Reliability and validity of the Vulnerability Index–Service Prioritization Decision Assistance Tool (VI-SPDAT) in real-world implementation

Article *in* Journal of Social Distress and the Homeless · June 2018

DOI: 10.1080/10530789.2018.1482991

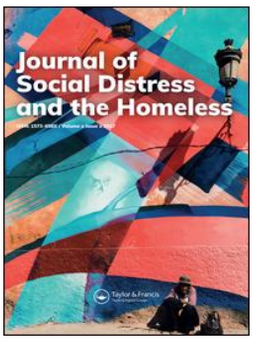
CITATIONS
27

READS
3,352

5 authors, including:

Camilla Cummings
DePaul University
6 PUBLICATIONS **40** CITATIONS
SEE PROFILE

Dennis P Watson
Chestnut Health Systems
81 PUBLICATIONS **531** CITATIONS
SEE PROFILE



Journal of Social Distress and the Homeless

ISSN: 1053-0789 (Print) 1573-658X (Online) Journal homepage: http://www.tandfonline.com/loi/ysdh20

Reliability and validity of the Vulnerability Index-Service Prioritization Decision Assistance Tool (VI-SPDAT) in real-world implementation

Molly Brown, Camilla Cummings, Jennifer Lyons, Andrés Carrión & Dennis P. Watson

To cite this article: Molly Brown, Camilla Cummings, Jennifer Lyons, Andrés Carrión & Dennis P. Watson (2018) Reliability and validity of the Vulnerability Index-Service Prioritization Decision Assistance Tool (VI-SPDAT) in real-world implementation, Journal of Social Distress and the Homeless, 27:2, 110-117, DOI: 10.1080/10530789.2018.1482991

To link to this article: https://doi.org/10.1080/10530789.2018.1482991

Published online: 08 Jun 2018.

JOURNAL OF SOCIAL DISTRESS AND THE HOMELESS
2018, VOL. 27, NO. 2, 110–117
https://doi.org/10.1080/10530789.2018.1482991

Taylor & Francis
Taylor & Francis Group

Reliability and validity of the Vulnerability Index-Service Prioritization Decision Assistance Tool (VI-SPDAT) in real-world implementation

Molly Brown[a], Camilla Cummings[b], Jennifer Lyons[c], Andrés Carrión[d] and Dennis P. Watson[e]

[a]Department of Psychology, DePaul University, Chicago, IL, USA; [b]Department of Psychology, DePaul University, Chicago, IL, USA; [c]Lyons Visualization, LLC, Whitmore Lake, MI, USA; [d]Institute for Sexual and Gender Minority Health and Wellbeing, Northwestern University, Chicago, IL, USA; [e]Richard M. Fairbanks School of Public Health, Indiana University-Purdue University Indianapolis, Indianapolis, IN, USA

ABSTRACT

This study examined the reliability and validity of the Vulnerability Index-Service Prioritization Decision Assistance Tool (VI-SPDAT), a widely-used assessment of the health and social vulnerabilities and housing needs of individuals experiencing homelessness. Homeless Management Information System data were obtained for 1495 individuals who were administered the VI-SPDAT between 2014 and 2016. Subsamples were selected for reliability and validity assessments. Results suggest there are challenges to the reliability and validity of the VI-SPDAT in practical use. VI-SPDAT total scores did not significantly predict risk of return to homeless services, while type of housing was a significant predictor. Vulnerability assessment instruments have important implications for communities working to end homelessness by facilitating prioritization of scarce housing resources. Findings suggest that further testing and development of the VI-SPDAT is necessary.

ARTICLE HISTORY
Received 25 February 2018
Accepted 28 May 2018

KEYWORDS
Vulnerability assessment; homelessness; housing prioritization; measurement

Introduction

Continuums of Care (CoCs) throughout the United States are implementing coordinated assessment to more efficiently allocate scarce housing resources based on the support service needs of homeless individuals and families. Through coordinated assessment, mental health, medical, and social vulnerabilities are assessed with a standardized instrument. Based on assessment scores, individuals are triaged to housing services offering varying levels of support services, and centralized waitlists for housing resources in the community are prioritized accordingly (U.S. Department of Housing and Urban Development, 2014). The Vulnerability Index-Service Prioritization Decision Assistance Tool (VI-SPDAT; Community Solutions & OrgCode Consulting, Inc., 2014) has been widely adopted for coordinated assessment. However, evidence of the reliability and validity of the VI-SPDAT and other coordinated assessment tools is limited despite federal recommendations for CoCs to adopt evidence-based assessments (U.S. Department of Housing and Urban Development, 2015). Indeed, no peer-reviewed studies on the measurement properties of the VI-SPDAT have been published to date.

Research on the reliability and validity of the VI-SPDAT is necessary due to its implications for the immediate and long-term housing outcomes of vulnerable individuals. The VI-SPDAT was designed for rapid, interview-style administration, making it a desirable choice for communities tasked with assessing a large population. The instrument primarily relies on the self-report of those assessed. Many items are of a sensitive nature, which may impact its reliability. Research has found that homeless people with mental illness generally produce reliable and valid self-reports; however, self-reported psychotic symptoms and substance use issues are less reliable and often underreported (Calsyn, Morse, Klinkenberg, & Trusty, 1997; Goldfinger et al., 1996). Underreporting such vulnerabilities on the VI-SPDAT may inadvertently limit one's opportunities for housing and support services by producing lower scores. Inaccurate reporting on the VI-SPDAT also has implications at the systems-level, as the instrument is used to ensure the costliest housing services, such as permanent supportive housing (PSH), are delivered to those with the greatest housing needs. People who over-report their vulnerability may be prioritized for higher-level support services than necessary. The VI-SPDAT also includes four observer-rated items indicating a subjective evaluation of the extent of impairment related to daily living skills, physical health conditions, substance use, and mental health observed by the assessor. These psychosocial or health domains may not be easily perceivable, particularly among assessors without clinical training. Further, an individual's presentation may vary over time. Given potential challenges to the self-report and observer-rated nature of the VI-SPDAT, an examination of its test-retest and inter-rater reliability is necessary.

CONTACT Molly Brown molly.brown@depaul.edu Department of Psychology, DePaul University, 2219 N. Kenmore Ave., Chicago, IL 60614, USA

The VI-SPDAT recommends people for three housing options based on their score: a) PSH (i.e. permanent housing subsidies with housing support services) for those reporting the greatest range of vulnerability, b) rapid rehousing (i.e. short-term housing subsidies or other financial support and temporary support services) for those scoring in the moderate range, and c) mainstream affordable housing (i.e. individuals directed toward private market affordable housing options) for those scoring in the minimally vulnerable range. Such an approach assumes indicators of vulnerability measured by the VI-SPDAT are also indicators of an individuals' self-sufficiency in independent living. However, the instrument's content does not fully align with predictors of housing tenure observed in studies of PSH for individuals with mental illness or chronic homelessness histories (Goldfinger et al., 1999; Hurlburt, Hough, & Wood, 1996; Lipton, Siegel, Hannigan, Samuels, & Baker, 2000; Malone, 2009; Pearson, Montgomery, & Locke, 2009; Pickett-Schenk, Cook, Grey, & Butler, 2007; Tsemberis & Eisenberg, 2000; Wong et al., 2006).Therefore, it is important to determine whether or not the items on the VI-SPDAT produce a valid assessment of the "vulnerability" construct. Moreover, little research has been conducted on housing outcomes in rapid rehousing and individual-level factors that predict housing stability among single adult populations (Brown, Vaclavik, Watson, & Wilka, 2017; Byrne, Treglia, Culhane, Kuhn, & Kane, 2016; Culhane, Metraux, & Byrne, 2011). Consequently, it is unclear whether the VI-SPDAT is a valid assessment of an individual's ability to be successful in a particular housing intervention.

Given its current implementation in CoCs, evaluation of the VI-SPDAT using data from Homeless Management Information Systems (HMIS) has been suggested (U.S. Department of Housing and Urban Development, 2015). This study used HMIS data to examine the internal, test-retest, and inter-rater reliability and the construct and predictive validity of the VI-SPDAT when implemented in real-world practice. Individuals with multiple administrations of the VI-SPDAT were utilized to examine test-retest reliability and inter-rater reliability, and individuals who were permanently housed following their VI-SPDAT administration were utilized to examine predictive validity based on risk of return to homeless services.

Methods

Sample

The sample was derived from a Midwestern U.S. CoC's HMIS and included all single adults experiencing homelessness who were administered the VI-SPDAT between April 2014 and April 2016 ($N = 1495$). During this time period, the CoC initiated its coordinated assessment system, which involved universal assessment of all homelessness service recipients with the VI-SPDAT. Individuals who encountered services, or were street outreached by VI-SPDAT assessors, were administered the VI-SPDAT, and their data were entered in HMIS. Further, the VI-SPDAT was utilized in the CoC's 2015 point-in-time count, a survey of sheltered and unsheltered individuals experiencing homelessness in the local area. Thus, the sample represents the majority of single adults experiencing homelessness in the CoC during the two-year timeframe.

The full sample was utilized for examination of the VI-SPDAT factor structure and internal reliability. Based on data availability subsamples were selected for the remaining analyses. Within the overall sample, 158 individuals had more than one VI-SPDAT administration for examination of test-retest and inter-rater reliability. A total of 476 had HMIS residential and homeless service utilization and housing status information. Of these, 203 resided in permanent housing settings following their VI-SPDAT administration, and this subsample was utilized to examine predictive validity. The HMIS data available for this study did not contain demographic information for participants and, therefore, is not reported.

Measures

VI-SPDAT

The VI-SPDAT is a 50-item assessment primarily composed of frequency and yes/no questions grouped in four thematic domains: History of Housing and Homelessness (e.g. "What is the total length of time you have lived on the streets or in shelters?", "In the last three years, how many times have you been housed and then homeless again?"), Risks (e.g. "In the past six months, how many times have you been to the emergency department/room?", "Threatened to or tried to harm yourself or anyone else in the last year?"), Socialization and Daily Functions (e.g. "Do you have planned activities each day other than just surviving that bring you happiness and fulfillment?", "Do you have friends, family or other people in your life out of convenience or necessity, but you do not like their company?"), and Wellness, which assesses health, substance use, and mental health issues (e.g. "Where do you usually go for healthcare when you're not feeling well?", "Have you ever had problematic drug or alcohol use, abused drugs of alcohol, or told you do?"; Community Solutions & OrgCode Consulting, Inc., 2014). In addition to the 50 items within these domains, there is one demographic question assessing age, which also contributes to the total VI-SPDAT score.

Within each domain, one or more items are grouped together to calculate prescreen scores (1 or 0) based on stated criteria, meaning that an endorsement on any or

all items within the grouping results in a score of 1 for the prescreen score in that grouping. For instance, questions 8 and 9 comprise a prescreen score such that if a person answers "yes" to one or both items, the prescreen score is scored 1. Individuals with a constellation of substance use, mental health, and medical conditions receive a "Tri-Morbidity" prescreen score of 1. Prescreen scores are summed to compute domain subtotals. Together with an age criterion (60 years or older = 1), domain subtotals are summed to calculate the total score ranging from 0 to 20, with higher scores indicating greater vulnerability and housing service needs. Four items are rated 1 or 0 by the administrator's observation of signs of: poor hygiene or daily living skills, a serious health condition, alcohol or drug abuse, or mental illness. Recommendations for housing services based on VI-SPDAT total scores are as follows: scores ≥10 PSH, 5–9 rapid rehousing, and 0–4 not recommended for housing support services.

Housing measures

Housing and homeless service utilization information dating from April 2014 and April 2016 was derived from the HMIS. Residential transitions occurring after the date of VI-SPDAT administration were used to assess predictive validity. HMIS "exit destination" indicators were used to identify housing placements in PSH, rapid rehousing, and mainstream housing with or without a permanent subsidy (e.g. Section 8). Subsequent contacts with homeless services (e.g. shelters) were coded as service re-entries.

A total of 203 individuals with residential information entered permanent housing in PSH (32.0%), rapid rehousing (16.3%), or mainstream housing with or without a permanent subsidy (51.7%) following their first VI-SPDAT administration. The follow-up period between individuals' housing date and the end of the study period, April 2016, averaged 209.39 days (*SD* = 124.79, *Range* 7–531). Most individuals (73.9%) were housed in a setting other than recommended based on their VI-SPDAT score.

Procedure

The study procedures were approved by the DePaul University Institutional Review Board. HMIS data were de-identified and provided to the researchers by the CoC data administrator. Pre-computed VI-SPDAT scores from HMIS were cross-checked for accuracy. The earliest-dated administration for each participant was utilized for examination of internal reliability and predictive validity.

Analysis

The construct validity of the VI-SPDAT was examined using CFA with R software (R Core Team, 2013). The diagonally weighted least squares (DWLS) estimator was used to support the binary VI-SPDAT items. Categorical and frequency items were dichotomized based on the scoring system. In the case of the five service utilization items within the Risks domain, each variable was dichotomized based on endorsement of any utilization of the service versus no utilization of the service. The Tri-Morbidity item was not included in the analysis, as it is a prescreen score item dependent on other items in the Wellness domain. CFAs were conducted with VI-SPDAT items, rather than prescreen scores, as prescreen scores composed of several items would not yield information on which items are best predicted by the latent variable(s).

In practice, the VI-SPDAT is utilized as a unidimensional scale assessing overall vulnerability. Thus, the first CFA tested a single factor model, with "global vulnerability" as a latent factor measured by 51 indicators (i.e. the 50 items and the age criterion). The construct validity of the VI-SPDAT domains and their relation to global vulnerability was examined with a second, hierarchical CFA model. The latent variable for the Risks domain was measured by 11 items, and the Socialization and Daily Functions domain was measured by seven items. The Wellness domain is composed of 30 items assessing a range of health indicators. To achieve model convergence, the Wellness domain was divided into two latent variables: Wellness – Health and Wellness – Substance Use and Mental Health, measured by corresponding items. Global vulnerability was a second-order factor measured by these four first-order factors, the two items comprising the History of Housing and Homelessness domain, and the age criterion variable. Model fit was assessed with several goodness-of-fit indices (Kline, 2004): model chi-square (p-value > .5), root mean square error of approximation (RMSEA; <0.08), comparative fit index (CFI; ≥0.90), Tucker-Lewis index (TLI; ≥0.95), and standardized root mean square residual (SRMR; <0.08). R software was used to produce ω_3 composite internal reliability of CFA factors using Green and Yang's (2009) formula accounting for item covariances and thresholds for dichotomous variables.

Test-retest reliability of the VI-SPDAT total score and inter-rater reliability of the four observer-rated items were explored among individuals who were administered the VI-SPDAT twice. Due to variable timeframes between re-administrations, selecting narrow timeframes limited the sample size. To balance timeframe considerations and sample size, test-retest and inter-rater reliability were analyzed in three ways with increasingly broad timeframes and larger samples: re-administration occurring within two-weeks (n = 28, M = 4.86 days, SD = 3.98), within one month (n = 42, M = 10.10 days, SD = 8.74), and within three months (n = 67, M = 27.06 days, SD = 25.14). Test-retest reliability of the VI-SPDAT total score was assessed

using Pearson's *r*, and inter-rater reliability of the four observer-rated items was assessed using Cohen's Kappa.

Predictive validity of the VI-SPDAT was explored using the total VI-SPDAT score to predict risk of re-entry to homeless services over time (1 = re-entry, 0 = non-re-entry), a proxy for residential stability, with Cox proportional hazards models. Theoretically, greater vulnerability should be associated with greater risk of homelessness; therefore, higher scores on a vulnerability assessment tool should be predictive of homeless service re-entry. Housing type (i.e. PSH, short-term subsidy, mainstream housing) was included as a secondary predictor of risk of re-entry to services in the first Cox model to examine its impact beyond VI-SPDAT scores. Further, because all individuals in PSH and 53.3% of individuals in mainstream housing had permanent subsidies – an important predictor of residential stability – housing with versus without a permanent subsidy was examined as a secondary predictor in the second Cox model. Twenty-seven individuals re-entered services, which was adequate for the models (Vittinghoff & McCulloch, 2007).

Results

VI-SPDAT scores, as calculated based on the scoring rubric (i.e. prescreen score totals), ranged from 0 to 16 ($M = 6.76$, $SD = 3.12$). Descriptive statistics are presented in Table 1. The VI-SPDAT factor structure and internal reliability were assessed using the full sample. Following listwise deletion of missing data, the resulting sample size was $N = 1407$. Results suggest that neither the single-factor nor the hierarchical CFA model demonstrated adequate fit, with only the RMSEA meeting the accepted cutoff for good model fit (Table 2). Standardized factor loadings are presented in Table 2. Findings suggest that several factor loadings fall below .3, suggesting a low correlation with the latent variables. Notably, several items on the Socialization and Daily Functions and Wellness – Health domains demonstrated negative associations with the latent variables.

Table 1. Descriptive statistics of VI-SPDAT domains and total score based on prescreen scores ($N = 1495$).

	Number of prescreen scores	*M*	*SD*	Min.	Max.
Age 60 or older	1	0.11	0.32	0	1
Domain					
History of housing and homelessness	1	0.46	0.50	0	1
Risks	4	1.70	1.09	0	4
Socialization and daily functions	4	2.01	0.98	0	4
Wellness	10	2.59	1.69	0	8
VI-SPDAT total score	20	6.76	3.12	0	16

Note: VI-SPDAT = Vulnerability Index-Service Prioritization Decision Assistance Tool.

In terms of composite internal reliability of the factors, global vulnerability demonstrated good reliability in the single-factor model ($\omega_3 = .87$). In the hierarchical model, the Risks ($\omega_3 = .80$), Wellness – Health ($\omega_3 = .65$), and Wellness – Substance Abuse and Mental Health ($\omega_3 = .89$) factors all demonstrated adequate internal reliability. The Socialization and Daily Functions domain had poor reliability ($\omega_3 = .09$).

A total of 158 individuals had more than one administration of the VI-SPDAT. Test-retest reliability coefficients fell below the $r \geq .7$ cutoff for acceptable test-retest reliability across the three timeframes (Table 3). Retest trends showed that total VI-SPDAT scores were higher on second administration for 110 (69.6%) participants and were lower on second administration for 30 (19.0%) participants. Kappa coefficients for the four items across timeframes were in the slight to fair range for inter-rater reliability (i.e. ≤.4; Landis & Koch, 1977).

The Cox model revealed the VI-SPDAT total score approached significance as a predictor of homeless service re-entry, hazard ratio (HR) = 1.09 (95% Confidence Interval [CI] = 0.99, 1.21), $p = .07$. The addition of housing type significantly improved the model, χ^2 (2, $N = 203$) = 7.56, $p = .02$. Controlling for VI-SPDAT score, individuals housed with short-term subsidies were significantly more likely to re-enter compared with those housed in PSH, adjusted HR = 4.84 (95% CI = 1.55, 15.83), $p = .007$, and those housed in the mainstream market, adjusted HR = 2.71 (95% CI = 1.09, 6.76), $p = .03$. In the second Cox model, subsidy significantly improved the model beyond the effect of VI-SPDAT score, χ^2 (1, $N = 203$) = 10.11, $p = .001$. Individuals who were housed without a permanent subsidy had a significantly greater risk of service re-entry, adjusted HR = 3.97, $p = .002$.

Discussion

This study offers important considerations regarding the VI-SPDAT's measurement properties in practical use. Findings from the CFAs suggest that both single-factor and hierarchical models were poorly fitting. Several items on the VI-SPDAT were not strongly associated, or were associated in an unexpected direction, with a global construct of vulnerability and/or with the VI-SPDAT domains. Model issues were most salient for items in the Socialization and Daily Functions and Wellness – Health domains. These results suggest that the construct validity of the VI-SPDAT may be improved by removing items, and further exploration is needed to determine whether vulnerability is a unidimensional or multidimensional construct.

The test-retest and inter-rater reliability of the VI-SPDAT were poor, which may be a result of factors related to the tool's implementation in a community context. Theoretically, coordinated assessment should

Table 2. Confirmatory factor analysis standardized factor loadings and goodness-of-fit statistics ($N = 1407$).

	Model 1: Single factor	Model 2: Hierarchical model[a]					
	Global vulnerability	Second-order factor: Global vulnerability	First-order factor 1: Risks	First-order factor 2: Socialization and daily functions	First-order factor 3: Wellness – health	First-order factor 4: Wellness – substance use and mental health	
Items[b]							
Age 60 or older	−.14**	−.15**					
Total length of time street or shelter[c]	.34***	.38***					
Past three years times housed and homeless[d,e]	.30	.33					
Past six months emergency room[e,f]	.72***		.82				
Past six months police[f]	.42***		.47***				
Past six months ambulance[f]	.68***		.77***				
Past six months crisis service[f]	.45***		.50***				
Past six months inpatient[f]	.63***		.71***				
Attacked or beaten up	.56***		.62***				
Harm to self or others past year	.65***		.72***				
Legal	.28***		.31***				
Anybody force or trick to do things	.56***		.64***				
Do things considered risky	.65***		.72***				
Places people sleep[g]	.14***		.17***				
Owe money[e]	.41***			.52			
Money coming in	−.02			−.04			
Enough money to meet expenses	−.07			−.10*			
Planned activities[h]	−.25***			−.32***			
People in life out of necessity	.48***			.61***			
People in life take money	.57***			.75***			
Surveyor signs of poor hygiene or daily living skills	.44***			.57***			
Where go for healthcare[i]	−.01				.05		
Kidney disease	.23***				−.45		
Frostbite, hypothermia, immersion foot	.31***				−.53		
Liver disease	.41***				−.75		
HIV/AIDS	.11				−.21		
Heat stroke	.43***				−.67		
Heart disease, arrhythmia	.26***				−.47		
Emphysema	.26***				−.46		
Diabetes	.14**				−.29		
Asthma	.29***				−.50		
Cancer	.13*				−.31		
Hepatitis C	.39***				−.68		
Tuberculosis	.27**				−.43		
Surveyor signs of serious health condition	.24***				−.48		
Problematic drug or alcohol use[e]	.78***					.82	
Consumed alcohol and/or drugs almost every day	.56***					.62***	
Used injection drugs	.48***					.50***	
Treated for drug or alcohol problems	.74***					.78***	
Used non-beverage alcohol	.43***					.46***	
Blacked out because of alcohol or drug use	.59***					.62***	
Surveyor signs of problematic alcohol or drug use	.58***					.61***	
Taken to hospital against will for mental health	.59***					.62***	
Gone to emergency room because weren't feeling well emotionally	.67***					.71***	
Spoken to a mental health professional past six months	.60***					.63***	
Serious brain injury	.42***					.44***	
Told have a learning or developmental disability	.38***					.40***	
Problems concentrating and/or remembering	.65***					.69***	
Surveyor detect signs of severe mental illness or compromised cognitive functioning	.50***					.53***	
Medications prescribed do not take	.60***					.63***	
Experienced trauma caused homelessness	.61***					.64***	
First-order factors							
Factor 1: Risks		.83***					
Factor 2: Socialization and daily functions		.79***					
Factor 3: Wellness – health		−.54					
Factor 4: Substance use and mental health		.85***					
Goodness-of-fit statistics	χ^2	*df*	RMSEA	(95% CI)	CFI	TLI	SRMR
Model 1: Single factor	9060.18***	1224	0.067	(0.065, 0.068)	0.786	0.778	0.127
Model 2: Hierarchical model	7971.34***	1220	0.063	(0.061, 0.063)	0.816	0.808	0.122

Note: RMSEA = Root Mean Square Error of Approximation; CI = Confidence Interval; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; SRMR = Standardized Root Mean Square Residual.

[a]The Wellness domain was divided into two factors to achieve model convergence.

[b]Item names abbreviated. Full item names available from the first author upon request.

[c]Variable dichotomized based on scoring system, 1 = two or more cumulative years homeless, 0 = less than two years homeless.

[d]Variable dichotomized based on scoring system, 1 = four or more episides, 0 = less than four episodes.

[e]Variable set to 1 for analysis of Model 1 and/or Model 2; significance level not computed.

[f]Variable dichotomized based on any utilization, 1 = one or more encounters, 0 = no encounters.

[g]Variable dichotomized based on scoring system, 1 = staying in place other than shelter, 0 = staying in shelter.

[h]Item is reverse scored such that a "no" response indicates greater vulnerability.

[i]Variable dichotomized based on scoring system, 1 = does not go for care, 0 = goes for care.

***$p < .001$, **$p < .01$, *$p < .01$.

Table 3. Test-retest reliability of the VI-SPDAT total score and inter-rater reliability of the VI-SPDAT observer-rated items (N = 158).

	Test-retest reliability[a]		
	n	Pearson's *r*	*p*
Timeframe for re-administration			
Within two weeks	28	.64	<.001
Within one month	42	.65	<.001
Within three months	67	.64	<.001
Observer-rated Item and timeframe between ratings	Inter-rater reliability		
	n	Cohen's Kappa	*p*
Poor hygiene or daily living skills			
Within two weeks	28	−.03	.86
Within one month	42	.27	.07
Within three months	67	.23	.05
Serious health condition			
Within two weeks	28	.09	.60
Within one month	42	.17	.20
Within three months	67	.13	.25
Alcohol or drug abuse			
Within two weeks	28	.29	.08
Within one month	42	.35	.02
Within three months	67	.27	.02
Mental illness			
Within two weeks	28	.21	.26
Within one month	42	.19	.22
Within three months	67	.29	.02

Note: VI-SPDAT = Vulnerability Index and Service Prioritization Decision Assistance Tool.
[a]VI-SPDAT total score.

aid communities in overcoming biases in who attains housing and who does not, as housing referrals should not hinge on an individual's or service provider's ability to navigate, and advocate for, services. Nevertheless, with service providers administering the instrument, it remains possible that creating policy at the ground level of services, often referred to as street-level bureaucracy (Lipsky, 2010), will impact the assessment process. Service providers have a strong will to advocate for clients, which may be at odds with organizational and systemic policies. The discrepancies in VI-SPDAT scores found across administrations could have resulted from service providers misrepresenting scores in an effort to advocate for clients to attain housing. Other threats to reliability could have occurred due to administrators receiving inadequate training, or participants may have been reluctant to respond accurately to the measure. An updated version of the VI-SPDAT has been released (Community Solutions & OrgCode Consulting, Inc., n.d.), which eliminates the observer-rated items and may improve the accuracy of the assessment for administrators without proper clinical training to observe signs of mental illness and other health conditions. Because coordinated assessment instruments are utilized in large homeless service systems, the development of measures producing accurate and reliable responses in settings faced with barriers to controlled implementation should be a key priority.

The total VI-SPDAT score did not significantly predict homeless service re-entry; however, the relationship did trend toward significance with higher scores associated with greater risk. These findings show promise regarding the VI-SPDAT's predictive validity. However, housing type remained a significant predictor of re-entry beyond the effect of VI-SPDAT score, suggesting the VI-SPDAT may be insufficient for prioritizing interventions that are appropriate to individuals' needs in achieving housing stability. Consistent with previous research demonstrating reduced risk of homelessness when permanent housing subsidies are provided (Byrne et al., 2016; Gubits et al., 2015), the availability of a permanent housing subsidy emerged as important for reducing risk of service re-entry. Individuals who received short-term subsidies (e.g. rapid rehousing) were at significantly greater risk of re-entry compared to the most vulnerable subset (i.e. those housed in PSH) and those housed in mainstream affordable housing, even when controlling for their vulnerability as assessed by the VI-SPDAT. There is very limited evidence for rapid rehousing interventions in terms of both long-term housing outcomes and vulnerability indicators predictive of housing stability (Brown et al., 2017; Byrne et al., 2016). Therefore, the development of valid measures prioritizing individuals to rapid rehousing may be premature and current score-based recommendations on the VI-SPDAT are likely arbitrary.

It is important to highlight that the majority of the sample was housed in a setting other than indicated by the tool, and the reasons for the community's inconsistent use of the tool to triage housing merits further consideration. Our data were derived from the initiation of coordinated assessment, and there may have been a transitional period in which individuals were assessed but already prioritized for a particular housing opportunity. It is also likely that PSH and rapid rehousing housing resources in the community were scarce, leading individuals to seek alternative housing options. Additionally, the CoC may have conducted further assessment of individuals' housing needs to inform service provision as recommended by the VI-SPDAT developers (Community Solutions & OrgCode Consulting, Inc., 2014), resulting in referrals to different housing types. Participants may have received additional assessment if under- or over-reporting of vulnerability indicators was suspected by service providers.

Findings suggest the VI-SPDAT has weaknesses in its reliability and validity, which may result from problems with the instrument itself, its implementation in real-world practice, or the incentive for recipients of services to over-report in order to compete for housing resources. Identifying sources other than self-report is recommended for triangulation with self-report items assessing risks, daily functioning, and wellness. A recent review of current instruments to screen for supportive housing recommends the Vulnerability Assessment Tool, a 10-domain interview-style

assessment of vulnerability (Aubry et al., n.d.), which may be useful examining the concurrent validity of the VI-SPDAT. In sum, the VI-SPDAT, as used in a practical community context, is not recommended as the sole instrument for housing prioritization until additional psychometric research is conducted.

This study had limitations that may influence the generalizability of findings to other settings. Reliability and validity were examined using administrative data in a community context, rather than a controlled setting. Participant demographic information linked to VI-SPDAT and homeless service utilization data was unavailable. Future research is needed to examine trends in scores across demographic subgroups of individuals experiencing homelessness could illuminate the instrument's cultural sensitivity and applicability with diverse groups. Further, this study focused exclusively on single adults limiting the generalizability to other subgroups. Finally, the sample sizes available for test-retest and inter-rater reliability and predictive validity were limited. Future controlled, prospective studies of the VI-SPDAT are recommended.

Coordinated assessment with evidence-based instruments has important implications for the housing opportunities and residential stability among individuals experiencing homelessness, and for communitywide efforts to end homelessness. The properties of the VI-SPDAT have not been fully examined, which may result in ineffective housing triage and prioritization. The usefulness of brief screening assessments like the VI-SPDAT may be questionable if a) scores are not reflective of a clear construct and do not predict housing stability, and b) if more in-depth housing needs assessments are necessary anyway to ensure accurate prioritization. Future research and development of vulnerability assessments for housing prioritization are needed. Consideration of the VI-SPDAT's utility in prioritizing housing models that do not have a robust evidence base is recommended.

Disclosure statement

No potential conflict of interest was reported by the authors.

Notes on contributors

Molly Brown, Ph.D., is an assistant professor of clinical-community psychology at DePaul University. Her research focuses on housing and recovery interventions for individuals experiencing homelessness.

Camilla Cummings, B.A., is a doctoral student in clinical-community psychology at DePaul University. Her research focuses on housing interventions for individuals experiencing homelessness.

Jennifer R. Lyons, M.S.W., is a data visualization consultant. She owns and operates her own consulting business where her work focuses on designing and teaching data visualization best practice rooted in brain science and visual processing theory.

Andrés Carrión, M.S., is a project coordinator at Northwestern University's Institute for Sexual and Gender Minority Health and Wellbeing. His interests broadly focus on the mental, physical, and sexual health of sexual and gender minority populations. His current work aims to decrease sexual risk taking behaviors and increase protective factors (e.g., condom use and biomedical prevention uptake) among adolescent men who have sex with men in efforts to prevent HIV and other sexually transmitted infections.

Dennis P. Watson, Ph.D., is Associate Professor of Social and Behavioral Sciences at the Richard M. Fairbanks School of Public Health at Indiana University-Purdue University Indianapolis. His research focuses on the development, implementation, and evaluation of behavioral health services.

References

Aubry, T., Bell, M., Ecker, J., Gaetz, S., Goering, P., Hume, C., … Turner, A. (n.d.). Screening for housing first. Retrieved from http://www.homelesshub.ca/sites/default/files/ScreeningforHF-Dec8.pdf

Brown, M., Vaclavik, D., Watson, D. P., & Wilka, E. (2017). Predictors of homeless services re-entry within a sample of adults receiving Homelessness Prevention and Rapid Re-Housing Program (HPRP) assistance. *Psychological Services*, *14*, 129–140.

Byrne, T., Treglia, D., Culhane, D. P., Kuhn, J., & Kane, V. (2016). Predictors of homelessness among families and single adults after exit from homelessness prevention and rapid re-housing programs: Evidence from the Department of Veterans Affairs Supportive Services for Veteran Families program. *Housing Policy Debate*, *26*, 252–275.

Calsyn, R. J., Morse, G. A., Klinkenberg, W. D., & Trusty, M. L. (1997). Reliability and validity of self-report data of homeless mentally ill individuals. *Evaluation and Program Planning*, *20*, 47–54.

Community Solutions, & OrgCode Consulting, Inc. (2014). *The Vulnerability Index-Service Prioritization Decision Assistance Tool (VI-SPDAT) manual for single person households*. Retrieved from http://www.orgcode.com/wordpress/wp-content/uploads/2014/08/VI-SPDAT-Manual-2014-v1.pdf

Community Solutions, & OrgCode Consulting, Inc. (n.d.). *VI-SPDAT Version 2 and Family VI-SPDAT Version 2*. Retrieved from http://www.community.solutions/sites/default/files/about_the_vi-spdat_2.0.pdf

Culhane, D. P., Metraux, S., & Byrne, T. (2011). A prevention-centered approach to homelessness assistance: A paradigm shift? *Housing Policy Debate*, *21*, 295–315.

Goldfinger, S. M., Schutt, R. K., Seidman, L. J., Turner, W. M., Penk, W. E., & Tolomiczenko, G. S. (1996). Self-report and observer measures of substance abuse among homeless mentally ill persons in the cross-section and over time. *The Journal of Nervous and Mental Disease*, *184* (11), 667–672.

Goldfinger, S. M., Schutt, R. K., Tolomiczenko, G. S., Seidman, L., Penk, W. E., Turner, W., & Caplan, B. (1999). Housing placement and subsequent days homeless among formerly homeless adults with mental illness. *Psychiatric Services*, *50*, 674–679.

Green, S. B., & Yang, Y. (2009). Reliability of summed item scores using structural equation modeling: An alternative to coefficient alpha. *Psychometrika*, *74*, 155–167.

Gubits, D., Shinn, M., Bell, S., Wood, M., Dastrup, S., Solari, C. D., … Abt Associates, Inc. (2015). *Family options study: Short-term impacts of housing and services interventions for homeless families*. Washington, DC: U.S. Department of Housing and Urban Development. Retrieved from http://www.huduser.gov/portal/sites/default/files/pdf/FamilyOptionsStudy_final.pdf

Hurlburt, M. S., Hough, R. L., & Wood, P. A. (1996). Effects of substance abuse on housing stability of homeless mentally ill persons in supported housing. *Psychiatric Services*, *47*, 731–736.

Kline, R. B. (2004). *Principles and practice of structural equation modeling* (2nd ed.). New York, NY: Guilford Publications, Inc.

Landis, J. R., & Koch, G. G. (1977). The measurement of observer agreement for categorical data. *Biometrics*, 33, 159-174.

Lipsky, M. (2010). *Street-level bureaucracy: Dilemmas of the individual in public service, 30th ann. Ed*. New York: Russell Sage Foundation.

Lipton, F. R., Siegel, C., Hannigan, A., Samuels, J., & Baker, S. (2000). Tenure in supportive housing for homeless persons with severe mental illness. *Psychiatric Services*, *51*, 479–486.

Malone, D. K. (2009). Assessing criminal history as a predictor of future housing success for homeless adults with behavioral health disorders. *Psychiatric Services*, *60*, 224–230.

Pearson, C., Montgomery, A. E., & Locke, G. (2009). Housing stability among homeless individuals with serious mental illness participating in Housing First programs. *Journal of Community Psychology*, *37*, 404–417.

Pickett-Schenk, S. A., Cook, J. A., Grey, D. D., & Butler, S. B. (2007). Family contact and housing stability in a national multi-site cohort of homeless adults with severe mental illness. *The Journal of Primary Prevention*, *28*, 327–339.

R Core Team. (2013). *R: A language and environment for statistical computing*. Vienna, Austria: R Foundation for Statistical Computing.

Tsemberis, S., & Eisenberg, R. F. (2000). Pathways to housing: Supported housing for street-dwelling homeless individuals with psychiatric disabilities. *Psychiatric Services*, *51*, 487–493.

U.S. Department of Housing and Urban Development. (2014). *Notice on prioritizing persons experiencing chronic homelessness and other vulnerable homeless persons in permanent supportive housing and recordkeeping requirements for documenting chronic homeless status*. Retrieved from http://portal.hud.gov/hudportal/documents/huddoc?id=14-12cpdn.pdf

U.S. Department of Housing and Urban Development. (2015). *Assessment tools for allocating homelessness assistance: State of the evidence*. Retrieved from http://www.huduser.gov/publications/pdf/assessment_tools_Convening_Report2015.pdf

Vittinghoff, E., & McCulloch, C. E. (2007). Relaxing the rule of ten events per variable in logistic and Cox regression. *American Journal of Epidemiology*, *165*, 710–718.

Wong, Y.-L. I., Hadley, T. R., Culhane, D. P., Poulin, S. R., Davis, M. R., Cirkesy, B. A., & Brown, J. L. (2006). *Predicting staying or leaving in permanent supportive housing that serves homeless people with serious mental illness*. Washington, DC: U.S. Department of Housing and Urban Development, Office of Policy Development and Research.