



Health coverage types and their relationship to mental and physical health in U.S. veterans[☆]

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ARTICLE INFO

Keywords:

Veterans
Health coverage
Mental health
Suicide
VA

ABSTRACT

Objective: To examine sociodemographic characteristics and chronic health conditions in veterans across health coverage types including those without coverage.

Design: The sample included cross-sectional data from veterans aged 18 years and over, collected in the 2016 National Health Interview Survey (n = 3487). Chronic health conditions and sociodemographic variables were examined across eleven health coverage types and combinations of health coverage types, as follows: No coverage, Medicare, Medicaid, Private, TRICARE (formerly known as the Civilian Health and Medical Program of the Uniformed Services (CHAMPUS)), TRICARE and Medicare, Veteran's Administration, Veteran's Administration and Medicare, Veteran's Administration and Private, Veteran's Administration and Private and Medicare.

Results: Approximately 3.9% of veterans did not have coverage. The greatest proportion had private coverage (28.2%), then private coverage plus Medicare (19.6%). Only 5.9% had Veterans Administration coverage solely. Among the veterans not covered, the majority were young, lived alone, had less than a high school education and resided in the South. The most common chronic health conditions among non-covered veterans were obesity and migraine. Regional differences were observed in the types of chronic health conditions. Veterans in the Northeast were less likely to report serious psychological distress. In a logistic regression, younger age (18–44 years), living alone and having less than a high school education were predictive of no coverage, but number of chronic health conditions was not.

Conclusion: A population of veterans without health coverage may be undeserved and at risk for poor mental and physical health due to non-health related factors.

1. Introduction

The VA has conducted data driven efforts using medical record data and predictive modeling to guide clinicians who are treating and screening veterans (McCarthy et al., 2015; Zedler et al., 2015). Risk factor indices have been used to predict opioid risk, safety and mitigation and to prevent overdoses and suicide (McCarthy et al., 2015). A recent study drawing on data collected from the National Health Interview Survey (NHIS) between 2000 and 2016 demonstrated an increase in the number of veterans using the VA and TRICARE (known as the Civilian Health and Medical Program of the Uniformed Services

Health Care Systems) (Zelaya and Nugent, 2018). This increasing trend of participation suggests that the military health care system may be a good source to identify and understand risk factors in veterans for poor mental and physical health and to conduct health outreach.

Not all veterans however are eligible for VA health care. More than 3.7% of the veteran population from 2000 to 2016 self-reported that they had no coverage of any kind, making these uninsured veterans unaccounted for in the VA system (Zelaya and Nugent, 2018). Basic eligibility requires that veterans be separated from active military service under any condition other than dishonorable. Enrollment is based on income, disability status, and periods of service. The present study

[☆] All authors provided: (1) substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data for the article; (2) drafting of the article or reviewing it and revising it critically for important intellectual content; and (3) final approval of the version to be published.

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aims to compare the sociodemographic characteristics and risk for chronic health conditions across veterans with no coverage and veterans with varying types of health coverage. Uncovered veterans are a group of particular concern because of the detrimental consequences of lacking coverage. Lack of coverage is associated with poor mental and physical health (Case and Deaton, 2015; Weissman et al., 2015). Uninsured veterans are likely to represent an at-risk group that would benefit from targeted outreach. Studying uninsured veterans in relationship to chronic health conditions (Ferro et al., 2017), pain (Doan et al., 2015), and sleep disturbances (Ford and Kamerow, 1989) as well as how these risk factors vary by socio-demographic characteristics, including gender and region furthers an understanding of risk in a yet unknown population.

With the expansion of Medicaid under the Patient Protection Affordable Care Act (ACA) and other policy changes, veteran coverage has been in flux (Tsai and Rosenhack, 2014). Some data suggests that veterans are achieving coverage solely from the insurance offerings through the ACA exchanges. These plans may have limitations in mental and physical health coverage, and little is known about the veterans receiving coverage under the ACA. For this reason, the study goal is to examine variations in sociodemographic characteristics, mental and physical health across veterans with different combinations of health coverage.

Our study is a cross-sectional analysis of the largest national survey dedicated to health, the NHIS. An analysis of sociodemographic characteristics, mental and physical health in veterans without coverage and by coverage type in a large national survey is relevant based on prior research. Female veterans have a higher rate of suicide than women in the general population (McCarthy et al., n.d.). Residence at the time of the interview may incur risk for suicide. Risk for suicide is greater in the South and West compared to the Northeast (*Regional Variations in Suicide, 1997*). Living alone tends to be correlated with social isolation and increases risk for serious psychological distress (SPD), a validated measure that identifies persons with a high likelihood of having a diagnosable mental health problem severe enough to cause moderate to serious impairment in social or occupational functioning requiring treatment (Cudjoe et al., 2018; Kessler et al., 2003, 2004). Increasing rates of SPD are associated with the rise in suicide among U.S. adults (Case and Deaton, 2015). Identifying veterans by profiling their sociodemographic characteristics could inform efforts to target outreach to veterans who do not have health coverage. Our hypothesis is that veterans without coverage as well as veterans by coverage type can be differentiated by sociodemographic characteristics, mental health and chronic health conditions.

2. Methods

2.1. Data source and analytic sample

This study draws from data collected by the 2016 NHIS survey. The NHIS is conducted by the Centers for Disease Control and Prevention (CDC) National Center for Health Statistics (NCHS) and collects information through home-based interviews (Parsons et al., n.d.; Botman et al., 2000). This analysis is based on the sample adult questionnaire administered to one randomly selected adult in each family (Parsons et al., n.d.; Botman et al., 2000). Informed consent was obtained prior to interview. IRB approval was not required for this study because the data are de-identified and publicly available. Our sample included adults aged 18 years and older who identified as a veteran.

A positive response to the question: “Have you ever served on active duty in the U.S. Armed Forces, military Reserves, or National Guard?” was used to select the sample of veterans for this study. It is possible that active duty members of the military were included among the veterans. We included TRICARE as a health coverage type because it is designated for army reserves and active duty military. With TRICARE, active duty military still may have access to VA health care under

specific circumstances such as medical emergencies or referrals.

2.2. Health coverage type

Private insurance was defined as coverage through employer(s), union(s), or purchase. Public insurance was defined as Medicaid and Medicare insurance plans. Some adults had both private and Medicaid coverage. TRICARE is military health coverage provided to individuals currently serving in the military, retired military personnel, Medal of Honor recipients and active duty army reserves (https://www.va.gov/healthbenefits/apply/active_duty.asp). Recipients of TRICARE may also be eligible for medical services at the Veterans Administration (VA) with referrals and in urgent situations.

Veterans described as having “no coverage” are persons who did not report having health insurance at the time of the interview under private health insurance, Medicare, Medicaid, State Children's Health Insurance Program (SCHIP), a State-sponsored health plan, other government programs, or military health plan (including TRICARE, VA, and CHAMPUS) (Weissman et al., 2015). Coverage types included in our analysis were determined based on an examination of the distribution of the types of coverage in the sample of veterans.

We began with a total of 34 different types or combination of health coverage types, and from there included only 11 in our analysis that had 100 or more veterans participating. We excluded military coverage types from our sample (such as CHAMPUS) other than TRICARE and VA when enrollment numbers were under 100 veterans. The combination of types of coverage were reduced to those populated by 100 or more veterans in order to have sufficient numbers to examine that combination of coverage types relative to the others, and the types of coverage and combinations of coverage were not predetermined. A variable called Health Coverage Type grouped insurance coverage as No Coverage, Private, Medicare, Medicare and Private, Medicaid and VA coverage, as well as combinations of these coverage types, as follows: Private and Medicare, TRICARE and Medicare, VA and Medicare, Veterans administration and Private, VA combined with Private and Medicare coverage. There were 48 veterans in our sample missing insurance information. Those veterans missing insurance were excluded.

2.3. Eligibility for VA health coverage

A veteran must enroll to have VA coverage. Once enrolled, however, a veteran can have access for life. Veterans can elect to use private insurance. Among veterans not eligible for a TRICARE health plan or VA health care, the other main coverage options include private insurance, Medicaid, and Medicare (Zelaya and Nugent, 2018; https://www.va.gov/healthbenefits/apply/active_duty.asp). Veterans are eligible for premium-free Part A Medicare if they are age 65 or older and has worked or their spouse worked and paid Medicare taxes for at least 10 years. Part B of Medicare requires the payment of premiums. In order to participate in Medicaid, federal law requires states to cover certain groups of individuals such as those with low incomes (<https://www.medicare.gov/eligibilitypremiumcalc/>).

2.4. Serious psychological distress

SPD is measured using the Kessler K6, a validated scale that identifies persons with a high likelihood of having a diagnosable mental health problem severe enough to cause moderate to serious impairment in social or occupational functioning requiring treatment (Kessler et al., 2003, 2004). The K6 asks respondents to indicate the frequency of six symptoms, as follows: “During the PAST 30 DAYS, how often did you feel, as follows: So sad that nothing could cheer you up; Nervous; Restless or fidgety; Hopeless; that everything was an effort; and Worthless”. The following options are given for frequency: “ALL of the time; MOST of the time; SOME of the time; A LITTLE of the time; and NONE of the time”. In keeping with this methodology, we reversed the

coding so that “none of the time” was scored as 0 and “all of the time” was scored as 4, with a total possible score from 0 to 24. Prior studies used a score of 13 or above as a validated cut-point for SPD. Scores of 13 or above were coded “1” for SPD and lower scores were coded “0” (Kessler et al., 2003, 2004).

2.5. Chronic health conditions

Coverage type in veterans was considered in comparison to chronic health conditions, listed as follows: obesity, Chronic obstructive pulmonary disease (COPD), cancer excluding non-melanoma skin cancer, diabetes, high blood pressure, heart disease, stroke, back pain, face pain, joint pain, colitis, ulcer, trouble falling asleep, trouble staying asleep, migraine, dizziness,

Obesity was defined as having a body mass index ≥ 30 . Back pain, face pain, leg pain, joint pain, colitis, and ulcer were all based on positive responses to the question as to whether a doctor ever informed the respondent of these conditions. Similarly, trouble falling asleep, staying asleep, migraine dizziness, blindness, hearing loss, injury related to a fall and dizziness from head neck or concussion trauma were based on positive responses. Binge drinking was based on questions about the respondent having 5 or more/4 or more drinks on an occasion.

From this list we also created the variable named number of chronic health conditions (0, 1 and 2 or more) which included chronic health conditions that are known to be common in the general population, as follows: COPD, diabetes, heart disease, stroke and cancer (Ward et al., 2014). The Respondents were asked if they had been told by a health professional they had coronary heart disease, angina, a heart attack or any other heart condition. Diabetes and stroke were based on a positive response about being told of the conditions. COPD was based on questions about being told they had emphysema or in the past 12 month's chronic bronchitis. Cancer was based on questions about being told there was a malignancy excluding non-melanoma skin cancer (Buchanan et al., 2013).

Relatively small numbers of respondents were missing data among the chronic health conditions included in the summation of disease variable as follows: cancer ($n = 0$), high blood pressure ($n = 41$), heart disease ($n = 9$), diabetes ($n = 0$), COPD ($n = 9$), and stroke ($n = 16$). Records with missing data were excluded in multinomial regression analyses but retained in the overall study population.

2.6. Demographic characteristics

Race/ethnicity was categorized as Hispanic, non-Hispanic white (white), non-Hispanic black (black) and other race/ethnicities. Region of respondent's residence was included as North East, Midwest, South and West.

2.7. Statistical analysis

Point estimates and 95% confidence intervals were calculated using SUDAAN (SUDAAN (Release 10.0) [Computer Software], 2008). Categorical variables were evaluated using Rao Scott chi-square statistics for weighted surveys at alpha (α) = 0.05 level (two-sided). Because we set the alpha level at the acceptable rate of 0.05, the approximations reported in bivariate analyses (Tables 1 and 2) follows acceptable procedures for approximation measurements (Bradley and Brand, 2016).

3. Results

The analytic sample included 3487 adults aged 18 years and older; reflecting a weighted sample of 21,920,601 veteran's nation-wide. The sample mean age was 60.7 years (SD = 16.9 years) (range 18–85 years). The sample was predominately male (92.3%). The greatest proportion of veterans had some college (38.8%). The majority of the veterans

were white (78.7%) followed by black (11.9%) and Hispanic (7.2%).

The greatest proportion of veterans had private coverage solely (28.2%), followed by Private and Medicare (19.6%), VA (5.9%), Medicare (15.1%), TRICARE (5.7%), VA and Medicare (4.8%), No coverage (3.9%), VA and Private and Medicare (2.1%), Medicaid (2.0%), and VA and Private (1.9%). The study likely underestimated the number of veterans that were uncovered because the NHIS does not include homeless, and incarcerated respondents as well as respondents in nursing homes.

Medicare coverage had a significantly higher prevalence in the older age group ($P < .01$). Women and men had comparable proportions of no coverage (3.9% male vs. 3.2% female) (Table 1). Among veterans who are not covered, the greatest proportion lived alone, lived in the South, and were in the lowest education group with less than a high school degree (Table 1). A greater proportion of veterans with no coverage had cancer, diabetes, high blood pressure, stroke and heart disease compared to veterans with all other types of coverage (Table 1).

The most common chronic health conditions among veterans without health coverage were obesity, SPD, joint pain, trouble falling asleep and staying asleep (Table 1). All of the chronic health conditions listed in Table 1 were examined in relationship to SPD. The following conditions were significantly associated with SPD among veterans: obesity, COPD, back pain, face pain, leg pain, joint pain, colitis, ulcer (s), trouble falling asleep, trouble staying asleep, and migraine/severe headache or dizziness.

Because there was a large proportion of veterans not covered who resided in the South, we examined in Table 2, the chronic health conditions in veterans by region. Veterans residing in the Midwest were more likely to have colitis ($P < .05$) (Table 2). Veterans residing in the South were more likely to self-report having obesity and leg pain ($P < .05$). Veterans in the northeast had the greatest proportion with heart disease and blindness (Table 2) ($P < .05$). Veterans residing in the Northeast were less likely to have SPD ($P < .05$) (Table 2). Table 3 presents results from a logistic regression analysis examining predictors of no health coverage (dependent variable; compared to all other health coverage types), including SPD, sociodemographic variables and the total number of chronic health conditions. These analyses revealed that younger age (18–44 years) compared to middle-aged and older age groups, living alone compared with living with a spouse/partner and having less than a high school education compared to having some college education predicted no coverage.

4. Discussion

Our major finding was that 3.9% of U.S. veterans representing 859,195 nation-wide self-reported that they did not have health coverage. We also found that the non-covered veterans were more likely than their counterparts with health coverage to be young, living alone and have less than a high school education. Had variation occurred for reasons due to good health, we would have expected that veterans with no chronic health conditions would be at greatest risk for no coverage. However, no association was found between coverage type and number of chronic health conditions, suggesting that variation in coverage occurred due to sociodemographic differences and not for reasons related to physical or mental health in veterans.

Eligibility for veteran services is contingent on enrollment and honorable discharge. Recent efforts to expand eligibility to those veterans with other than an honorable discharge may result in improved veteran care (Tsai and Rosenheck, 2018). Future research may also want to examine other possible barriers to eligibility including logistical barriers (Newins et al., 2018) such as paper work, and wait times, which may discourage enrollment of the mentally ill. Additional barriers which could include lack of knowledge about VA services (Washington et al., 2015) and insufficient number of VA providers that may discourage veterans from seeking VA care (Hill et al., 2016). Addressing homelessness may also be critical to reduce veteran suicide

Table 1
Chronic health conditions and sociodemographic characteristics by health coverage types in veterans aged 18 years and over: NHIS 2016.

		Health coverage type and combinations of health coverage types						
		Total unweighted number (weighted %) of veterans by chronic health conditions, number of chronic health conditions and sociodemographic characteristics	No coverage	Medicare only	Medicaid only	Private only	Private combined with Medicare	TRICARE only
Total unweighted number (weighted %) of veterans		3487 (100%)	114 (3.9%)	581 (15.1%)	70 (2.0%)	785 (28.2%)	783 (19.6%)	177 (5.7%)
<i>Chronic health condition</i>								
Obese		1104 (34.9%)	48 (4.7%)	154 (12.8%)	21 (1.6%)	296 (33.2%)	212 (15.5%)	57 (5.6%)
Chronic obstructive pulmonary disease		255 (7.5%)	6 (3.2%)	43 (15.8%)	14 (4.4%)	22 (14.6%)	59 (23.7%)	13 (5.3%)
Cancer		729 (20.9%)	11 (1.3%)	156 (21.6%)	7 (0.65%)	50 (8.8%)	276 (37.3%)	14 (2.1%)
Diabetes		637 (19.6%)	10 (1.1%)	133 (21.6%)	9 (1.0%)	78 (17.4%)	178 (26.3%)	11 (1.5%)
High blood pressure		1621 (43.7%)	34 (1.9%)	328 (19.9%)	25 (1.3%)	211 (16.5%)	448 (25.5%)	56 (4.5%)
Heart disease		919 (23.4%)	10 (0.61%)	195 (21.2%)	14 (1.4%)	85 (11.7%)	296 (30.7%)	23 (3.6%)
Stroke		195 (5.3%)	2 (0.75%)	4 (2.4%)	38 (20.4%)	20 (16.3%)	55 (28.3%)	4 (2.1%)
Back pain		115 (33.3%)	33 (3.3%)	165 (13.8%)	29 (2.5%)	226 (24.8%)	227 (16.2%)	74 (7.7%)
Face pain		125 (3.2%)	5 (3.9%)	15 (13.4%)	8 (2.8%)	25 (24.2%)	13 (12.6%)	9 (5.3%)
Leg pain		458 (36.6%)	14 (3.5%)	55 (11.7%)	15 (2.5%)	87 (24.9%)	62 (11.4%)	24 (6.4%)
Colitis		56 (1.3%)	1 (2.5%)	10 (17.1%)	2 (2.6%)	8 (10.6%)	11 (30.9%)	1 (0.63%)
Joint pain		1630 (48.4%)	62 (4.1%)	265 (15.5%)	34 (1.9%)	285 (23.2%)	398 (20.9%)	77 (5.3%)
Ulcer		295 (9.6%)	7 (3.0%)	40 (11.0%)	11 (3.4%)	41 (17.4%)	87 (28.1%)	8 (2.3%)
Trouble falling asleep		708 (23.7%)	26 (4.2%)	105 (12.7%)	24 (3.2%)	173 (30.4%)	134 (15.9%)	43 (6.2%)
Trouble staying asleep		727 (28.4%)	25 (3.8%)	113 (13.7%)	13 (1.8%)	183 (31.1%)	143 (15.7%)	47 (7.6%)
Migraine/severe headache		350 (10.0%)	29 (6.2%)	34 (9.9%)	229 (4.8%)	74 (24.7%)	30 (9.6%)	28 (8.5%)
Dizziness		1055 (29.8%)	24 (2.4%)	170 (1.9%)	24 (2.4%)	152 (20.4%)	269 (23.2%)	46 (5.0%)
Drizziness from head neck or concussion trauma		16 (7.1%)	0	0	2 (6.2%)	4 (31.2%)	1 (2.2%)	2 (15.8%)
Blind		22 (5.0%)	0	2 (4.9%)	1 (1.5%)	1 (4.5%)	5 (37.1%)	1 (1.3%)
Injury related to fall		143 (43.4%)	2 (0.76%)	27 (16.6%)	9 (5.4%)	10 (14.3%)	36 (23.5%)	6 (3.8%)
Serious psychological distress		108 (3.0%)	7 (6.3%)	9 (10.6%)	11 (6.5%)	13 (15.7%)	2 (3.4%)	7 (6.3%)
Trouble with activities without a hearing aid		65 (3.0%)	0	8 (6.7%)	0	2 (3.2%)	23 (32.8%)	0
Binge alcohol drinking		203 (5.6%)	9 (3.5%)	25 (10.4%)	10 (4.4%)	39 (21.0%)	36 (16.4%)	13 (7.7%)
<i>Number of chronic health conditions</i>								
0		1177 (38.0%)	70 (7.2%)	124 (8.5%)	32 (2.9%)	467 (44.6%)	138 (8.7%)	97 (7.8%)
1		960 (27.2%)	21 (2.3%)	175 (16.2%)	13 (1.2%)	204 (26.4%)	226 (20.9%)	52 (6.8%)
2 or more		1310 (34.6%)	22 (1.3%)	277 (21.7%)	25 (1.6%)	111 (11.6%)	414 (30.2%)	28 (2.6%)
<i>Sociodemographic characteristics</i>								
<i>Region</i>								
Northeast		564 (15.6%)	12 (2.2%)	105 (16.9%)	12 (2.2%)	133 (27.4%)	153 (25.5%)	9 (2.1%)
Midwest		763 (22.5%)	21 (4.0%)	107 (13.4%)	15 (1.3%)	176 (29.6%)	206 (23.9%)	25 (2.7%)
South		1199 (42.2%)	56 (4.7%)	197 (13.9%)	21 (1.7%)	280 (28.9%)	235 (15.5%)	79 (9.2%)
West		941 (24.9%)	25 (3.4%)	172 (18.0%)	22 (2.9%)	196 (26.1%)	189 (18.2%)	64 (5.1%)
<i>Age group</i>								
18–44		488 (18.4%)	46 (4.6%)	3 (0.21%)	26 (5.9%)	237 (50.8%)	0	65 (10.0%)
45–64		1014 (32.2%)	64 (5.2%)	31 (3.3%)	42 (2.6%)	93 (8.3%)	499 (52.6%)	10 (1.2%)
65 and older		1965 (49.4)	4 (0.20%)	547 (28.5%)	2 (0.15%)	107 (5.0%)	49 (3.8%)	773 (38.9%)
<i>Race/ethnicity</i>								
Hispanic		174 (7.2%)	9 (6.2%)	8 (6.2%)	33 (15.0%)	45 (32.1%)	16 (10.0%)	18 (7.1%)
White		2825 (78.7%)	81 (3.3%)	45 (1.5%)	490 (15.9%)	624 (27.0%)	704 (22.5%)	121 (4.8%)
Black		330 (11.9%)	17 (5.5%)	14 (2.8%)	41 (11.3%)	36 (10.6%)	90 (34.0%)	30 (7.2%)
Other race/ethnicities		90 (2.1%)	2 (4.6%)	1 (0.58%)	12 (12.9%)	18 (32.7%)	25 (15.4%)	9 (13.0%)
<i>Living arrangements</i>								
Living alone		1275 (22.1%)	50 (5.3%)	246 (16.6%)	30 (2.5%)	213 (18.9%)	254 (17.6%)	44 (3.5%)
Living with spouse/partner		1368 (43.5%)	21 (1.8%)	252 (19.4%)	5 (0.35%)	247 (21.3%)	446 (28.9%)	49 (3.8%)

(continued on next page)

Table 1 (continued)

Health coverage type and combinations of health coverage types									
	Total unweighted number (weighted %) of veterans by chronic health conditions, number of chronic health conditions and sociodemographic characteristics	No coverage	Medicare only	Medicaid only	Private only	Private combined with Medicare	TRICARE only		
Living with a roommate	45 (0.98%)	2 (5.4%)	8 (29.8%)	2 (2.1%)	7 (13.3%)	4 (5.9%)	3 (5.6%)		
Adult only families	275 (13.4%)	11 (1.4%)	51 (2.5%)	6 (0.9%)	63 (3.4%)	64 (2.6%)	14 (2.4%)		
Living with children	508 (19.8%)	30 (1.4%)	24 (0.85%)	27 (1.2%)	255 (2.6%)	15 (0.85%)	67 (1.6%)		
Sex									
Men	3163 (92.3%)	104 (3.9%)	54 (1.7%)	563 (16.0%)	682 (27.2%)	761 (20.7%)	133 (5.1%)		
Women	304 (7.6%)	10 (3.2%)	18 (5.3%)	16 (5.0%)	103 (3.7%)	22 (1.7%)	44 (12.7%)		
Education									
Less than a High School degree	250 (7.4%)	12 (7.2%)	68 (23.5%)	5 (0.97%)	16 (7.2%)	79 (33.8%)	2 (0.62%)		
High School degree	876 (25.5%)	31 (3.6%)	22 (2.5%)	151 (16.0%)	60 (6.2%)	188 (27.6%)	217 (20.5%)		
Some college	1258 (38.8%)	48 (4.4%)	184 (14.3%)	35 (2.7%)	296 (29.2%)	240 (16.3%)	80 (7.7%)		
College degree or more	982 (29.2%)	17 (2.2%)	160 (14.1%)	6 (0.96%)	255 (31.5%)	225 (20.5%)	65 (7.0%)		
Health coverage type and combinations of health coverage types									
	TRICARE combined with Medicare	Veterans Administration only	Veterans Administration combined with Medicare	Veterans Administration combined with private Medicare	Veterans Administration combined with private and Medicare	Chi-squared P-value comparing all insurance categories	Chi-squared P-value comparing across all insurance coverage and no coverage		
Total unweighted number (weighted %) of veterans	177 (4.3%)	215 (5.9%)	210 (4.8%)	61 (1.9%)	88 (2.1%)	< .0001	< .0001		
<i>Chronic health condition</i>									
Obese	44 (3.3%)	73 (3.3%)	67 (5.2%)	24 (2.5%)	21 (1.4%)	< .001	Not significant		
Chronic obstructive pulmonary disease	12 (3.8%)	21 (6.0%)	35 (10.3%)	1 (0.34%)	6 (1.3%)	< .0001	Not significant		
Cancer	62 (7.3%)	20 (2.5%)	59 (7.9%)	6 (1.1%)	35 (4.7%)	< .0001	< .001		
Diabetes	40 (4.8%)	32 (5.3%)	63 (8.6%)	10 (1.4%)	22 (3.0%)	< .0001	< .0001		
High blood pressure	101 (5.8%)	80 (4.8%)	139 (7.2%)	19 (1.2%)	61 (3.4%)	< .0001	< .0001		
Heart disease	64 (6.3%)	41 (4.5%)	86 (7.6%)	8 (0.93%)	33 (3.0%)	< .001	< .0001		
Stroke	16 (7.2%)	10 (2.8%)	22 (10.3%)	2 (0.55%)	7 (1.9%)	< .0001	< .05		
Back pain	56 (4.0%)	99 (7.9%)	86 (5.6%)	25 (2.1%)	30 (2.5%)	< .05	Not significant		
Face pain	6 (3.4%)	19 (16.4%)	9 (4.1%)	4 (3.4%)	2 (2.2%)	< .0001	Not significant		
Leg pain	17 (2.6%)	56 (12.9%)	47 (7.2%)	15 (3.7%)	9 (1.2%)	< .05	Not significant		
Colitis	3 (1.1%)	4 (3.6%)	3 (7.3%)	3 (5.7%)	1 (0.70%)	< .0001	Not significant		
Joint pain	86 (4.1%)	101 (6.6%)	116 (5.7%)	32 (1.9%)	50 (2.4%)	< .001	Not significant		
Ulcer	14 (4.1%)	19 (7.4%)	30 (8.9%)	9 (3.2%)	8 (2.1%)	< .001	Not significant		
Trouble falling asleep	25 (3.6%)	50 (6.9%)	47 (5.9%)	18 (2.7%)	15 (1.6%)	< .05	Not significant		
Trouble staying asleep	37 (4.9%)	46 (6.8%)	41 (4.3%)	18 (2.2%)	19 (2.6%)	.12	Not significant		
Migraine/severe headache	6 (0.69%)	52 (14.7%)	18 (4.1%)	16 (4.9%)	5 (0.74%)	< .0001	Not significant		
Dizziness	55 (4.1%)	68 (5.7%)	97 (6.8%)	20 (1.8%)	38 (3.1%)	< .0001	< .05		
Dizziness from head neck or concussion trauma	0	3 (18.3%)	0	0	0	N/A	N/A		
Blind	1 (4.1%)	2 (14.0%)	4 (21.7%)	0	2 (3.2%)	N/A	N/A		
Injury related to fall	7 (3.1%)	15 (11.2%)	13 (8.8%)	3 (2.9%)	4 (2.9%)	N/A	N/A		
Serious psychological distress	3 (1.6%)	19 (19.0%)	15 (10.9%)	6 (6.1%)	0	N/A	Not significant		
Trouble with activities without a hearing aid	6 (10.2%)	2 (3.2%)	10 (15.2%)	2 (4.5%)	4 (10.3%)	N/A	Not significant		
Binge alcohol drinking	10 (7.0%)	22 (11.0%)	15 (5.6%)	3 (1.0%)	4 (1.7%)	< .05	Not significant		
<i>Number of chronic health conditions</i>									
0	35 (2.2%)	95 (7.2%)	32 (2.3%)	31 (2.8%)	7 (0.53%)	< .0001	< .0001		
1	43 (4.3%)	67 (7.1%)	52 (3.8%)	21 (2.4%)	25 (1.8%)				
2 or more	97 (6.6%)	52 (3.5%)	126 (8.5%)	9 (0.66%)	56 (4.0%)				

(continued on next page)

Table 1 (continued)

Health coverage type and combinations of health coverage types						
	TRICARE combined with Medicare	Veterans Administration only	Veterans Administration combined with Medicare	Veterans Administration combined with private Medicare	Chi-squared P-value comparing all insurance categories	Chi-squared P-value comparing across all insurance coverage and no coverage
Sociodemographic characteristics						
Region						
Northeast	22 (3.2%)	34 (5.0%)	31 (4.4%)	11 (2.0%)		
Midwest	34 (3.3%)	48 (5.4%)	51 (6.4%)	13 (2.1%)		
South	70 (5.3%)	79 (6.5%)	63 (4.1%)	17 (1.4%)		
West	51 (4.3%)	54 (5.9%)	65 (4.8%)	20 (2.5%)		
Age group						
18–44	0	64 (11.6%)	0	26 (5.1%)		
45–64	111 (12.0%)	6 (0.64%)	116 (9.2%)	29 (2.6%)		
65 and older	171 (8.3%)	35 (1.6%)	191	6		
Race/ethnicity						
Hispanic	4 (3.3%)	14 (5.7%)	9 (3/9%)	9 (4.5%)		
White	153 (4.6%)	153 (5.1%)	181 (5.1%)	40 (1.6%)		
Black	11 (7.7%)	40 (2.2%)	15 (10.8%)	11 (3.6%)		
Other race/ethnicities	7 (6.8%)	6 (6.9%)	2 (3.3%)	1 (0.60%)		
Living arrangements						
Living alone	55 (3.2%)	117 (10.4%)	110 (8.6%)	19 (2.2%)		
Living with spouse/partner	102 (6.5%)	51 (3.5%)	75 (5.0%)	17 (1.4%)		
Living with a roommate	0	8 (1.49%)	2 (8.5%)	1 (1.2%)		
Adult only families	17 (1.6%)	10 (2.3%)	15 (1.1%)	3 (0.59%)		
Living with children	3 (0.27%)	29 (1.3%)	8 (0.31%)	21 (0.88%)		
Sex						
Men	164 (4.3%)	182 (5.5%)	205 (5.0%)	52 (1.9%)		
Women	13 (3.6%)	33 (10.1%)	5 (2.4%)	9 (2.2%)		
Education						
Less than a High School degree	7 (3.0%)	10 (5.0%)	23 (6.6%)	0		
High School degree	20 (2.5%)	40 (4.3%)	52 (5.5%)	65 (6.7%)		
Some college	59 (3.5%)	96 (6.3%)	81 (5.1%)	27 (1.8%)		
College degree or more	68 (5.9%)	52 (4.8%)	40 (3.0%)	24 (2.9%)		

Table 2
Chronic health conditions and sociodemographic characteristics by region in veterans 18 years and over: NHIS 2016.

	Northeast	Midwest	South	West	Chi-squared P-value
Obese	173 (33.3%)	251 (32.4%)	422 (35.7%)	263 (28.1%)	< .05
COPD	36 (4.8%)	65 (7.5%)	90 (6.2%)	64 (6.7%)	.53
Cancer	133 (22.8%)	157 (18.6%)	253 (18.2%)	190 (19.2%)	.32
High blood pressure	280 (45.2%)	355 (43.2%)	602 (44.3%)	391 (41.4%)	.74
heart disease	185 (29.7%)	224 (27.1%)	291 (19.6%)	223 (21.3%)	< .001
Stroke	32 (6.3%)	42 (4.4%)	77 (5.6%)	44 (4.8%)	.70
Back pain	181 (31.6%)	254 (32.2%)	410 (33.1%)	321 (35.9%)	.58
Face pain	22 (3.6%)	31 (3.4%)	38 (2.4%)	34 (4.2%)	.31
Leg pain	67 (35.5%)	99 (40.0%)	181 (45.6%)	114 (33.6%)	< .05
Colitis	8 (1.3%)	16 (2.2%)	14 (0.65%)	18 (1.5%)	< .05
Ulcer	49 (8.7%)	70 (9.7%)	104 (7.8%)	74 (8.1%)	.70
Joint pain	247 (40.6%)	402 (50.3%)	567 (45.4%)	425 (46.7%)	.09
Trouble falling asleep	110 (20.6%)	152 (23.5%)	242 (23.5%)	207 (26.2%)	.54
Trouble staying asleep	116 (24.7%)	140 (27.5%)	249 (27.3%)	224 (32.9%)	.14
Migraine/severe headache	38 (6.0%)	82 (9.8%)	121 (9.8%)	109 (13.0%)	< .01
Dizziness	192 (31.7%)	245 (30.4%)	325 (26.4%)	293 (33.1%)	.07
Dizziness from head neck or concussion trauma	5 (10.9%)	2 (4.3%)	5 (7.6%)	4 (5.7%)	.68
Blind	2 (6.4%)	9 (3.5%)	7 (2.8%)	4 (1.3%)	< .05
Injury related to fall	26 (7.7%)	40 (6.0%)	41 (5.7%)	36 (8.2%)	.31
Serious psychological distress	15 (1.2%)	28 (3.3%)	36 (2.7%)	30 (4.3%)	< .05
Trouble hearing without a hearing aid	5 (1.5%)	18 (3.8%)	26 (3.1%)	16 (2.8%)	.60
Binge alcohol drinking	36 (6.1%)	46 (5.7%)	63 (5.0%)	59 (6.2%)	.81
<i>Summation of disease</i>					
0	176 (35.7%)	257 (37.1%)	402 (40.1%)	350 (37.3%)	.42
1	150 (24.9%)	198 (26.4%)	341 (27.3%)	278 (29.3%)	
2 or more	238 (39.3%)	309 (36.3%)	459 (32.5%)	309 (33.3%)	

Table 3
Logistic regression with sociodemographic and number of chronic health conditions as independent variables predicting no coverage as the dependent variable in veterans age 18 years and over: NHIS 2016.

Independent variables	No health coverage
	<i>Adjusted odds ratios</i>
<i>Serious psychological distress</i>	0.29 (0.08,1.0)
<i>Age group</i>	
18–44	–
45–64	0.47 (0.26,0.84)*
65 and older	0.01 (0.003,0.09)***
<i>Race/ethnicity</i>	
Hispanic	1.0 (0.45,2.6)
Non-Hispanic White	–
Non-Hispanic Black	1.3 (0.65,2.8)
Other race/ethnicities	
<i>Living arrangements</i>	
Living alone	2.3 (1.1,4.6)*
Living with spouse/partner	–
Living with a roommate	1.9 (0.32,11.5)
Adult only families	1.9 (0.79,4.8)
Living with children	1.1 (0.51,2.3)
<i>Sex</i>	
Men	–
Women	0.58 (0.26,1.2)
<i>Education</i>	
Less than a high school degree	6.6 (2.5,17.7)**
High school degree	1.1 (0.64,2.1)
Some college	–
College degree and more	0.63 (0.31,1.3)
<i>Region</i>	
Northeast	–
Midwest	1.5 (0.52,4.8)
South	1.8 (0.69,4.9)
West	1.3 (0.48,3.9)
<i>Summation of disease</i>	
0	–
1	0.57 (0.26,1.2)
2 or more	0.51 (0.23,1.1)

* P < .05.
** P < .001.

and improve veteran physical and mental health. Homeless veterans are typically unknown and unenrolled in the VA system, and rates of suicide and suicide attempts are increased among homeless veterans compared to veterans in the VA system (Tsai et al., n.d.). A limitation in this study is the underestimation of the number of uncovered veterans and the frequency of chronic health conditions and SPD in the uncovered veterans because the data did not include the homeless.

The population of veterans who report no coverage may offer information to reduce veteran suicide. Increased rates of SPD in non-covered veterans may have implications including increased risk for several chronic health conditions and suicide (Case and Deaton, 2015; Weissman et al., 2015). Although in our models SPD was marginally predictive of lack of coverage in veterans, we found that SPD was more common in veterans with no coverage. It may be possible that the increased risk of SPD veterans without coverage could amplify risk for suicide when combined with other disorders such as obesity and sleep disturbances, which have been also been pointed to as risk factors, particularly when left untreated (Ferro et al., 2017; Doan et al., 2015; Ford and Kamerow, 1989; National Council for Community Behavioral Healthcare, n.d.). This finding also corroborates the significant positive relationship in the civilian population between SPD and the presence of chronic health conditions (Weissman et al., 2015).

SPD was more common in veterans who resided in the South. Prior research points to an increase in suicide in rural vs. urban areas (Dreiber et al., 2017; Weissman et al., 2017). Although we could not determine the distance to VA mental health care and the veterans' residence from our data, future research may be needed to examine the relationship between SPD, suicide and the geography of the VAs (Dreiber et al., 2017; Weissman et al., 2017). A greater proportion of veterans in the South compared to other regions had the VA as their sole source of coverage; further raising questions about whether VA coverage solely provides adequate mental health care. Regional differences in rates of SPD among veterans may be indicative of regional differences in VA coverage for mental health care. We found significantly lower rates of SPD in the Northeast; a region with the smallest proportion of veterans covered solely by the VA.

Younger veterans without coverage who live alone may be at increased risk for not having health coverage relative to veterans in older

age groups. These younger veterans may benefit from increasing VA efforts in telehealth, 24 h and web based health care services, and outreach to veterans potentially in socially isolated living arrangements (McCarthy et al., 2012; Office of Public and Intergovernmental Affairs, 2006). Interestingly, the age group at risk (18 to 44 years) for no coverage is younger than the age group of veterans known to be at risk for suicide (50 years and older) (AHRQ, 2018). However, because the younger veterans who do not have coverage may not have their health outcomes recorded at the VA medical centers, their actual suicide rate may not be known.

Our study made the novel contribution of describing the types of chronic health conditions in veterans without coverage. However, we must caution that our findings are preliminary. Future research may seek to examine the cause of the significant differences in types of chronic health conditions as cross-sectional studies cannot provide information about causation. The study may have likely underestimated the number of uncovered veterans because it did not include veterans that were homeless, incarcerated or in nursing homes. Data on the number of veterans that were less than honorably discharged or were not eligible for VA coverage were not available in the NHIS. Moreover, the data may not reflect time in region, which may represent a limitation if residence was transitory. Additionally, SPD reporting may be limited by differential recall dependent on the respondent's SPD status. A study strength is the use of the NHIS survey, providing a national sample, which made it possible to report health care patterns that are generalizable to the U.S. veteran population.

5. Conclusion

Sociodemographic factors and not number of chronic health conditions were predictive of no coverage in adjusted models suggesting that there is a population of veterans that are undeserved and at risk for poor mental and physical health due to non-health related factors. Regional differences in rates of SPD also suggest that there is regional variation in mental health services for veterans.

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The authors report no financial relationships with commercial interests.

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