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ORIGINAL ARTICLE

Trauma in Veterans With Substance Use Disorder: Similar Treatment Need Among Urban and Rural Residents

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Abstract

Purpose: The objective of this study is to determine whether rural residence is associated with trauma exposure or posttraumatic stress disorder symptoms among military veterans seeking treatment for substance use disorder (SUD) through the Department of Veterans Affairs (VA), Delivering mental health services to veterans in rural areas is a challenge, so identifying differences in the causes and outcomes of trauma exposure would assist in effectively targeting service delivery.

Methods: Veterans (N = 196) entering SUD treatment at 3 Midwestern VA treatment centers were designated as either urban or rural, based on rural-urban commuting area (RUCA) codes. The veterans completed the Life Events Checklist, the Posttraumatic Stress Disorder Checklist, and the Addiction Severity Index's psychiatric status subscale. Hypothesized relationships between rural-urban residence and both trauma exposure and symptomology were tested using independent samples t tests, chi-square tests, and ordinary least squares regression.

Findings: The range of traumatic experiences was similar between rural and urban veterans, and rural-urban residence was not significantly associated with the overall array of traumas experienced or the symptom measures' overall scores or subscores. Of 17 possible traumatic lifetime experiences, rural veterans differed from urban veterans on only 2, reporting significantly lower rates of transportation accidents and unwanted sexual experiences.

Conclusions: In both the causes of trauma and the need for treatment, veterans residing in rural areas differ little from their urban counterparts.

Key words health disparities, posttraumatic stress disorder, substance use disorder, trauma, veteran.

Nearly a quarter of United States military veterans live in rural areas, and these rural veterans represent more than a third of all veterans enrolled in the Department of Veterans Affairs (VA) health care system.[1] Compared to the general population, therefore, veterans are more likely to be rural, and compared to the overall veteran population, these rural veterans disproportionately rely on VA health care. The US Department of Veterans Affairs has enhanced rural veterans' access to health care through various initiatives, including establishing the Office of Rural Health, increasing the number of community-based outpatient clinics, and expanding telehealth services.

Expanding existing services to rural areas is an effective allocation of resources if rural and urban veterans have similar treatment needs and respond similarly to available treatments, but a growing body of research suggests they may not always be similar. For instance, soldiers from rural areas had a 48% higher death rate than urban and suburban soldiers in Operation Enduring Freedom and Operation Iraqi Freedom,[2] suggesting rural soldiers had more combat exposure, a significant predictor of posttraumatic stress disorder (PTSD).[3] Furthermore, the care offered to rural veterans within the VA health care system may differ from that offered to urban veterans. For instance, every VA medical facility is required to have an integrated (ie, on-site) substance use disorder (SUD)-PTSD specialist, but the VA community-based outpatient clinics that are more accessible to rural veterans are required to have only "similar services," which may include telemental health or referral to community-based providers.[4]

The purpose of this study is to examine trauma exposure among veterans with SUD in order to identify potential rural-urban differences in the antecedents or symptoms of that trauma. Existing research indicates that mortality is positively associated with rurality for a range of traumatic injuries[5] and that rural veterans may experience PTSD symptoms differently from their urban counterparts.[6] If the frequency and type of preenlistment traumas differ for rural military service members, research suggests their susceptibility to develop PTSD following later traumas will differ, along with their ability to marshal social support.[7] Any rural-urban differences identified by this study could enhance decision-making about both the level and types of SUD and PTSD treatments to offer in various settings.

Examining trauma exposure and its consequences among veterans with SUD is logical because a history of trauma is predictive of both PTSD and SUD, and PTSD and SUD are highly comorbid.[8] Researchers theorize an etiological relationship between the disorders[9] and have developed specialized treatments for PTSD-SUD.[10,11] PTSD is diagnosable in 55%-75% of veterans with SUD,[12] and 75% of combat veterans with PTSD have SUD.[8,13,14] Alcohol's effect on coordination and judgment increases the risk for a range of trauma events,[15] but recent studies have reached different conclusions on rural and urban patterns of alcohol use. A 2012 study of 55,452 veterans participating in the Behavioral Risk Factor Surveillance System found rural veterans were less likely than urban veterans to drink at all, more likely to binge drink, and just as likely to engage in problematic heavy drinking.[16] A separate study found a lack of association between rural residence and unhealthy alcohol use among 33,883 VA outpatients.[17]

Research on rural-urban differences in PTSD is similarly inconclusive. An epidemiological study of over 36,000 civilian adults conducted in 2012–2013 found higher rates among rural versus urban residents on past-year prevalence of PTSD (5.6% vs 4.4%) and lifetime prevalence of PTSD (7.3% vs 5.8%).[18] These findings contradicted an earlier study which found that psychiatric disorders, including PTSD and exposure to trauma, were similar across the rural-urban continuum.[19] A 2004 study of combat veterans with PTSD concluded rural and urban veterans had similar treatment needs, but it also found that rural veterans scored significantly higher on dissociation, a PTSD symptom.[6] No definitive population-based studies comparing prevalence of PTSD in rural and urban veterans have been published.

Predeployment exposure to traumatic events—including events in childhood—is a risk factor for both the development and severity of combat-related PTSD.[20] Among both men and women seeking SUD treatment, the type of trauma matters, with physical and sexual trauma more closely associated with psychiatric symptoms than other types of trauma.[21,22] Little research on adults has addressed whether rural residence is associated with differential exposure to traumatic events. The first study to test for links between rurality and trauma antecedents in a population of SUD treatment-seeking veterans found no associations between a rural childhood and any type of trauma measured by the (childhood) Early Trauma Inventory or the (adult) Trauma History Questionnaire.[23] Still unknown is whether traumatic events are differentially associated with rural or urban residence at the time veterans enter SUD treatment, knowledge which could inform resource allocation for treatment of veterans with SUD and co-occurring trauma exposure or PTSD.

Given the mixed findings in the research literature, we aim to clarify whether traumatic life events are differentially associated with rural or urban residence by testing the following hypotheses:

H1a: The range of traumatic life events varies by rural-urban residence.

H1b: The types of traumatic life events vary by rural-urban residence.

Regarding PTSD symptoms, a 2004 study of veterans in the Southeast United States tested for rural-urban differences on 9 symptom inventories, finding only 1 significant difference: rural veterans scored higher on the Dissociative Experiences Scale.[6] A 2011 study of Midwestern veterans found no association between PTSD symptoms and a rural childhood.[23] To contribute to the knowledge base on potential rural-urban differences in PTSD symptoms, we therefore will test the following hypothesis:

H2: PTSD and specific trauma symptoms vary by rural-urban residence.

Method

Participants

The VA Office of Rural Health funded a pilot study to facilitate mutual-help group attendance among rural clients in VA SUD treatment. Potential participants were therefore treatment-seeking military veterans with diagnosed SUD, and the only additional eligibility criterion was that participants must be 19 years old or older. This research team obtained institutional review board approval for human subjects research and secured written informed consent prior to enrolling participants and collecting data.

Data Collection

Potential participants were invited to participate in this study as they entered intensive SUD treatment at 1 of 3 VA sites in Nebraska: Grand Island, Lincoln, or Omaha. The data used in this analysis were collected soon after patients began treatment, using face-to-face, on-site interviews administered by a research team member. These interviews lasted approximately 40 minutes. Data collection began March 1, 2013, and concluded December 11, 2014.

Measures

This study included 3 primary variables: rurality, traumatic events, and psychological symptoms associated with trauma. Self-report instruments were used to measure these variables. Demographic variables used in multivariable analysis included age at baseline, sex (1 = male; 2 = female), and race (1 = white; 2 = nonwhite).

Rural-Urban Commuting Area Codes

Level of rurality was determined using Rural-Urban Commuting Area (RUCA) codes.[24] Participants provided their current residential ZIP code at treatment entry and these ZIP codes were used to assign a RUCA code, which can range from 1.0 (metropolitan area core) to 10.6 (rural area). These codes were then used to assign participants to 1 of 2 categories (1 = urban; 2 = rural, including rural city, rural town, and isolated rural).[25] RUCA codes have been similarly used in other recent and large-scale studies of health disparities among veterans.[26,27]

Life Events Checklist

The measure of traumatic events used in this study was the Life Events Checklist (LEC),[28] which was developed at the National Center for PTSD and has shown adequate reliability[29] and validity.[30,31] The LEC is a trauma screening tool with 17 potentially traumatic events (eg, "fire or explosion"). Participants may respond to each of the events according to level of exposure: happened to me (1), witnessed it happen (2), learned about it (3), or never happened (4). Because some items could not logically be experienced first-hand (eg, I experienced a sudden violent death) for each potential trauma category, participants were designated as trauma exposed (if they experienced or witnessed trauma) or not trauma exposed (if they learned about it or it never happened). To determine whether urban veterans are exposed to a greater variety of traumas, we added the number of categories of traumatic events experienced or witnessed to provide a rough measure of the range of lifetime traumatic events to which a participant had been exposed. Potential totals ranged from 0 to 17.

PTSD Checklist

One measure of trauma symptoms was the PTSD Checklist. After completing the LEC, participants were asked (a) which of the events was most traumatic, and (b) whether that event occurred in their military or their civilian life. To determine whether rural veterans were more likely to identify military experiences as their most traumatic, we compared the proportion of urban and rural residents making that claim. Those whose most traumatic event occurred in the military were administered the PCL-M[32] and those who experienced the most traumatic event as a civilian were administered the PCL-C.[33] Both measures include 17 PTSD symptoms. For each symptom listed, participants responded from 1 (not at all bothered by the problem in the past month) to 5 (extremely bothered by the problem in the last month). The 2 versions include symptoms which are identical or very similar, so to maintain adequate subsample sizes in the urban and rural categories we opted to aggregate the PCL-M and PCL-C scores. Total scores could range from 17 to 85. We also calculated subscale scores, whose potential ranges vary: intrusion (5 to 25), avoidance (7 to 35), and hyperarousal (5 to 25). Psychometric rigor has been demonstrated by both the PCL-M[34,35] and the PCL-C.[36,37]

Addiction Severity Index-Lite's Psychiatric Status Subscale

Participants also completed the Addiction Severity Index (ASI)-Lite,[38] and the 11-item psychiatric status subscale

Table 1 Trauma Exposure, Trauma Symptoms, and Psychiatric Status Among Urban and Rural Residents (n = 196)

	M (SD)		
Measure	Urban n = 134	Rural n = 62	*P* Value
Range of traumatic events experienced or witnessed (from Life Events Checklist)	7.47 (3.14)	6.89 (2.69)	.21
PTSD checklist	47.84 (18.20)	43.65 (17.71)	.13
Intrusion subscale	13.87 (6.40)	12.61 (5.91)	.19
Avoidance subscale	19.26 (7.97)	17.85 (7.91)	.25
Hyperarousal subscale	14.72 (5.78)	13.17 (5.62)	.08
Addiction Severity Index-Lite Psychiatric Status	0.46 (0.25)	0.43 (0.24)	.46

(PSY) was included in the present analysis. The ASI has been used by clinicians and researchers for 35 years,[39] and both the ASI-Lite[40] and the PSY[41] have demonstrated adequate reliability and validity. Eight of the ASI-PSY items are psychiatric symptoms not necessarily specific to trauma, but they are included in this analysis because symptoms such as *serious depression* and *serious anxiety* are frequently comorbid with PTSD.[42,43] Participants responded either *no* (0) or *yes* (1) when asked if they had experienced each symptom for a significant period in the previous 30 days. An additional item asks how many days in the previous 30 days the participant had experienced the symptom. The remaining 2 items relate to intensity and desire for treatment of the symptoms, with responses ranging from 0 (not at all) to 4 (extremely). The ASI's subscale scores range from 0 to 1.0, with higher numbers indicating greater severity.

Analysis

Statistical analysis was conducted using SPSS 22.0 (IBM Corp., Armonk, NY, USA). The binary independent variable of rural-urban residence allowed for initial independent samples' *t* tests to compare mean scores on the continuous dependent variables of the range of traumatic events, the total and subscale scores on the PCL, and the ASI-PSY. Pearson's chi-square test of independence was used to determine whether rural residents were significantly more or less likely to be exposed to each of the 17 specific traumas in the Life Events Checklist. Two-tailed tests were conducted and findings were deemed significant at $P < .05$. These tests were followed by multivariable analyses using ordinary least squares (OLS) regression to determine whether rural-urban residence contributes significantly when controlling for age, sex, and race.

Results

Sample Characteristics

A total of 196 participants provided the data used in this study. Although age at the time of treatment entry ranged from 25 to 82, the average was middle age ($M = 47.90$, SD = 12.27). The sample was 91.3% male. Whites comprised 76.0% of the sample and 18.4% were African American. A small number (5.6%) identified as Hispanic or Latino. At time of treatment entry, ZIP codes of residence indicated more urban than rural veterans. Those living in urban-focused areas numbered 134 (68.4%), rural city 31 (15.8%), rural town 13 (6.6%), and isolated rural 18 (9.2%). Our sample was slightly more rural than the Nebraska population (31.6% vs 26.9%), but one of the SUD treatment centers serving as a study site also serves the western region of Iowa, a more rural state where 36.0% of the population is rural.[44]

Rural and urban participants were compared on the demographics variables of age, sex, and ethnicity. An independent samples *t*-test indicated no significant difference on age ($t = -0.43$, $P = .67$, $d = -0.81$). Chi-square analysis likewise showed no significant difference in sex ($\chi^2 = 3.04$, $P = .07$), but it indicated that a significantly greater proportion of rural veterans than urban veterans were white ($\chi^2 = 9.60$, $P = .002$).

Traumatic Life Events

Out of 17 possible, the number of trauma categories directly experienced ranged from 0 to 14, with an overall mean of 7.28 (SD = 3.01). Table 1 shows that the average number of trauma types urban veterans reported ($M = 7.47$, SD = 3.14) did not differ significantly from the number reported by rural veterans ($M = 6.89$, SD = 2.69, $P = .21$). These findings offer no support for H_{1a}, that

Table 2 Traumatic Events Among Urban and Rural Residents

Type of Trauma (Life Events Checklist)	Experienced or Witnessed Trauma (%)			
	Total n = 196	Urban n = 134	Rural n = 62	Urban vs Rural: *P* Value
Transportation accident	74.0	78.4	64.5	.04*
Physical assault	71.4	70.1	74.2	.56
Natural disaster	68.4	67.2	71.0	.59
Assault with a weapon	57.7	59.0	54.8	.59
Other serious accident	56.6	55.2	59.7	.56
Fire or explosion	55.6	55.2	56.5	.87
Another's unexpected death	49.5	51.5	45.2	.41
Life threatening illness/injury	48.0	50.0	43.5	.40
Exposure to combat zone	46.9	47.0	46.8	.98
Exposure to toxic substance	39.8	38.8	41.9	.68
Other stressful event	33.2	34.3	30.6	.61
Sudden/violent death	31.6	33.6	27.4	.39
Severe human suffering	31.1	34.3	24.2	.15
Injury/harm/death you caused	23.5	22.4	25.8	.60
Unwanted sexual experience	23.5	29.3	11.3	.01**
Rape	14.3	17.3	8.1	.09
Experience in captivity	4.1	4.5	3.2	.68

*$P < .05$; **$P < .01$.

the range of traumatic life events varies by rural-urban residence.

Table 2 provides the 17 specific traumas in the LEC listed in decreasing order of trauma exposure indicated by the overall sample. The prevalence of 15 traumas did not significantly differ between rural and urban veterans. Rural residence was a protective factor for lifetime exposure to 2 of the traumas. A significantly higher proportion of urban veterans reported experiencing a transportation accident ($\chi^2 = 4.22$, $P = .04$) and an unwanted sexual experience ($\chi^2 = 7.63$, $P = .006$). With these 2 traumas serving as exceptions, the data provide little overall support for H_{1b} that the types of traumatic life events vary by rural-urban residence.

To determine which version of the PCL to administer, participants were asked whether their most traumatic experience happened in their military or civilian life. Overall, 63.6% reported a civilian trauma as their most traumatic experience. This proportion did not significantly differ between urban and rural veterans ($\chi^2 = 0.411$, $P = .41$).

PTSD Symptoms

Table 1 also includes comparisons between urban and rural veterans on posttraumatic stress and psychiatric symptoms. The mean score on the PCL was 46.51 (SD = 18.12), or just above the lower end of the VA's recommended cut-point score for patients in a VA specialty mental health clinic.[45] Urban and rural veterans did not differ significantly on either the PTSD checklist (PCL) overall scores or the subscale scores measuring intrusive thoughts, avoidance, or hyperarousal. The number of rural residents completing the PCL-M (n = 20) was small, and no significant difference between urban and rural veterans was found for both the PCL-M and PCL-C and the 3 subscales for each.

Table 3 OLS Regression Model for Correlates of Trauma Exposure and ASI-Lite Psychiatric Status (n = 196)

Variables	Model 1		Model 2	
	β	SE	β	SE
	LEC No. of Traumas		ASI Psychiatric Status	
Age	−0.194**	0.018	−0.161*	0.001
Sex	−0.013	0.762	0.106	0.062
Race	−0.043	0.524	−0.007	0.043
Urban vs rural	−0.095	0.473	−0.036	0.039
Adjusted R^2	0.031		0.024	

*$P < .05$; **$P < .01$.

The overall average on the ASI-Lite's psychological status subscale was 0.45 (SD = 0.24). Urban and rural veterans did not differ significantly.

Multivariate Models

Because trauma exposure is associated with demographic characteristics, OLS regression was used to test a series of multivariate models to determine whether rural

Table 4 OLS Regression Model for Correlates of PTSD Checklist (PCL) and PCL Subscales (n = 196)

	Model 3		Model 4		Model 5		Model 6	
Variables	β PTSD Checklist	SE	β Intrusion Subscale	SE	β Avoidance Subscale	SE	β Hyperarousal Subscale	SE
Age	−0.198**	0.105	−0.173*	0.037	−0.169*	0.043	−0.202**	0.033
Sex	0.156*	4.492	0.131	1.571	0.140*	1.991	0.155*	1.433
Race	0.151*	3.083	0.152*	1.079	0.173*	1.377	0.072	0.985
Urban vs rural	−0.048	2.781	−0.037	0.972	−.020	1.233	−.083	0.887
Adjusted R^2	0.070		0.051		0.055		0.065	

*$P < .05$; **$P < .01$.

residence accounts for a significant portion of the variation in trauma exposure, PTSD symptoms, and psychological status after controlling for a veteran's age, sex, and race. Table 3 shows the first 2 models which indicate that only age is a significant correlate of both the range of traumatic events experienced and psychiatric status as measured on the ASI-Lite's Psychological Status subscale.

Table 4 shows the results of 4 OLS regression models with the PCL's overall score and intrusive thoughts, avoidance, and hyperarousal subscales. Similar to the previous models, age was a significant correlate in all 4 models. Specifically, younger age veterans were more likely to have higher scores on all 4 subscales. In addition, females had higher PCL total scores, avoidance scores, and hyperarousal scores compared to males. Nonwhites had higher scores on PCL total scores, intrusion, and avoidance compared to whites. Rural-urban residence was not significantly correlated with any of the outcome variables. Additional models were tested in which only rural residence was entered in the model and in which rural residence was entered before the demographic variables. None of these models yielded a significant result for rural-urban residence.

Discussion

This study of SUD treatment-seeking veterans sought to determine whether rural-urban residence is associated with the range of lifetime traumas, with specific types of traumas, or with symptoms associated with PTSD. Using the Life Events Checklist, the PTSD Checklist, and the Psychological Status subscale of the ASI-Lite, we found little evidence supporting the hypotheses that rural veterans differ from urban veterans in either the causes or the symptoms of PTSD. Rural veterans were significantly less likely than urban veterans to report lifetime experience of a transportation accident or an unwanted sexual encounter, but otherwise the 2 groups were quite similar. These findings help clarify the relationship between rurality and trauma among veterans and hold implications for both clinical practice and future research.

Previous research indicates that physical and sexual trauma in those with SUD is associated with worse outcomes.[46] In this sample, urban veterans were more than twice as likely as their rural counterparts to have experienced unwanted sexual contact. This finding contrasts with a previous finding among a similar sample of Midwestern veterans, which found no rural-urban difference in the broader category of lifetime "physical/sexual trauma" measured on the Trauma History Questionnaire.[23] Our study distinguished between rape and unwanted sexual experiences, which may account for the different findings. Our current findings are consistent with previous research which found urban women in primary care are more likely than rural women to have a history of sexual trauma.[47] Given that only 8.7% of our sample was female and distributed across the urban and rural subsamples, our findings suggest that urban residence is a risk factor for sexual trauma among both women and men.

The finding that rural residence is a protective factor for transportation accidents among substance-dependent veterans is unexpected. Earlier research found that driving under the influence is significantly more common among both rural veterans and Midwestern veterans.[16] Rural roads, however, have less traffic and therefore provide less opportunity for accidents between vehicles, perhaps accounting for our findings.

Perhaps more important than the 2 significant differences which emerged is the finding that rural veterans are quite similar to urban veterans in their trauma history. A 2005 study of Marine Corps recruits found a majority of them entered the military with at least 1 interpersonal trauma.[48] We did not ask participants when their most traumatic experience occurred, but nearly two-thirds reported it happened in civilian life. The average of about 7 different types of trauma experienced and the bidirectional relationship between trauma and SUD support the

conclusion that treatment for the underlying causes of PTSD should focus as much on civilian experiences as on military experiences.

Regarding symptoms, we found no support for H_2, that PTSD symptoms differ by rural-urban residence. The lack of association supports previous findings that health-related quality of life is not associated with rural status among veterans recently separated from the military.[26] Our findings are also consistent with results from a 2004 study of combat veterans in outpatient treatment for PTSD, which found little difference between urban and rural residents.[6]

Collectively, these findings emphasize that rural veterans with comorbid SUD and PTSD need equal access to treatment. Access to mental health services, however, continues to be inadequate and the problem of access is acute in rural areas.[49] Equal need combined with unequal access may contribute to significant negative consequences for rural veterans. A 2014 systematic review of 95 articles found a consistent association between negative life events (ie, traumatic events) and both suicidal ideation and behavior.[50] Despite efforts of researchers and clinicians, suicide is epidemic among veterans, who are twice as likely as the general population to die of suicide.[51] A study of 5,221 veterans receiving intensive VA mental health case management found an association between suicidality and rurality.[52]

A strength of this study is that it focuses on rural residence as the independent variable. A 2008 review by Weeks and associates[53] identified multiple problems with the research literature on rural veterans, including outdated studies and inconsistent definitions of *rural*. In about 20% of the articles they located, "the rural aspect of the setting was incidental to the study."[53(p 337)]

Limitations

One limitation of this study is that RUCA codes were used to designate rural or urban residence, and a different classification system may have yielded different associations.[54] In addition, the patient's residence at intake may be an imperfect measure of rural status. Most of the participants in this study indicated more urban than rural residence at intake, perhaps reflecting that, even in rural Midwestern states patients with SUD are likely to be highly mobile or even homeless as they await admission to urban VA treatment facilities.

Other limitations relate to the data. The RUCA data were categorical and disproportionately urban. Future research should attempt to recruit samples with rural participants, women, and ethnic minorities in sufficient numbers to allow subgroup analyses.

In addition, previous findings suggest in many cases those in suburban settings have better health than those in either highly urban or highly rural areas.[55] The nature of our data and our small rural subsamples did not allow for rigorous nonlinear tests of association. Future research should also recruit samples which allow for more categories of rural-urban residence which, in turn, would permit testing for potential linear and nonlinear associations between rural residence and trauma exposure and symptoms.

Finally, we did not find evidence of relationships between rural residence and trauma exposure in this sample, but other influences should be examined independently and in combination with rurality. Longitudinal methods would help determine if relationships between rural residence and trauma might be reversed or even bidirectional. In other words, traumatic events and PTSD symptoms may be as likely to influence relocation to rural, urban, or suburban residences as to be influenced by those locations. Given that an earlier study found that nearly half of veterans raised in rural areas relocated to urban settings by the time of treatment intake,[23] relocation should be considered a potential outcome measure in future studies.

Conclusion

Among treatment-seeking veterans, those in rural areas have histories of trauma exposure and current PTSD symptomology very similar to those in urban areas. The VA should continue efforts like the Veterans Choice Act, which make mental health treatments more accessible to rural-residing veterans.

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