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Comorbidity Between Psychiatric and General Medical Disorders in Homeless Veterans

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Abstract

Homeless veterans have numerous co-occurring medical and behavioral health problems. Identification of common patterns of comorbid conditions may help providers to determine severity of medical conditions and triage health care more effectively. In this study we identify such patterns of comorbid medical and psychiatric disorders using cluster analysis and we evaluate relationships between these patterns and sociodemographic factors. We used data from a survey of 3,595 veterans in a regional VA network who were presently or recently homeless assessing nine major medical disorder and six psychiatric disorder categories. Diagnostic ratings of presence or absence of these disorders were placed into the same cluster analysis to determine whether separable clusters emerged reflecting differing diagnostic profiles. There are recognizable patterns of comorbidity involving several psychiatric and general medical disorders, as well as disorders of both types that exist independently. Cluster membership was associated with various sociodemographic indices. Mental and general medical health problems in homeless veterans often occur in association with each other and form identifiable patterns that vary on sociodemographic factors.

Keywords

Homelessness; Comorbidity; Health Status

Comorbidity of psychiatric and medical disorders among homeless veterans is common and socio-demographic characteristics may be associated with these multiple conditions. The major purpose of this study is to provide at least a preliminary classificatory framework for organizing common patterns of comorbidity. Knowledge of such patterns might encourage clinicians caring for homeless psychiatric patients to evaluate general medical conditions that are often associated with particular mental disorders and, ultimately, to increase the utilization of comprehensive evaluation in healthcare planning and management.

Many homeless individuals with psychiatric difficulties experience often untreated general health problems [1]. Tuberculosis [2], HIV infection [3,4], obstructive lung disease [5], hepatic disease [6], skin and orthopedic problems [7], and eye disease [8] have been commonly found among homeless individuals. Use of alcohol and other drugs of abuse are also common among the homeless, and this use influences availability of treatment and healthcare decision making [9]. In previous studies we demonstrated the presence of several

patterns of psychiatric [10] and general medical [11] disorders using cluster analytic methods. In this study we considered the situation in which the homeless individual has at least one psychiatric and one medical disorder. There are numerous reports of various pairs of medical and psychiatric comorbidities in the literature many of which involve substance abuse. There has been extensive consideration of the interaction between alcoholism or drug abuse, other psychiatric disorders and various medical conditions. While individual or small groups of comorbid disorders have been studied, there has not been a consideration of a relatively broad range of medical and behavioral health disorders as they exist in homeless veterans in combination with each other. If one considers a broad range of psychiatric and medical disorders, the question becomes, "What characteristic patterns emerge?" It is important to gain an understanding of the patterns of disorders that can be expected to appear among homeless veterans and of factors associated with their emergence. Such information is useful in treatment planning and management as individuals in different subgroups could require substantially different treatments that influence different outcomes. It is particularly important to recognize differing comorbid patterns that commonly occur among homeless individuals because they may differ from patterns commonly observed in the general population. An application of these considerations was made by Henderson et al. [12] who provided a model concerning how factors including disabling illness, substance abuse and cognitive impairment impact on sheltered housing placement.

The problem then becomes one of developing a taxonomy for classification of cases. In this study, a cluster analytic approach was taken to determine whether there are identifiable subgroups of homeless individuals with distinguishable patterns of psychiatric and general medical comorbidities. One might hopefully obtain a small number of clusters that demonstrate differing combinations of psychiatric and general medical disorders. The absence of such associations would indicate that the general medical disorders are largely independent of the psychiatric disorders. Subtyping with cluster analysis may aid significantly in developing treatment planning and management of healthcare in homeless individuals, as previously illustrated by Kuhn and Culhane [13] who used cluster analysis to subtype homeless individuals on the basis of shelter utilization. If the cluster solution obtained supports the view that there are identifiable health status patterns among homeless veterans, then one can go on to consider whether cluster membership is meaningful in relation to sociodemographic factors that could reasonably be expected to be associated with health status. Patterns may be identified that are associated with such sociodemographic characteristics as age, ethnicity, employment status, marital status, military history in the case of veterans, and duration of homelessness. Thus, comparing the obtained subgroups on such factors may help to associate subgroup membership with pertinent, in this case sociodemographic, factors. A straightforward example is that subgroup membership may be associated with age.

There is some evidence that when homeless individuals are identified as having mental health or substance abuse problems in need of treatment, there is a tendency to neglect general health problems. Following an extensive review, Wright and Tomkins said with regard to developing effective health intervention, "This requires addressing barriers to provision and multi-agency working so that homeless people can access the full range of health and social care services [14]."

Methods

Recruitment and Interview Procedure

As a part of an outreach program to identify the needs of homeless veterans and provide increased access to medical care, the Department of Veterans Affairs (DVA) designed and administered an interview-based questionnaire for veterans who were presently or recently

homeless. Veterans were contacted for this program through DVA-initiated outreach, referrals from shelter staff, and referrals from veteran's community centers or special programs for the homeless to DVA patient care facilities. Service periods of veterans receiving these interviews spanned several wars. Approximately 9% of them served in World War II or during the Korean War era, 47% were Vietnam era veterans, 6% served during the Gulf War era, and 38% of them served after Vietnam but before the Gulf War (1975–1990).

The interview used in the present study and others of its type have been developed as standard assessment procedures by the DVA Northeast Program Evaluation Center (NEPEC) for use in research and in various programs for homeless veterans including the Homeless Chronically Mentally Ill Veterans (HCMII) program; the Community Homelessness Assessment, Local Education, and Networking Groups (CHALENG) program; the Access to Community Care and Effective Services and Support (ACCESS) program; and the Health Care for Homeless Veterans (HCHV) program. The interviewer is provided with a 60-item assessment form that must be completed on the basis of the interview and other information available. The program in which this type of assessment was used was first described by Rosenheck et al. in 1989 and was called the Homeless Chronically Mentally Ill Veterans Program [15]. In a later paper [16], a standardized intake assessment procedure was described to be used by clinicians at outreach and intake assessments. A two-day training program was conducted to demonstrate how the evaluations were to be conducted, and monthly conference calls were conducted for ongoing quality control and guidance on data collection. All interviewers were trained in the administration of the procedure.

Data utilized for this analysis were gathered using an updated version of this standard schedule administered as an interview by experienced health workers, mainly nurses or social workers associated with the DVA-sponsored Health Care for Homeless Veterans (HCHV) program trained in its use. Assignment of diagnostic classifications were made on the basis of interview data obtained by these trained staff. Interviewers had access to clinical records for veterans who had received medical services from the VA, but whether such records were actually employed was not recorded. Kaspro and Rosenheck [17] have pointed out that these interview inventories are used for unstructured assessments, and that diagnostic impressions are therefore based upon clinical judgment. Such diagnostic impressions ratings can be viewed as equivalent to preliminary screening in a primary care setting.

The interviews included sections on demographic information, characteristics of the contact with the veteran, military history, living situation, medical history, substance abuse, psychiatric status, employment status, and observations made by the interviewer covering needs for referral and treatment. The general medical disorders inquired about included eye problems, hypertension, heart and cardiovascular problems, COPD/emphysema, gastrointestinal problems, liver disease, seizures and other neurologic disorders, orthopedic problems, and significant trauma. Psychiatric disorder data were categorized as presence or absence of substance abuse (combining alcoholism and drug addiction), psychosis (combining schizophrenia and other psychotic disorders), mood disorders, personality disorders, combat related PTSD and adjustment disorders. Detailed considerations of individual psychiatric [10] and medical [11] disorders have been made elsewhere. The diagnostic classifications were made on the basis of organ system involvement of general categories of illness or disease. Consequently the patterns described should not be viewed as clinical syndromes in a medical sense, but rather as profiles of co-occurring conditions or health problems.

Informed consent was obtained at the time of the interview, which was always conducted in privacy. The data were transmitted from NEPEC in de-identified form meeting HIPAA standards, and so it was not possible to review individual consent forms for verification. Approval to conduct the analysis based upon the obtained data and to submit the results for publication was granted by the IRB of the VA Pittsburgh Healthcare System.

Participants

For the present study, data from an updated version of this assessment instrument were made available to the authors from a consecutive series of 3,595 interviews conducted over a two-year period (October 1, 2001 to September 30, 2003) in one VA regional network, the Veterans Integrated Services Network 4 (VISN 4), which includes all of Pennsylvania, Delaware and parts of West Virginia, New York and Ohio. The sample included all presently or recently homeless veterans identified and contacted in various settings located in both urban and rural areas within VISN 4, including community facilities for the homeless, VA hospitals, outpatient clinics, prisons, and veteran's centers in the community. The majority of participants lived in shelters (48%) or with acquaintances on a temporary basis (19%). Only a small percentage of the veterans recruited were living on the street (16%) and 13% of them were interviewed in an institutional setting. Recruitment was not restricted to individuals who had made application for treatment by the DVA. However, 52% of the individuals sampled had used the DVA medical system during the six months prior to the interview. Computer-based clinical records were available to the interviewers for obtaining medical information and additional demographic information for these participants. Thus, there was no restriction on recruitment that would appear to preclude obtaining a representative sample of homeless veterans except that specific randomization procedures were not used; taking the interview was voluntary and may have been biased toward individuals who were able and willing to sit for an interview and who presented with some concern about health problems.

Therefore, a relatively representative sample of help-seeking veterans was obtained.

In order to be included in the cluster analysis, the participant had to have at least one medical disorder or one psychiatric disorder. We dropped the "other disease" and "other diagnosis" categories for the data analysis because they lack specificity. We also dropped tuberculosis which, while reported to be common among homeless individuals, occurred very infrequently ($N = 113$) in the present sample. Ninety-three participants were not rated as positive on any of the medical or psychiatric disorder items, 104 were rated as only having an "other" medical disorder while 40 were rated as only having an "other" psychiatric diagnosis. Thus, of the total sample for which complete diagnostic data were available (3,595 participants), 3,498 cases were rated positive on at least one medical or one psychiatric item with the exception of the "other" categories and constituted the sample for the cluster analysis.

Data Analysis

The data were collated and entered into computer databases by staff from the NEPEC; further analyses described below were conducted by the authors. Cluster analyses were conducted using determinations made by interviewers as to the presence or absence of the disorders listed above. Participants could have more than one diagnosis and often had multiple diagnoses. Cluster analysis identifies patterns on the basis of similarities among subgroups or 'clusters' of cases, with each subgroup characterized by a different profile. The advantage of cluster analysis over a simple frequency distribution is that (1) it can easily identify structure in the data where there are numerous diagnostic combinations and (2) it empirically embeds infrequently occurring profiles into larger, more general patterns of

comorbidity. The cluster analysis was based upon binary data since disorders were assessed as either present or absent, generating binary scores. Accordingly, the Jaccard coefficient was selected as the similarity measure as it treats joint absences as non-informative. Dissimilarity coefficients were obtained by subtracting the Jaccard coefficients from 1. An agglomerative hierarchical clustering algorithm was employed using the Lance-Williams flexible beta method offered in SAS, version 9.1.3 [18]. Beta was set at -0.5 in order to reduce the likelihood of chaining among the clusters. Choosing the partition which best represented the data was determined by finding the intersection between a manageable number of interpretable clusters (no more than five or six) and large jumps in the normalized distance between clusters. Number of clusters was plotted against distances in a manner similar to “scree testing,” with a clear flattening of the curve at four clusters, indicating that adequate separation of clusters would not be achieved beyond that point. The number of clusters was also determined by preliminary evaluations with varying numbers of cluster solutions aimed at avoiding trivial clusters and plotting clusters in discriminant function space, seeking adequate separation among group centroids, all recommended by Aldenderfer and Blashfield [19]. The use of these heuristic methods does not rule out alternative cluster solutions, but does suggest the location of the point at which further clustering is not productive because of reduced distance among the cluster spaces. The combination of method and distance measure used is thought to be appropriate for binary data.

After establishing an internally valid cluster solution, the next step was to use other portions of the interview not included in the cluster analysis to determine possibly differing statuses among the clusters of areas of concern covered by the interview. Aldenderfer and Blashfield [19] describe this method of performance of significance tests comparing the clusters on variables not used to produce the cluster solution as a way of evaluating the *external validity* of the solution. These items produced nominal data except for age which was dichotomized at the median and analyzed with χ^2 tests. These items mainly involved yes or no or present or absent ratings. Age differences were also analyzed by evaluating age differences in years with a oneway analysis of variance. The purpose of these analyses was to determine the relationships between cluster membership, based on diagnostic ratings, demographic factors, including military history, living situation describing the homeless condition, and employment status.

Results

Cluster Analysis

Based on considerations indicated above, a four-cluster solution was adopted. The clusters differed substantially in size: The first cluster had 2,294 cases; the second, 285 cases; the third, 700 cases; and the fourth cluster contained 219 cases. The four cluster profiles are presented in Fig. 1. The first cluster had a profile marked by a peak on addictive disorders, with secondary elevations on mood, adjustment and orthopedic disorders. It was characterized as an “Addiction” cluster. The second cluster had a very high peak on psychotic disorders, with a secondary elevation on addictive disorders. It was called a “Psychosis” cluster. The third cluster had a peak on hypertension, with secondary elevations on heart, orthopedic, addiction, mood, and adjustment disorders. It was named a “Vascular” cluster. The fourth cluster had no clear peak with substantial elevations on most of the general medical disorders in addition to addictive, mood, and adjustment disorders and was designated as a “Generalized Illness” cluster. Thus, there was a very large subgroup of individuals with addictive disorders often accompanied by mood disorder but without high percentages of medical comorbidity, except for orthopedic and liver disorders. The second cluster represented psychosis, with no substantial degree of general medical comorbidity but with notable co-occurrence with the addictive disorders. The third cluster largely reflects cardiovascular illness, mainly hypertension, with moderate association with orthopedic,

addictive, and mood disorders. The fourth cluster represents individuals with multiple illnesses, both psychiatric and general medical. Orthopedic disorders and addiction were not specific to any of the clusters, approaching or exceeding a prevalence of 40% of the cases in each cluster. However, in the case of Cluster 1, addiction occurred relatively independently of other psychiatric and medical disorders, while it occurred along with other disorders in the other clusters. As a general conclusion, it would appear that the cluster profiles contain disorders that are relatively unique to the individual cluster and other disorders, notably addictive and orthopedic disorders that are common in all four subgroups.

Influence of Age

For the sample as a whole, age was normally distributed ranging from 18 to 88 years, with a mean of 48.0(± 9.0). Age in years plotted against cluster membership is presented in Fig. 2. There is a linear relationship with age increasing from the Addiction, through the Psychosis and Vascular clusters to the Generalized Illness cluster. The proportion of relatively old and young subjects differed significantly among the four clusters ($\chi^2(3) = 124.98, P < .001$). In the Addiction cluster the proportion of older participants (44.6%) was lower than that of younger participants (55.4%). The reverse was true for the Vascular and Generalized Illness clusters. In the Vascular cluster there were 64.0% older and 36.0% younger participants. In the Generalized Illness cluster the equivalent values were 72.1 and 27.9%. In the Psychosis cluster close to 50% of the participants were in each age group. Because of these age differences, the relationship between age and the other external validity criteria were evaluated with χ^2 tests to explore the possibility of age confounding other differences across the clusters. The results are presented in Table 2.

The χ^2 for age was highly significant with substantially more older participants in the Vascular and Generalized Illness clusters. This result was supported by a one-way analysis of variance using actual years of age as the dependent measure. A highly significant difference among clusters was found ($F(3, 3494) = 77.59, P < .001$). The Tukey HSD test indicated that the Addiction and Psychosis clusters did not differ from each other but both of them differed from the Vascular and Generalized clusters, which also did not differ from each other. The relation between cluster membership and age is depicted graphically in Fig. 2.

Because of the strong influence of age on cluster membership, the results of the sociodemographic external validity analysis are presented separately for the younger and older age groups. These results are presented in Table 1. Age was associated with gender, ethnicity and employment status. Since the great majority of participants were male the impact of gender differences on the results was minor. However, ethnicity and employment status results may be associated with age. Non-white participants were on the average younger than white participants and young participants were more frequently employed than older participants. Thus, there appeared to be an interactive relation among age, ethnicity, and employment status. In order to evaluate whether age acts as a confound between race and cluster membership and employment and cluster membership, Cochran–Mantel–Haenszel tests of conditional independence were performed. The employment rate was highest within the Addiction cluster, followed by the Vascular, Generalized Illness, and Psychosis clusters regardless of age (General Association (3) = 229.88, $P < .0001$). Similarly, the percentage of whites is greatest within the addiction and general illness clusters in both age groups (General Association (3) = 9.79, $P = .0204$). The relationship between race and employment with cluster membership was therefore independent of age.

Relations with Other Sociodemographic Variables

The results of this analysis are contained in Table 2. Race was of borderline significance ($P = .052$) with more whites than non-whites in the Generalized Illness cluster and less whites than non-whites in the other three clusters. Marital status was also significant ($P = .01$). While there were very few married participants (4.2%), there were more married participants in the Generalized Illness cluster and less in the Psychosis cluster. In the case of employment status, the intercluster difference was also significant ($P < .001$) with substantially fewer employed participants in the Psychosis and Generalized Illness cluster than in the other two clusters.

Participants had been asked about their military history and whether or not they experienced combat under fire. Most of the participants served during the Vietnam era, with very few of them serving in the military before then. There were only 56 (1.6%) veterans in the total sample who served during World War II. There was a significant intercluster difference for having experienced combat under fire ($P < .001$); a relatively high percentage of members of the Generalized Illness cluster had received fire during combat (33%). Length of homelessness was significant ($P = .023$); among those in the Generalized Illness cluster, a higher percentage of individuals had been homeless more than two years.

Significant inter-cluster differences were found on all of the clinical history items, with the one exception of suicide attempts. As would be anticipated, the frequency of individuals having hallucinations and being hospitalized for psychiatric reasons were substantially higher in the Psychosis cluster than the other clusters, while depression and anxiety symptoms and concentration problems were remarkably high in the Generalized Illness cluster. Current and past alcohol and drug dependence were high in all clusters, but were slightly higher in the Addiction cluster. Use of psychiatric medications was highest in the Psychosis cluster followed by the Generalized Illness Cluster.

Discussion

The results indicate that the health status of homeless veterans while heterogeneous contains identifiable patterns among the psychiatric and general medical disorders studied. Addiction and Generalized Illness clusters reflected substantial comorbidity, in one case addiction with mood disorder and generalized comorbidity in the other, while the Psychosis and Vascular clusters appeared to reflect less comorbidity. Addictive disorders are pervasive, but may exist relatively independently or in comorbid patterns with other disorders. Orthopedic disorders also show substantial elevations in each of the clusters.

An evaluation was made of the relation between cluster membership and sociodemographic variables. Most prominently, cluster membership is related to age, with older participants having a higher prevalence of hypertension, other cardiovascular diseases and multiple illnesses. The same relationship was not found for the psychiatric disorders for which there was no such age difference. Indeed the proportion of younger participants was higher than older participants in the Addiction cluster. There was no age difference in the Psychosis cluster. The influence of ethnicity was mixed and the relationship between cluster membership and ethnicity was significant ($P = .049$). There were fewer white participants than non-whites in all but the Generalized Illness cluster where the reverse occurred. However, this result must be qualified since the non-whites were significantly younger than whites ($t(3,484) = 8.64$, $P < .001$) making an ethnicity difference a possible artifact of an age difference. When this possibility was controlled for statistically, the race difference disappeared. As indicated, Cochran–Mantel–Haenszel tests of conditional independence indicated that age was not associated with the relationship of race and employment with cluster membership.

There was a strong association between employment status and cluster membership. Fifty-nine percent of the participants in the Addiction cluster were employed at some time during the three years preceding the interview, while percentages in the mid-twenties were obtained for the Psychosis and Generalized Illness clusters. The Generalized Illness cluster had more members that were homeless for two years or more (23.2%) than the other three clusters that had percentages in the teens range. The Generalized Illness cluster constitutes a relatively small subgroup of mainly middle aged to elderly participants (mean age = 52.69, range = 22–80) with many more disorders than the other clusters. It had a mean of 7.7 (SD = 1.71) disorders, while the Addiction cluster had a mean of 3.3 (SD = 1.86) disorders, the Psychosis cluster had a mean of 3.2 (SD = 1.47) disorders, and the Vascular cluster had a mean of 4.3 (SD = 1.61) disorders. The difference was highly significant ($F(3, 3494) = 458.77, P < .001$). The mean number of disorders for individuals in the Generalized Illness cluster was significantly higher than for the other clusters.

It was also found that there was a small subgroup of 93 (about 3%) homeless individuals without any of the disorders considered. These individuals were predominantly young, non-white, employed, and had been homeless for less than one year. Thus, even in this sample of veterans who may have been concerned about their health status and thus willing to consent to interview, there is a small percentage of individuals with no apparent health problems.

Differing military histories were found among the clusters. Overall, about half of the total sample was Vietnam era veterans and there were not substantial differences among the clusters for that group. However, among the pre-Vietnam era veterans, some of whom served during World War II, there were substantially higher percentages in the Vascular and Generalized clusters than there were in the Addiction and Psychosis clusters. The reverse was true for the post-Vietnam veterans for whom there were relatively high percentages in the Addiction and Psychosis clusters. The Generalized cluster was distinguished by having a relatively large proportion of individuals who received fire under combat. Apparently, the contemporary population of veterans is not a homogeneous group but consists of major subgroups of older individuals with significant multiple physical health problems and a relatively younger subpopulation for whom psychosis and addiction are more prominent. The older subgroup, mainly pre-Vietnam veterans with multiple health problems contains a relatively large proportion of individuals with combat related disorders, with numerous individuals having PTSD.

Other participants with PTSD were largely classified into the Addiction Cluster. Thus, PTSD in this group of homeless veterans typically appears in a comorbid form either with addictive disorders or generalized impairment of health. It should be mentioned that the mean age of the 252 participants with PTSD was 51 (SD = 7.46). It is about 30 years since the Vietnam conflict at this writing, and veterans acquiring PTSD while engaged in it are now in middle age, approaching the period when there is increased risk for medical problems. We did not obtain a “PTSD cluster” probably because of this phenomenon and because PTSD is very frequently associated with some other psychiatric disorder [20]. When PTSD is comorbid with physical health problems, its relatively high elevation in the generalized illness cluster indicates that the interaction is with multiple illnesses encompassing several systems.

The significance of the findings would appear to be not so much the identification of numerous health problems among homeless individuals, something that is already well documented in the homeless literature, but is in the patterns characterized by the clusters. In the Addiction cluster there was a strong relationship between presence of substance use disorder and depression. Physical health comorbidity is relatively low but there were elevations for liver and orthopedic disease. Thus, the association between substance abuse

and depression may be a significant health care issue, and traditional specific drug and alcohol treatments (e.g., AA, methadone maintenance) may often be less effective than programs in which the issue of depression is addressed before or concurrent with the application of these treatments. There is little physical health comorbidity in the Psychosis cluster but in the Vascular cluster there is substantial co-occurrence of addictive, mood, and adjustment disorders.

A pattern of co-occurrence between general medical and psychiatric illness is also seen in the clinical history data. In particular, over half of the participants in each cluster were rated as suffering from serious depression and anxiety. These symptoms were rated as present in about 80% of the Generalized Illness cluster. Suicidal thoughts occurred in 17.4% of the total sample, and occurred at about that rate in the Vascular cluster. The Vascular cluster also shared high levels of depression and anxiety with the more psychiatrically driven clusters. Of particular concern would be the Generalized Illness cluster that has serious medical illness as well as frequent occurrence of comorbid substance abuse and mood and anxiety problems.

A limitation of this study is that the relationship between homelessness itself and acquiring the various disorders in individual or comorbid occurrence was not ascertained. There has been consideration of the antecedents of homelessness with Rosenheck and Fontana [21] proposing a multidimensional model, with post-military social isolation, substance abuse, psychiatric illness and history of childhood abuse or trauma as important factors. Duration of homelessness was associated with the Generalized Illness cluster but other aspects of the homeless situation such as environmental threat, malnutrition, and adequacy of shelter were not considered here. Psychosis, particularly schizophrenia, probably has its basis prior to homelessness, and substance abuse frequently precedes onset of homelessness [22]. Further study could describe the causal chain associated with our findings through retrospective or prospective longitudinal studies. Another limitation is that the clinical ratings made by the interviewers were not specific clinical diagnoses. While the interviewers were well trained experienced clinicians, these ratings do not necessarily reflect results taken from the numerous procedures required to make specific, precise diagnoses, but were only meant to describe general diagnostic categories. From a clinical standpoint, health providers for homeless individuals should expect to find subgroups of individuals who have anticipated comorbidities, such as between alcoholism and liver diseases, comorbidity between serious mental illness in the form of psychosis and substance use disorders, and a relatively elderly subgroup with multiple medical and psychiatric disorders suggestive of generalized serious health difficulty.

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Fig. 1.
The four cluster profiles

Fig. 2.
Relationships between cluster membership and age

Table 1External validity variables by age, *n* (% Total *N*)

Variable	Total (<i>N</i> = 3498)	Age		Test	
		<48 (<i>n</i> = 1730)	≥48 (<i>n</i> = 1768)	$\chi^2(1)$	<i>P</i>
Gender				30.71	<.001
Male	3388 (96.9)	1647 (48.6)	1741 (51.4)		
Female	110 (3.1)	83 (75.5)	27 (24.5)		
Race				69.31	<.001
White	1615 (46.2)	676 (41.9)	939 (58.1)		
Non-White	1883 (53.8)	1054 (56.0)	829 (44.0)		
Employed last 3 years				222.18	<.001
Yes	1766 (50.7)	1093 (61.9)	673 (38.1)		
No	1717 (49.3)	629 (36.6)	1088 (63.4)		
Married				1.32	.251
Yes	146 (4.2)	79 (54.1)	67 (45.9)		
No	3352 (95.8)	1651 (49.3)	1701 (50.7)		
Service period				2065.55	<.001
Pre-Vietnam	317 (9.1)	4 (1.3)	313 (98.7)		
Vietnam Era	1664 (47.6)	315 (18.9)	1349 (81.1)		
Post-Vietnam	1313 (37.6)	1209 (92.1)	104 (7.9)		
Persian Gulf	200 (5.7)	198 (99.0)	2 (1.0)		

Table 2Associations between cluster membership and demographic and clinical variables, *n* (%*N*)

Variable	Total (N = 3498)	Cluster	P		
			Addiction (N = 2294)	Psychosis (N = 285)	Vascular (N = 700)
			Generalized (N = 219)		
Age ≥ 48	1768 (50.5)		1022 (44.6)	140 (49.1)	448 (64.0)
Male gender	3388 (96.9)		2224 (96.9)	271 (95.1)	680 (97.1)
White race	1615 (46.2)		1074 (46.8)	114 (40.0)	314 (44.9)
Employed last 3 years	1766 (50.7)		1348 (59.1)	66 (23.2)	289 (41.4)
DVA support/psychiatry	213 (6.1)		115 (5.0)	53 (18.7)	31 (4.4)
DVA support/other	351 (10.1)		216 (9.5)	21 (7.4)	78 (11.2)
Non-VA disability	553 (15.9)		263 (11.5)	92 (32.4)	149 (21.4)
Married	146 (4.2)		86 (3.7)	6 (2.1)	39 (5.6)
Service period					
Pre-Vietnam	317 (9.1)		117 (5.1)	31 (10.9)	130 (18.6)
Vietnam Era	1664 (47.6)		1059 (46.2)	131 (46.0)	348 (49.7)
Post-Vietnam	1313 (37.6)		961 (42.0)	108 (37.9)	198 (28.3)
Persian Gulf	200 (5.7)		153 (6.7)	15 (5.3)	24 (3.4)
Combat zone fire	665 (19.4)		427 (19.0)	40 (14.3)	128 (18.7)
Used VA medical system, past 6 months	1835 (52.7)		1154 (50.5)	168 (59.4)	385 (55.2)
Alcohol dependency	1394 (39.9)		968 (42.3)	92 (32.3)	240 (34.4)
Past alcohol dependency	2317 (66.4)		1551 (67.7)	159 (56.0)	441 (63.1)
Drug dependency	1184 (34.0)		842 (36.8)	82 (28.9)	186 (26.6)
Past drug dependency	1922 (55.1)		1346 (58.8)	134 (47.0)	318 (45.5)
Hospitalized for psychiatric problem	1434 (41.2)		859 (37.6)	226 (79.6)	241 (34.6)
Serious depression	2069 (59.3)		1335 (58.4)	154 (54.0)	405 (57.9)
Serious anxiety	2136 (61.3)		1338 (58.6)	189 (66.3)	421 (60.4)
Hallucinations	458 (13.2)		219 (9.6)	125 (43.9)	69 (9.9)
Concentration	1410 (40.4)		806 (35.3)	178 (62.7)	282 (40.3)
Violence	412 (11.8)		264 (11.5)	35 (12.3)	64 (9.2)
Suicidal thoughts	605 (17.4)		389 (17.0)	47 (16.5)	111 (15.9)
Suicide attempt	149 (4.3)		91 (4.0)	14 (4.9)	34 (4.9)

Variable	Cluster				<i>P</i>
	Total (<i>N</i> = 3498)	Addiction (<i>N</i> = 2294)	Psychosis (<i>N</i> = 285)	Vascular (<i>N</i> = 700)	Generalized (<i>N</i> = 219)
Prescribed psychiatric medications	1177 (33.8)	682 (29.9)	187 (65.8)	209 (29.9)	99 (45.6)
Time homeless					
<1 month	948 (29.5)	590 (27.7)	84 (33.3)	219 (34.4)	55 (27.8)
<2 years	1784 (55.5)	1251 (58.8)	119 (47.2)	317 (49.8)	97 (49.0)
2+ years	482 (15.0)	286 (13.4)	49 (19.4)	101 (15.9)	46 (23.2)