliary exit to the interview date were captured with the Residential Time-Line Follow-Back (TLFB) Inventory.[44] The TLFB gathers a retrospective event history of an individual's residences. Following Tsemberis and colleagues' protocol,[45] all residences were categorized into "stable" vs. "unstable" settings.

We used the TLFB to categorize participants by their housing trajectories. We were interested in predictors of stable housing obtained outside the context of a formal housing program. That is, some participants completed the Domiciliary but required another residential rehabilitation program immediately thereafter—we viewed these successive efforts as a single, extended residential treatment program and started the event histories of these individuals at the day of discharge from the second residential program. For individuals who attempted independent housing immediately after the Domiciliary, we started the event histories at the day of discharge.

We continued these housing trajectories to the day of data collection or, if applicable, the date of entry into an apartment obtained through the VA's Housing First program (HUD-VASH). Again, we viewed HUD-VASH as a formal housing program that did not reflect a participant's ability to independently secure and maintain stable housing. Following this protocol, using the TLFB's definitions, we calculated the percent of days participants spent in stable housing, without programmatic supports.

Analysis Plan

Using data from the TLFB, we looked for cut-points that created mutually exclusive categories of housing outcomes. We decided to view this outcome as categorical, not continuous, given substantive differences in types of housing achieved, e.g., independent housing vs. chronic institutionalization, that are more clinically relevant than the percentage of days in stable housing. We used the χ^2 test and analysis of variance (ANOVA) to determine how demographic and diagnoses varied by housing outcome. Analyses were performed in Stata/SE 12.1.[46]

We used recursive partitioning (RP) to identify which combination of potential predictors and corresponding scores best-differentiated participants by these categorical housing outcomes. RP is a data mining technique that uses "decision trees" to predict outcomes from a group of predictor variables.[47,48] In particular, this nonparametric methodology facilitates exploration of complex and potentially overlapping predictor variables. For this analysis with 26 predictor variables, RP analysis began by independently evaluating each predictor on the categorical outcome variable. The variable and its corresponding cut-point (or value) that best split the data into two subsamples of housing outcomes was selected as the first predictor, or the first "two branches" of a "classification and regression tree (CART)."[47,48]

Subsequently, this process was repeated on each of the two newly created subsamples, again identifying the variable and its value that best-predicted the most homogenous subsamples within each previously formed branch. Branching continued until there was no further improvement in correct differentiation of participants by housing outcome. Here, this approach aimed to simplify a complex set of 26 potential predictor variables into a few

simple “if-then” rules that predicted outcomes.[47,48] These analyses were performed with the RP algorithm in the rpart package version 3.1-33 for the R language and environment.[49]

RESULTS

Using the TLFB, all participants clearly divided into one of three mutually exclusive longitudinal housing trajectories: 1) stable housing (70-100% days in stable housing outside a housing program, n=14); 2) unstable housing (0-45% days in stable housing outside a housing program, n=15); and 3) continuously engaged in housing programs (no days spent outside a housing program, n=7). The TLFB captured housing status between Domiciliary discharge and data collection, which averaged 2.5 years (range 1.2-4.3 years).

Table 2 describes these groups across demographics, diagnoses, and housing histories. Participants continuously engaged in housing services were about a decade older than their peers in the other groups. All participants were male and very few were married. One-half of participants self-identified as African American and a quarter self-identified as Caucasian. Similar educational attainment was seen across groups.

Participants spanned a breadth of SMI diagnoses, similar across groups. Most participants were diagnosed with PTSD (41.2%), followed by Major Depressive Disorder (33.3%). Among participants who achieved stable housing, most had concurrent alcohol abuse or dependence (42.9%). Among those with unstable housing and individuals continuously engaged in housing services, the most prevalent SUD diagnosis was polysubstance abuse or dependence (46.7% and 71.4%, respectively). Of note, the diagnoses of enrolled participants and other consumers approached to participate were not significantly different.

Most participants (77.8%) were chronically homeless at Domiciliary admission. Of note, most participants engaged in HUD-VASH at some point in their housing trajectory. As HUD-VASH is a housing program, time spent enrolled in this program was not included in the denominator of days spent independently seeking housing, without supports. All participants continuously engaged in housing services were enrolled in HUD-VASH. No participants received housing services outside the VA.

Recursive partitioning

In RP analyses, all measures except demographics, diagnoses, and HUD-VASH participation (viewed as non-malleable, poor targets for intervention development) were used as potential predictors of housing trajectories. Figure 2 depicts the best possible model for these data, highlighting the two variables (symbol digit modalities test, a neurocognitive speed of processing measure and the BASIS-24-relationships subscale, which measures symptoms that influence interpersonal relationships) that were sufficient to capture information provided by all 26 predictors to classify participants by housing outcome.

In a normative sample of adults aged 45-54 years with 12 years of education, the mean SDMT raw score is 47.3 (standard deviation=9.6).[31] In these analyses, the group predicted to remain continuously engaged in housing services had impaired processing speeds (SDMT

raw score<32.5). This cut-off score is over one standard deviation below normative values and suggests marked cognitive impairment.

Among persons with SDMT scores above this cut-off (SDMT raw score≥32.5), persons predicted to achieve stable housing had fewer symptoms influencing interpersonal difficulties (BASIS-relationships raw score<0.81) than those predicted to be unable to achieve stable housing (BASIS-relationships raw score≥0.81). In normative outpatient mental health samples (Domiciliary patients engage in outpatient mental health as they receive residential housing services), the mean and standard deviation of the BASIS-relationships score for patients are 1.2 and 0.9, respectively.[24] That is, this BASIS-relationships cut-off score is better than that seen in the average outpatient consumer.

This decision tree correctly classifies 66.7% of participants continuously engaged in housing services, 76.9% of participants with stable housing, and 78.6% of participants with unstable housing (or 75% of participants overall). The model explains 57% of variance in this sample (relative error=0.43). Based on cross-validation, it also explains 14% of variability in housing outcomes in the population at large (cross-classified standard error=0.86).

DISCUSSION

To tailor interventions for homeless adults with SMI and SUD, we must identify predictors of achieving independent housing and factors that suggest some consumers' need for continuous housing supports. Though these findings are exploratory in light of our small sample size, this is one of the first studies of factors affecting exits from homelessness in this population. In predicting longitudinal housing trajectories among adults with SMI and SUD, these data show the potential influence of **age, substance(s) misused,** neurocognition and psychiatric symptoms that affect relationships.

We found three key housing outcomes. A small proportion of participants simply moved sequentially from one housing program to another. Among the remaining participants, about half spent most (>70%) of their days in independent, stable housing while their peers struggled to achieve stable housing without supports (<45% of days in stable housing).

Participants continuously engaged in housing services were older than their peers. We query if this group had more age-related medical problems and favored more supportive settings. In addition, those with stable housing had more alcohol misuse while participants in the other groups had more polysubstance abuse/dependence. Of note, the latter diagnosis inherently includes the purchase and/or use of illicit substances, often tied with criminal-justice involvement and/or strained ties with family and friends that may influence one's ability to secure housing.

Using recursive partitioning to identify malleable factors that best-predicted housing outcomes, we elucidated interplay between SDMT scores and BASIS-relationships subscale scores. Of note, though SDMT reflects processing speed, it employs multiple processes, i.e., perception, working memory, attention, and visuomotor coordination,[50] and is among the most sensitive tests for detecting cognitive dysfunction across a range of disorders.[48,51,52]

These data suggest that, for homeless individuals with SMI and SUD, poor cognition as measured by the SDMT may be incompatible with independent housing without supports.

These findings parallel other studies of functional outcomes for individuals with SMI, where cognitive abilities are associated with employment outcomes and success in rehabilitation programs.[48,53-55] Upon enrollment into homeless programs, screening with measures like the SDMT may help guide resource allocation. Consumers with markedly impaired processing speed may be best suited to Housing First approaches that provide long-term, community-based supports. Cognitive remediation—shown to improve response to vocational training among persons with SMI[56-58]—may have a role in homeless programs.

Though individuals with better cognition may attempt independent housing, those with symptoms that negatively affect relationships (measured by the BASIS-relationships subscale score and likely worsened by illicit substance use in persons with polysubstance abuse/dependence) may struggle to obtain stable housing without support. To address these symptoms and potentially improve housing outcomes, these findings suggest the utility of social skills training within residential programs for homeless persons.

This study has limitations. **These data are from a** small, cross-sectional sample of **male Veterans** in Los Angeles who receive VA care and may not extrapolate well to other populations. Veterans often have experiences that differ from civilians, e.g., combat exposure, and women may have unique factors affecting exits from homelessness. Though enrolled consumers were diagnostically similar to those who refused to participate, our sample may preferentially include persons with higher rates of institutionalization, e.g., those who lived on VA grounds. Moreover, with cross-sectional data collection, participants' current housing status may cloud self-reported scores, e.g., social capital, psychiatric symptoms affecting interpersonal relationships, and/or perceived health may be worsened in the context of unstable housing. To improve external validity, this study would benefit from replication in a larger, prospective **study**, with potential predictors of housing outcomes collected at baseline.

Though the TLFB is a valid and reliable method to assess housing outcomes among persons with SMI and SUD,[44] its test-retest reliability for the duration of time at any given residence decreases as the time between occupancy and recall increases.[44] Housing data from shortly after Domiciliary discharge may be less reliable than more recent housing data. In addition, given our findings on cognition as a potential predictor of housing outcomes, our assessments were limited in that we used an abbreviated neuropsychological battery.[59] We did not explore several domains with implications for functional outcomes among individuals with SMI, such as social cognition, or the mental operations that underlie interpersonal interactions.[60,61] Future work would also benefit from inclusion of more environmental-level measures that may influence housing outcome, including low-income housing availability and the prevalence of community resources for homeless persons.

CONCLUSIONS

These data suggest that cognition—particularly speed of processing—and mental health symptoms that cause interpersonal problems are interrelated factors that affect the attainment and retention of independent housing. As we develop and adapt services for homeless persons, cognitive remediation and social skills training may be useful considerations. Given the limited supply Housing First resources, these data may speak to the best use of these services for cognitively impaired consumers who may be less likely to achieve stable housing without robust longitudinal supports. Future studies are needed on a prospective cohort of homeless adults, exploring the relationships between specific cognitive domains and housing outcomes.

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CLINICAL POINTS

- Cognitive and/or social skills trainings may help homeless patients with serious mental illness and substance use disorders achieve better housing outcomes.
- Cognitively impaired patients with serious mental illness and substance use disorders may require robust longitudinal supports, e.g., intensive case management, to achieve stable housing.

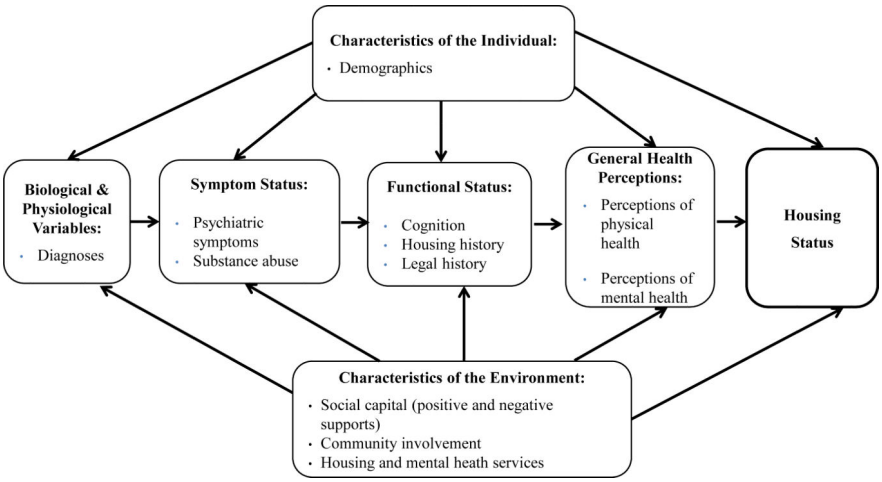

Figure 1.
Wilson and Cleary Conceptual Framework (adapted)

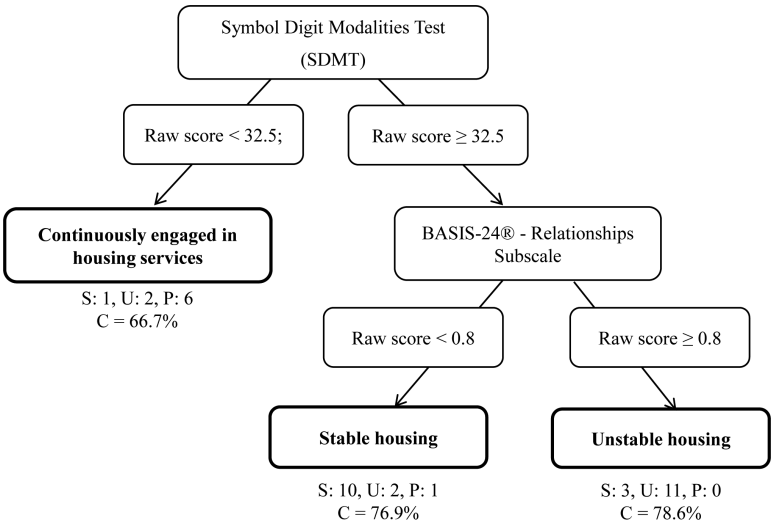

Figure 2. Results of recursive partitioning analyses for classifying consumers by housing trajectory

Noted below each housing trajectory are the number of participants with stable housing (S), unstable housing (U), and continuous engagement in housing programs (P). C = percentage of participants this model classified correctly.

Estimation was based on 36 participants and 26 predictor variables, including:

•Lifetime jail/prison days; Felony (yes/no); AUDIT-C (positive/negative); DAST-20 (positive/negative); BASIS-24® (overall score; depression and functioning; interpersonal problems; psychotic symptoms; alcohol or drug use; emotional lability; self-harm); PCLM; HVLT-R; SDMT; category fluency; TMT B; VR-12 (physical health component score, mental health component score); CIS (score out of 10 activities, overall involvement score); Social Capital Resource Generator (social network score, personal resources score); CIM; MOS-SSS; PDD; Number of outpatient mental health visits (past 6 months).

Table 1

Potential Predictors and Associated Measures

Potential Predictors	Measures
Demographics	Age; gender; race/ethnicity; marital status; highest level of education
Diagnoses	Primary serious mental illness (SMI) and substance use disorder (SUD) diagnoses were identified from the medical record
Psychiatric symptoms	24-item Behavior and Symptom Identification Scale (BASIS-24®); 17-item PTSD Checklist-Military version (PCL-M)
Substance abuse	Alcohol Use Disorders Identification Test-Consumption Questions (AUDIT-C); 20-item Drug Abuse Screening Test (DAST-20)
Cognition	Hopkins Verbal Learning Test-Revised (HVLT-R); Symbol Digit Modalities Test (SDMT); category fluency; Trail Making Test B (TMT B)
Housing history	Acute vs. chronic homelessness at the time of Domiciliary admission was identified from the medical record
Legal history	Lifetime felony history (yes/no); estimated lifetime duration of incarceration
Perceptions of physical and mental health	Veterans RAND 12-item Health Survey (VR-12)
Positive social capital	Medical Outcomes Study-Social Support Survey (MOS-SSS); Social Capital Resource Generator
Negative social capital	Perceived Devaluation and Discrimination Scale (PDD)
Community involvement	Involvement in Community Activities Scale; Community Integration Measure (CIM)
Housing and mental health services	Number of individual mental health appointments in the six months preceding assessment; participation in the VA's Housing First program (yes/no); participation in any other housing program (yes/no)

Table 2

Patient Demographics, Diagnoses, and Housing

Patient Characteristic	Stable housing, (n=14)	Unstable housing (n=15)	Continuously engaged in housing services (n=7)	p-value	All participants (n=36)
DEMOGRAPHICS					
Age (mean, SD in years)	50.0, 8.1	51.5, 9.3	60.1, 7.7	0.04	52.6, 9.1
Gender (male)	14 (100.0%)	15 (100.0%)	7 (100.0%)	1.00	36 (100.0%)
Marital Status				0.04	
Single	6 (42.9%)	3 (20.0%)	1 (14.3%)		10 (27.8%)
Married	2 (14.3%)	0 (0.0%)	2 (28.6%)		4 (11.1%)
Separated	0 (0.0%)	5 (33.3%)	0 (0.0%)		5 (13.9%)
Divorced	6 (42.9%)	5 (33.3%)	4 (57.1%)		41.7%
Widowed	0 (0.0%)	2 (13.3%)	0 (0.0%)		2 (5.6%)
Race/Ethnicity				0.62	
Non-Hispanic White	3 (21.4%)	5 (33.3%)	1 (14.3%)		9 (25.0%)
Non-Hispanic Black	6 (42.9%)	6 (40.0%)	6 (85.7%)		18 (50.0%)
Hispanic, Any Race	3 (21.4%)	2 (13.3%)	0 (0.0%)		5 (13.9%)
Asian	0 (0.0%)	1 (6.7%)	0 (0.0%)		1 (2.8%)
Native Hawaiian or Other Pacific Islander	1 (7.1%)	0 (0.0%)	0 (0.0%)		1 (2.8%)
Decline to State/Other	1 (7.1%)	1 (6.7%)	0 (0.0%)		2 (5.6%)
Highest Educational Level (mean, SD in grade-level)	13.3, 2.0	12.0, 2.3	12.0, 2.0	0.22	12.5, 2.2
DIAGNOSES					
Serious Mental Illness (SMI)				0.98	
Major Depressive Disorder	6 (42.9%)	4 (26.7%)	2 (28.6%)		12 (33.3%)
Bipolar Disorder	2 (14.3%)	0 (0.0%)	2 (28.6%)		4 (11.1%)
Post-Traumatic Stress Disorder (PTSD)	5 (35.7%)	7 (46.7%)	3 (42.9%)		15 (41.2%)
Psychotic Disorder	1 (7.1%)	2 (13.3%)	1 (14.3%)		4 (11.1%)
Substance Abuse or Dependence (SUD)				0.06	
Alcohol	6 (42.9%)	3 (20.0%)	0 (0.0%)		9 (25.0%)
Amphetamine	0 (0.0%)	2 (13.3%)	0 (0.0%)		2 (5.6%)

Patient Characteristic	Stable housing, (n=14)	Unstable housing (n=15)	Continuously engaged in housing services (n=7)	p-value	All participants (n=36)
Cannabis	1 (7.1%)	1 (6.7%)	0 (0.0%)		2 (5.6%)
Cocaine	2 (14.3%)	2 (13.3%)	0 (0.0%)		4 (11.1%)
Opioid	0 (0.0%)	0 (0.0%)	2 (28.6%)		2 (5.6%)
Polysubstance	4 (28.6%)	7 (46.7%)	5 (71.4%)		17 (47.2%)
HOUSING					
Chronically Homeless at Domiciliary Admission	9 (64.3%)	14 (93.3%)	5 (71.4%)	0.23	28 (77.8%)
HUD-VASH participation	3 (21.4%)	11 (73.3%)	7 (100.0%)		21 (58.3%)
Community-based housing program participation	0 (0.0%)	0 (0.0%)	0 (0.0%)	1.00	0 (0.0%)