

2017-06-05

Rurality or distance to care and the risk of homelessness among Afghanistan and Iraq veterans

Richard E. Nelson, Adi Gundlapalli, Marjorie Carter, Emily Brignone, Warren Pettey, Thomas H. Byrne, Ann Elizabeth Montgomery, Randall Rupper, Jamison Fargo. 2017. "Rurality or distance to care and the risk of homelessness among Afghanistan and Iraq veterans." *Housing, Care and Support*, Volume 20, Issue 2, pp. 45 - 59.

<https://hdl.handle.net/2144/26462>

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1 **ABSTRACT**

2

3 **Introduction**

4 To date, no studies have examined the relationship of rurality and distance to nearest VA facility
5 to risk of homelessness.

6

7 **Methods**

8 We examined differences in the rate of homelessness within a year of a Veteran's first
9 encounter with the VA following last military separation based on rurality and distance to the
10 nearest VA facility using multivariable log-binomial regressions.

11

12 **Results**

13 In our cohort of 708,120 Veterans, 73% were determined to have a forwarding address in urban
14 areas, 59.2% and 86.7% lived within 40 miles of the nearest VA medical center (VAMC),
15 respectively. Veterans living in a rural area and those living between 20+ miles away from the
16 nearest VAMC were at a lower risk for homelessness.

17

18 **Conclusions**

19 Our unique dataset allowed us to explore the relationship between geography and
20 homelessness. These results are important to policy makers in understanding the risk factors for
21 homelessness among Veterans and planning interventions.

22

23

24 **INTRODUCTION**

25 More than 40% of the Veterans enrolled in the Department of Veterans Affairs (VA) healthcare
26 system live in rural areas and roughly 30% of the enrolled Veterans living in rural areas served in
27 the military in Afghanistan and Iraq with Operations Enduring and Iraqi Freedom(OEF/OIF).¹

28 Individuals living in rural areas face many obstacles relative to their urban counterparts
29 including more barriers to access healthcare^{2,3} as well as other services such as public
30 transportation and government agencies.⁴ However, compared with their urban counterparts,
31 rural individuals are more likely to report having strong social ties and connections with friends
32 and family.⁴

33

34 Risk factors for homelessness include economic instability, mental illness, and substance abuse.⁵

35 An area of particular concern for Veterans generally is housing instability as they are at high risk
36 for homelessness and are over-represented in general homeless populations.⁶ In 2010, the VA
37 and the White House set an ambitious goal to end homelessness among US Veterans within five
38 years. Efforts have focused on determining specific risk factors and providing mitigative and
39 supportive services to those Veterans experiencing homelessness. Most studies of Veterans
40 have not specifically addressed rural vs. urban residence. The relationship between rurality and
41 homelessness is not well understood, although several studies have found lower rates of
42 persistent homelessness⁷ or living in an unsheltered^{8,9} homeless situation for Veterans accessing
43 VA healthcare services at a rural facility compared to an urban facility. In addition, several
44 papers have examined differences in characteristics and health services utilization between
45 homeless veterans in rural compared with non-rural areas.

46

47 The strong support networks and community engagement that are present in rural areas may
48 protect individuals against becoming homeless. Alternatively, individuals in rural areas could be
49 at greater risk for homelessness due to fewer economic opportunities.¹⁰ To our knowledge,
50 there is no published empirical evidence as to which of these effects holds true, due in part to
51 the challenges in determining the rurality vs. urbanicity of homeless individuals. If a person does
52 not have a stable residence or provides a temporary address such as a post office box or of the
53 nearest homeless shelter, it is not clear whether they should they be defined as urban or rural.
54 Few studies addressing this issue have used the rurality of the VA site of care.⁷⁻⁹ Thus, studies on
55 rurality and homelessness have been hampered by availability of appropriate data to determine
56 rurality of Veterans. We overcame this obstacle by using data from Veterans recently separated
57 from the military after serving in OEF/OIF.

58

59 **METHODS**

60 **Study design and population**

61

62 We employed a historical cohort study design and used data from the national VA healthcare
63 system, the largest integrated healthcare system in the United States.¹¹ Our cohort consisted of
64 Veterans in the OEF/OIF roster file who had separated from the military between 2001-2011. On
65 separation from service, the Veterans provide the military with a forwarding address, which we
66 used as the Veteran's self-reported place of residence after leaving the military to define
67 rurality. We then combined these data with administrative evidence of homelessness or of
68 receiving homeless services within the VA in order to examine the relationship between
69 homelessness and rurality or distance to VA care. We excluded Veterans whose address on the
70 OEF/OIF roster file matched that of a US military installation or whose zip code was missing.

71

72 The follow-up observation period in our study was 1 year following the first VA visit following
73 the last separation from the military as service members may have had more than one
74 deployment. Only Veterans with data available for the one-year follow-up period were included
75 in the study.

76

77 **Data**

78 *Homelessness*

79 We identified homelessness among Veterans based on any of the three following criteria in VA
80 administrative data^{12,13}: (1) an International Classification of Diseases, Ninth Revision, Clinical
81 Modification (ICD-9-CM) code of V60.0, which represents “lack of housing,” (2) an outpatient
82 stop code indicating receipt of homelessness services (permanent supportive housing and
83 community and hospital-based outreach for Veterans experiencing homelessness); or (3)
84 inpatient treatment specialty codes that indicate homeless services during an inpatient stay.

85

86 *Rurality and distance*

87 Zip codes were designated as urban or rural based on rural-urban commuting area (RUCA) codes
88 which capture population density, urbanization, and daily commuting. While RUCA codes are
89 designated at the census tract level, we used a zip code approximation of the 2010 RUCA codes
90 since we did not have census tract information on Veterans. In addition to rurality, we also used
91 ArcGIS software to construct measures of proximity to locations of VA care. These measures
92 captured the driving distance in miles to the nearest VA medical center (VAMC) and community-
93 based outpatient clinic (CBOC).

94

95 *Veteran characteristics*

96 We obtained characteristics related to the Veterans' demographics and military service from the
97 OEF/OIF roster file. This file has been used in a number of recent studies to examine
98 homelessness^{12,14} and other conditions such as infertility in returning female Veterans,¹⁵
99 persistent pain,¹⁶ and gestational diabetes and hypertensive disorders of pregnancy.¹⁷

100

101 **Outcome variables**

102 The outcome variables for our analyses were indicators for homelessness within 1 year of a
103 Veterans' first VA encounter following last separation from the military.

104

105 **Independent variables**

106 The key independent variables in our models were categorical measures of rurality and
107 proximity to VA care. We created 3 categories by collapsing 10 RUCA code values based on
108 definitions employed by the VA¹⁸: (1) codes 1.0 or 1.1 were designated as urban; (2) code 10.0
109 was designated as highly rural; and (3) all other codes were designated as rural. Examinations of
110 these data by researchers at the University of Washington suggest that there was 99.3%,
111 98.0% and 95.2% agreement between census tract and zip code for 1.0, 1.1, and 10.0 RUCA
112 codes, respectively. In secondary analyses, we used an alternative definition of rurality used by
113 the US Census Bureau. This measure defines Urbanized Areas (UAs) as those of 50,000 or more
114 people and Urban Clusters (UCs) as those with between 2,500 and 50,000 people. All
115 population, housing, and territory not included in an UA or UC are designated as rural. Finally to
116 measure proximity to VA care, we categorized driving distance to the nearest VAMC or CBOC
117 into 3 categories: (1) < 20 miles, (2) 20-40 miles, and (3) >40 miles.

118

119 We controlled for potential confounders, including age; race; sex; education (high school or
120 more than high school); marital status (married, never married, divorced); branch of service;
121 component (Active Duty, Reserve, National Guard); enrollment priority group as a way of
122 identifying Veterans who are eligible to receive reimbursement for travel^{19,20}; year of separation
123 from the military, to account for macroeconomic conditions that can affect the risk of
124 homelessness; and state of residence, to account for geographical differences in homelessness
125 prevention services or economic conditions.

126

127 **Statistical analysis**

128 We estimated the relative impact of rurality or proximity to VA care on homelessness by
129 estimating multivariable log-binomial regressions. To estimate the absolute risk of
130 homelessness, we used recycled predictions to compute marginal effects.²¹ In addition to the
131 primary regression models, which included all Veterans in our cohort, we also conducted several
132 supplementary analyses. First, our analyses were based on the assumption that the forwarding
133 address given in the OEF/OIF roster file was a Veteran's true address of residence. This
134 assumption is more likely to be true for military personnel who are in the National Guard or in
135 the military reserve of one of the 4 military branches. For this reason, we ran separate models
136 for National Guard members/Reservists and Active Duty personnel. Second, we ran additional
137 models restricting our cohort to those whose first encounter with the VA was within the first
138 365 days following separation from the military with the assumption that the forwarding
139 address in the OEF/OIF roster file, collected at the time of discharge from the military, was more
140 likely to be current at their time of interaction with the VA system due to temporal proximity.
141 We tested interactions between our measure of rurality and distance, but we removed them
142 from the final statistical models because they were non-significant. The level of collinearity

143 between rurality and distance was trivial with variance inflation factors ranging from 1.18 to
144 1.44.

145

146 **Institutional Review Board approval**

147 All relevant ethical safeguards have been met in relation to patient or subject protection.
148 Institutional Review Board (IRB) approval for this study was obtained through the University of
149 Utah's IRB and the VA's Office of Research and Development, therefore this study was
150 performed in accordance with the ethical standards contained in the 1964 Declaration of
151 Helsinki and its later amendments.

152

153 **RESULTS**

154 *Veteran characteristics*

155 Our cohort with a forwarding address consisted of 708,120 OEF/OIF Veterans. Table 1 depicts
156 the characteristics of the Veterans in our analysis cohorts. Veterans identified as homeless
157 tended to be younger (17.4% between the ages of 18-29 vs. 10.5%), were slightly more likely to
158 be female (14.3% vs. 12.1%), less likely to have education beyond high school (9.2% vs. 21.9%),
159 and more likely to have been in active duty while in the military (68.1% vs. 57.9%) compared
160 with non-homeless Veterans.

161

162 Most of the Veterans in our cohort reported an address in an urban area and those with
163 evidence of homelessness were also more likely to have an urban address (80.9% vs. 72.9%). In
164 addition, the addresses for nearly 60% of the Veterans in our cohort were within 40 miles of the
165 nearest VAMC and more than 80% were within 40 miles of the nearest CBOC. Compared to
166 those without evidence of homelessness, Veterans identified as homeless in the 1-year time

167 window were more likely to live within 20 miles of the nearest VAMC (43.0% vs. 36.5%) and
168 within 20 miles of the nearest CBOC (68.7% vs. 63.8%).

169

170 Figures 1a and 1b depict the relationship between the urban/rural distinction and the distance
171 to the closest VAMC and CBOC, respectively. In general, Veterans in our cohort with urban
172 addresses were more likely to live closer to both a VAMC and a CBOC compared to those with
173 rural addresses.

174

175 *Multivariable regression models*

176 After controlling for confounders, Veterans living in a rural area were 21.4% (95% CI: 16.7% -
177 25.9%) less likely to be homeless in the 1 year following their first VA encounter following
178 separation from the military compared with those living in an urban area (Table 2). This
179 amounted to 3.68 (95% CI: 2.79 - 4.58) fewer cases of homelessness per 10,000 Veterans.

180 Compared to Veterans living within 20 miles of a VAMC, those living 20-40 miles or more than
181 40 miles away were 12.4% (95% CI: 7.8% - 16.8%) and 8.3% (95% CI: 3.6% - 12.9%) less likely to
182 be homeless, respectively, corresponding to 2.03 (95% CI: 1.24 - 2.81) and 1.33 (95% CI: 0.56 -
183 2.10) fewer cases of homelessness per 10,000 Veterans, respectively. Similarly, Veterans living
184 20-40 miles from the nearest CBOC were 12.1% (95% CI: 7.2% - 16.8%) less likely to be
185 homeless, a difference of 1.98 (95% CI: 1.15 - 2.81) cases of homelessness per 10,000 Veterans.
186 However, Veterans living further than 40 miles from the nearest CBOC were 12.9% (95% CI:
187 5.9% - 20.3%) more likely to have evidence of homelessness, which amounts to 1.86 (95% CI:
188 0.88 - 2.83) more cases of homelessness per 10,000 Veterans.

189

190 The relationship between homelessness and rurality or distance to a VA healthcare facility was
191 similar when restricting our analysis to just Veterans who were on Active Duty in the military.
192 However, the risk of homelessness was no longer elevated for those living more than 40 miles
193 from the nearest CBOC after restricting to those who were in the Reserve or National Guard
194 while all other effects were similar.

195

196 Table 3 contains multivariable regression results for the subset of Veterans in our cohort whose
197 first VA encounter was within 1 year of their military separation. These results are relatively
198 consistent with those for the full cohort. A significant reduction in the risk of homelessness was
199 evident in those living in rural areas relative to urban areas and in those living further away from
200 compared with those living close to the nearest VAMC or CBOC. The most substantial difference
201 between these results and those for the full cohort was the lack of significant increased risk of
202 homelessness in those living further than 40 miles from the nearest CBOC.

203

204 Results from analyses using the Census definition of rurality are found in Tables 4 and 5 and
205 corroborate those found in our primary analyses.

206

207 **DISCUSSION**

208 This study is the first to explore the relationship between Veterans' homelessness and rurality or
209 distance from healthcare facilities. Our results suggest that Veterans living in rural areas were
210 less likely to experience homelessness compared with those in urban areas during the 1 year
211 following their first VA encounter following their last separation from the military. Similarly, in
212 most instances, we found that Veterans living more than 20 miles from the nearest VA facility
213 were less likely to experience homelessness than those living closer than 20 miles.

214

215 While ours is the first study to compare homelessness rates by rurality or distance from
216 healthcare facilities, other published studies have compared characteristics and health care
217 utilization between homeless Veterans living in metropolitan and nonmetropolitan areas.
218 Gordon et al, (2010) found that homeless Veterans in metropolitan areas were less likely to have
219 medical or psychiatric problems but were more likely to use VA medical services than those in
220 nonmetropolitan areas. And Tsai, et al (2015) found that homeless veterans living in a
221 micropolitan in Nebraska were sicker and utilized more VA healthcare services than homeless
222 counterparts in metropolitan areas of Nebraska. While these studies point out key differences in
223 the homeless experience based on where an individual lives, neither involved a comparison of
224 rates of homelessness between veterans in urban versus rural areas. a

225

226 There are several explanations as to why Veterans in our cohort with a rural residence would be
227 less likely to be identified as homeless. It may be that individuals living in rural areas are more
228 likely to develop a culture of self-reliance.^{22,23} In addition, there is evidence to suggest that social
229 and kinship networks are stronger for those in rural areas than those in urban areas.²⁴ For
230 example, individuals in rural areas are more likely to indicate that they have had longer
231 friendships with or are more closely related to those in their social network compared with
232 those in urban areas.²⁵ Individuals in rural areas are more likely to have close connections with
233 neighbors^{26,27} and strong ties to their community.²⁸ It is quite possible that these strong social
234 connections can help to lessen the blow of financial difficulties leading to fewer instances of
235 homelessness.²⁹ Finally, the conceptual understanding and programmatic responses to
236 homelessness are often centered on the archetypal version of it in an urban setting (i.e. literal
237 homelessness).^{30,31} However, it is quite possible that poverty manifests itself differently in rural

238 settings compared to urban settings. It has been suggested that rural homeless individuals might
239 be more likely to be “doubled-up” (i.e., living with a friend or a family member), living in a
240 vehicle, or living in substandard housing compared with their urban counterparts.³² While it is
241 beyond the scope of our analysis to explore this, if individuals living in these conditions are less
242 likely to be recognized as being homeless during encounters with the VA, then that would be
243 consistent with our findings.

244

245 One potential reason for the lack of previously published studies in this areas may be the
246 difficulty in assigning rurality, a distinction that requires a residential address, to individuals who
247 are homeless. We overcame this challenge by using a unique dataset in the VA healthcare
248 system that provides a forwarding residential address for all individuals whose military service
249 was ending. We made the assumption that this address would be the residence to which these
250 individuals would return upon separation from the military. There were a number of addresses
251 that were clearly not residences such as those for military installations, which we excluded from
252 our analysis. It is quite possible that the residences associated with these addresses may not be
253 the residences in which these Veterans lived during their post-deployment period. For example,
254 these addresses may have been the residence of the Veterans’ parents or other family members
255 with whom the Veteran lived prior to joining the military. Because our initial cohort of Veterans
256 included more than 700,000 individuals, we were able to conduct several supplementary
257 analyses using subsets of this initial cohort in order to more confidently say that the address on
258 record was likely to be the address of post-deployment residence. The first was to restrict our
259 analysis to individuals who served in the military as a member of a reserve group or of the
260 National Guard. Unlike active duty military personnel, the military is not a full-time occupation
261 for those in a reserve group or in the National Guard. We therefore assumed that those in the

262 reserve or National Guard would be more likely to be returning from military service to their
263 permanent place of residence, rather than a temporary or previous living arrangement. In
264 addition, we restricted our analyses to the subset of Veterans whose first encounter was within
265 1 year of separation from the military. In each of these secondary analyses, our results
266 confirmed the findings of our primary analysis.

267

268 One possible explanation for why we consistently found that individuals living in rural areas and
269 areas further away from VA healthcare facilities were at a decreased risk for homelessness may
270 have been our definition of homelessness. It is important to note that the V60.0 ICD-9-CM code,
271 outpatient stop codes, and inpatient treatment specialty codes that we used to identify
272 homelessness are indicators that a VA provider was aware of the Veteran's lack of housing. To
273 the extent that a Veteran would be reluctant to divulge this information or that a Veteran would
274 cease to receive certain healthcare services in the VA after becoming homeless due to barriers
275 to access care, these administrative codes may not completely capture homelessness among
276 our cohort. However, it may be the case that Veterans living in rural areas or living far away
277 from VA facilities are less likely to have administrative evidence of homelessness simply because
278 they faced more substantial barriers to accessing VA facilities than those living in urban areas or
279 closer to VA facilities or that they had more limited access to VA homeless programs. If this were
280 the case, then our findings presented here would just be confirming previously identified
281 relationship between access and rurality or distance. However, we found that the mean number
282 of encounters in the 1-year follow-up period was similar across definitions of rurality (16.7, 16.7,
283 16.2), distance to nearest VAMC (17.5, 16.7, and 15.9), and distance to nearest CBOC (16.4,
284 17.0, and 17.3).

285

286 In conclusion, we found that Veterans living in rural areas or at great distances from VA
287 healthcare facilities have lower rates of homelessness compared to those living in urban areas
288 or close to VA healthcare facilities. These results are important to VA and national policy makers
289 in understanding the risk factors for homelessness among Veterans. Further investigations are
290 necessary to understand homelessness in different geographic settings with a goal of potentially
291 tailoring services and prevention strategies to meet setting-specific needs.

Table 1: Veteran characteristics by homelessness

Variable	Not homeless		Homeless	
	N	%	N	%
Total	697,295		10,825	
Age				
18-29	73,500	10.5%	1,883	17.4%
30-44	414,710	59.5%	7,339	67.8%
45-59	185,385	26.6%	1,495	13.8%
60+	23,700	3.4%	108	1.0%
Race				
White	74,880	10.7%	2,378	22.0%
Black	65,640	9.4%	1,332	12.3%
Hispanic	33,401	4.8%	421	3.9%
Other	163,620	23.5%	2,391	22.1%
Unknown	359,754	51.6%	4,303	39.8%
Sex				
Female	84,583	12.1%	1,545	14.3%
Male	612,707	87.9%	9,279	85.7%
Missing	5	0.0%	1	0.0%
Education				
HS or equivalent	535,389	76.8%	9,710	89.7%
Beyond HS	153,028	21.9%	993	9.2%
Missing	8,878	1.3%	122	1.1%
Marital status				
Divorced	1,455	0.2%	29	0.3%
Married	315,139	45.2%	3,850	35.6%
Never Married	348,778	50.0%	6,557	60.6%
Other	31,923	4.6%	389	3.6%
Branch of service				
Army	94,482	13.5%	1,909	17.6%
Navy/Coast Guard	98,965	14.2%	1,310	12.1%
Air Force	85,262	12.2%	624	5.8%
Marines	418,586	60.0%	6,982	64.5%
Component				
National Guard	186,041	26.7%	2,224	20.5%
Active Duty	404,053	57.9%	7,374	68.1%
Reserve	107,201	15.4%	1,227	11.3%
Enrollment Priority				
1	44,433	6.4%	396	3.7%
2	35,574	5.1%	349	3.2%
3	62,791	9.0%	729	6.7%
4	173	0.0%	3	0.0%

5	158,860	22.8%	5,119	47.3%
6	260,751	37.4%	3,435	31.7%
7	7,836	1.1%	161	1.5%
8	30,345	4.4%	305	2.8%
Missing	96,532	13.8%	328	3.0%
Year of separation from military				
2001	4,862	0.7%	72	0.7%
2002	23,359	3.3%	368	3.4%
2003	76,366	11.0%	1,121	10.4%
2004	81,665	11.7%	1,045	9.7%
2005	95,453	13.7%	1,118	10.3%
2006	81,800	11.7%	1,154	10.7%
2007	73,036	10.5%	1,089	10.1%
2008	81,263	11.7%	1,392	12.9%
2009	76,563	11.0%	1,516	14.0%
2010	68,785	9.9%	1,356	12.5%
2011	34,143	4.9%	594	5.5%
Rurality – VA definition				
Urban	508,270	72.9%	8,757	80.9%
Rural	183,630	26.3%	2,007	18.5%
Highly rural	5,395	0.8%	61	0.6%
Rurality – US Census definition				
Urban	639,071	91.7%	8,757	80.9%
Rural	58,223	8.3%	587	5.4%
Distance to nearest VAMC				
< 20	254,788	36.5%	4,656	43.0%
20 - 40	157,109	22.5%	2,346	21.7%
40+	285,398	40.9%	3,823	35.3%
Distance to nearest CBOC				
< 20	445,072	63.8%	7,433	68.7%
20 - 40	159,603	22.9%	1,923	17.8%
40+	4,866	13.3%	1,469	13.6%

293 Note: VAMC = VA medical center; CBOC = community-based outpatient clinic; VA enrollment
294 priority groups are defined as follows:
295 Priority Group 1 = Veterans with service-connected disabilities 50% or more disabling or whose
296 service-connected conditions cause them to be unemployable
297 Priority Group 2 = Veterans with service-connected disabilities 30-40% disabling
298 Priority Group 3 = Veterans who are former prisoners of war, were awarded a Purple Heart
299 medal, were discharged from the military due to a disability incurred or aggravated in the line of
300 duty, with service-connected disability 10-20% disabling, were disabled by treatment or
301 vocational rehabilitation, or were awarded the Medal of Honor
302 Priority Group 4 = Veterans who are receiving aid or household benefits from VA or who are
303 catastrophically disabled

304 Priority Group 5 = Nonservice-connected veterans and service-connected veterans whose
305 annual income falls below a certain threshold, veterans receiving VA pension benefits, or
306 Veterans eligible for Medicaid programs
307 Priority Group 6 = Veterans with 0% service-connected disabilities, exposed to ionizing radiation
308 during the occupation of Hiroshima and Nagasaki, project 112/SHAD participants, served in the
309 Republic of Vietnam between 1/9/1962 and 5/7/1975, served in Persian Gulf War between
310 8/2/1990 and 11/11/1998, served at Camp Lejeune for at least 30 days between 8/1/1953 and
311 12/31/1987, or who served in a theater of combat operations after 11/11/1998
312 Priority Group 7 = Veterans with gross household income below a certain threshold and who
313 agree to pay copays
314 Priority Group 8 = Veterans with gross household income above this threshold and who agree to
315 pay copays

Figure 1a: Rurality and distance to nearest VAMC

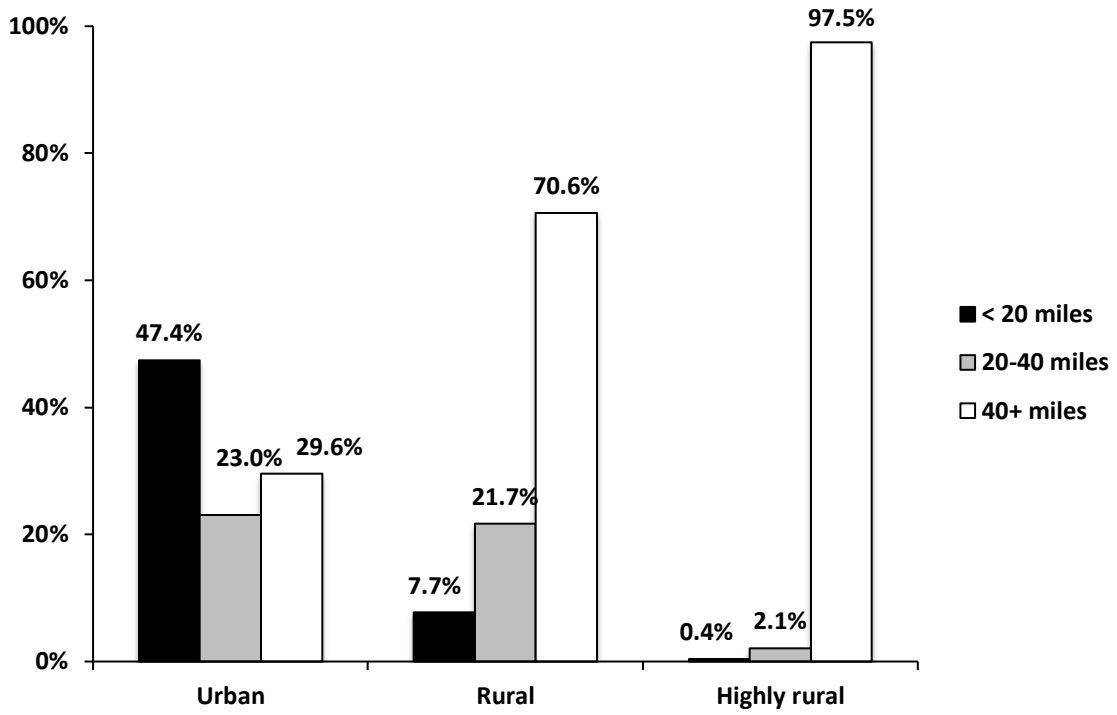


Figure 1b: Rurality and distance to nearest CBOC

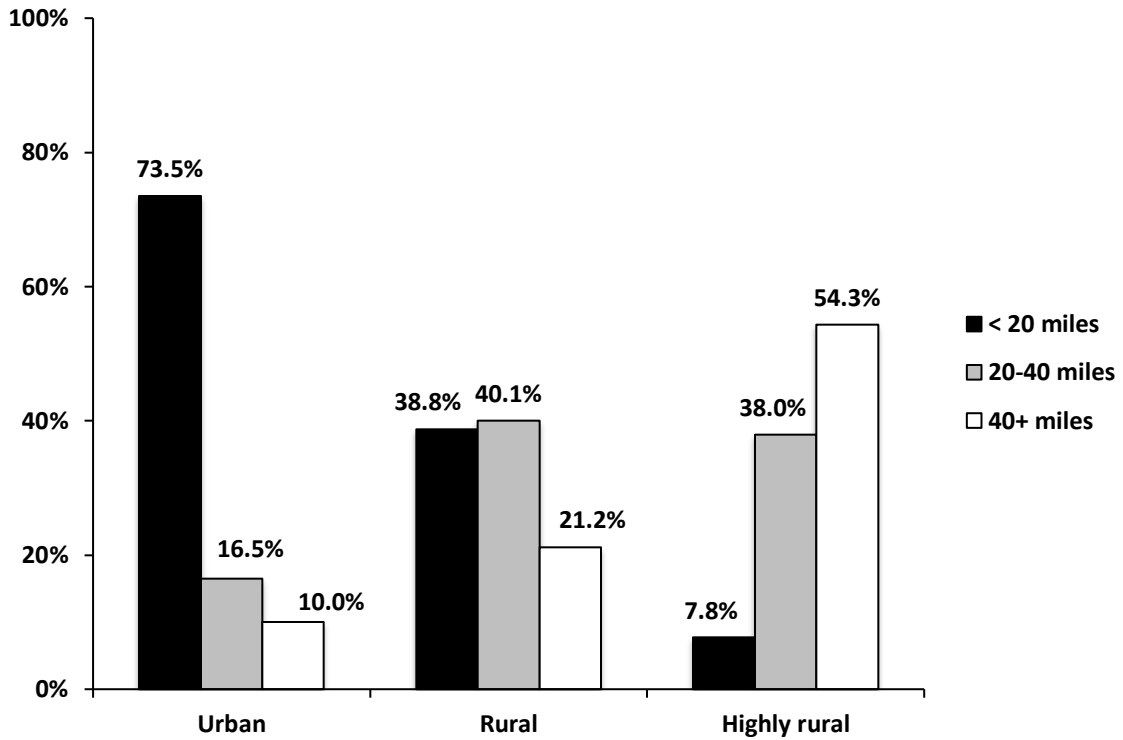


Table 2: Multivariable log-binomial regression results for full cohort

Variable	All Veterans (n = 708,120)						Active duty (n = 411,424)						Reserve/National Guard (n = 296,618)					
	95% CI			Risk diff	95% CI			95% CI			Risk diff	95% CI			Risk diff	95% CI		
	RR	LL	UL		LL	UL	RR	LL	UL	LL		UL	RR	LL		UL	LL	UL
Rural	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Urban (ref)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rural	0.786	0.741	0.833	-3.684	-4.575	-2.792	0.783	0.728	0.842	-4.385	-5.700	-3.070	0.824	0.748	0.909	-2.249	-3.385	-1.113
Highly rural	0.848	0.656	1.096	-2.524	-6.449	1.401	0.979	0.708	1.353	-0.382	-6.183	5.420	0.742	0.487	1.130	-3.473	-8.368	1.422
Distance to nearest VAMC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
< 20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20 - 40	0.876	0.832	0.922	-2.026	-2.809	-1.242	0.891	0.838	0.947	-2.073	-3.171	-0.976	0.822	0.747	0.904	-2.284	-3.401	-1.166
40+	0.917	0.871	0.964	-1.331	-2.102	-0.560	0.946	0.890	1.006	-0.994	-2.090	0.101	0.847	0.774	0.927	-1.929	-2.984	-0.874
Distance to nearest CBOC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
< 20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20 - 40	0.879	0.832	0.928	-1.977	-2.810	-1.145	0.888	0.830	0.950	-2.124	-3.333	-0.915	0.861	0.784	0.944	-1.746	-2.828	-0.663
40+	1.129	1.059	1.203	1.855	0.882	2.829	1.190	1.102	1.286	3.122	1.738	4.506	0.999	0.889	1.123	-0.009	-1.369	1.350

Note: Regressions controlled for age, race, sex, education, marital status, branch of service, active duty vs. reserve, state of residence, and year of separation

RR = relative risk

Risk diff = risk difference

CI = confidence interval

LL = lower limit

UL = upper limit

VAMC = VA medical center

CBOC = community-based outpatient clinic

Table 3: Multivariable log-binomial regression results – Veterans whose 1st VA encounter was within 365 days of military separation date

Variable	All Veterans (n = 308,115)						Active duty (n = 108,187)						Reserve/National Guard (n = 199,447)					
	95% CI			Risk diff	95% CI			95% CI			Risk diff	95% CI			Risk diff	95% CI		
	RR	LL	UL		LL	UL	RR	LL	UL	Risk diff		LL	UL	RR		LL	UL	LL
Rural	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Urban (ref)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rural	0.707	0.631	0.791	-3.507	-4.650	-2.364	0.609	0.504	0.734	-6.191	-8.551	-3.830	0.792	0.686	0.915	-2.055	-3.329	-0.781
Highly rural	0.700	0.429	1.142	-3.603	-8.544	1.339	0.412	0.131	1.294	-11.064	-25.352	3.224	0.871	0.505	1.504	-1.216	-6.035	3.604
Distance to nearest VAMC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
< 20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20 - 40	0.788	0.709	0.876	-2.401	-3.474	-1.328	0.850	0.728	0.992	-2.032	-3.967	-0.096	0.721	0.621	0.836	-2.896	-4.216	-1.576
40+	0.798	0.722	0.882	-2.280	-3.298	-1.262	0.874	0.751	1.016	-1.683	-3.566	0.200	0.728	0.635	0.834	-2.804	-4.014	-1.594
Distance to nearest CBOC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
< 20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20 - 40	0.888	0.797	0.989	-1.203	-2.291	-0.114	0.894	0.752	1.062	-1.397	-3.547	0.752	0.878	0.764	1.009	-1.152	-2.382	0.077
40+	1.009	0.892	1.142	0.094	-1.155	1.342	1.047	0.866	1.267	0.574	-1.799	2.947	0.942	0.796	1.114	-0.532	-2.017	0.953

Note: Regressions controlled for age, race, sex, education, marital status, branch of service, active duty vs. reserve, state of residence, and year of separation

RR = relative risk

Risk diff = risk difference

CI = confidence interval

LL = lower limit

UL = upper limit

VAMC = VA medical center

CBOC = community-based outpatient clinic

Table 4: Multivariable log-binomial regression results for full cohort – Census definition of rurality

Variable	All Veterans (n = 708,120)						Active duty (n = 411,424)						Reserve/National Guard (n = 296,618)					
	95% CI			Risk diff	95% CI			95% CI			Risk diff	95% CI			Risk diff	95% CI		
	RR	LL	UL		RR	LL	UL	RR	LL	UL		RR	LL	UL		RR	LL	UL
Rural																		
Urban (ref)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rural	0.838	0.767	0.916	-0.003	-0.004	-0.001	0.847	0.754	0.952	-0.003	-0.005	-0.001	0.853	0.744	0.977	-0.002	-0.003	0.000
Distance to nearest VAMC																		
< 20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20 - 40	0.848	0.806	0.892	-0.003	-0.003	-0.002	0.865	0.814	0.920	-0.003	-0.004	-0.001	0.796	0.724	0.874	-0.003	-0.004	-0.002
40+	0.853	0.813	0.893	-0.002	-0.003	-0.002	0.879	0.830	0.931	-0.002	-0.003	-0.001	0.800	0.736	0.870	-0.003	-0.004	-0.002
Distance to nearest CBOC																		
< 20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20 - 40	0.846	0.802	0.892	-0.003	-0.003	-0.002	0.852	0.797	0.910	-0.003	-0.004	-0.002	0.844	0.771	0.924	-0.002	-0.003	-0.001
40+	1.089	1.023	1.159	0.001	0.000	0.002	1.154	1.071	1.245	0.003	0.001	0.004	0.965	0.861	1.082	0.000	-0.002	0.001

Note: Regressions controlled for age, race, sex, education, marital status, branch of service, active duty vs. reserve, state of residence, and year of separation

RR = relative risk

Risk diff = risk difference

CI = confidence interval

LL = lower limit

UL = upper limit

VAMC = VA medical center

CBOC = community-based outpatient clinic

Table 5: Multivariable log-binomial regression results – Veterans whose 1st VA encounter was within 365 days of military separation date –
 Census definition of rurality

Variable	All Veterans (n = 308,115)						Active duty (n = 108,187)						Reserve/National Guard (n = 199,447)					
	95% CI			Risk diff	95% CI			95% CI			Risk diff	95% CI			Risk diff	95% CI		
	RR	LL	UL		LL	UL	RR	LL	UL	LL		UL	RR	LL		UL	LL	UL
Rural	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Urban (ref)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rural	0.814	0.693	0.955	-0.002	-0.004	0.000	0.733	0.546	0.986	-0.004	-0.007	0.000	0.868	0.716	1.051	-0.001	-0.003	0.000
Distance to nearest VAMC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
< 20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20 - 40	0.734	0.666	0.809	-0.003	-0.004	-0.002	0.785	0.678	0.907	-0.003	-0.005	-0.001	0.687	0.601	0.785	-0.003	-0.004	-0.002
40+	0.712	0.652	0.779	-0.003	-0.004	-0.002	0.756	0.661	0.865	-0.003	-0.005	-0.002	0.671	0.596	0.756	-0.003	-0.005	-0.002
Distance to nearest CBOC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
< 20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20 - 40	0.833	0.755	0.920	-0.002	-0.003	-0.001	0.796	0.678	0.934	-0.003	-0.005	-0.001	0.857	0.754	0.973	-0.001	-0.002	0.000
40+	0.944	0.838	1.065	-0.001	-0.002	0.001	1.002	0.834	1.203	0.000	-0.002	0.002	0.883	0.750	1.039	-0.001	-0.003	0.000

Note: Regressions controlled for age, race, sex, education, marital status, branch of service, active duty vs. reserve, state of residence, and year of separation

RR = relative risk

Risk diff = risk difference

CI = confidence interval

LL = lower limit

UL = upper limit

VAMC = VA medical center

CBOC = community-based outpatient clinic

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