

# Impact of presumed service-connected diagnosis on the Department of Veterans Affairs healthcare utilization patterns of Vietnam-Theater Veterans

## A cross-sectional study

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### Abstract

During the Vietnam War, the US military sprayed almost 20 million gallons of Agent Orange (AO), an herbicide contaminated with dioxin, over Vietnam. Approximately, 2.7 million US military personnel may have been exposed to AO during their deployment. Ordinarily, veterans who can demonstrate a nexus between a diagnosed condition and military service are eligible for Department of Veterans Affairs (VA) service-connected disability compensation. Vietnam Veterans have had difficulty, however, establishing a nexus between AO exposure and certain medical conditions that developed many years after the war. In response, VA has designated certain conditions as “presumed service connected” for Vietnam Veterans who were present and possibly exposed. Veterans with any of these designated conditions do not have to document AO exposure, making it easier for them to access the VA disability system. The extent to which VA healthcare utilization patterns reflect easier access afforded those with diagnosed presumptive conditions remains unknown. In this cross-sectional study, we hypothesized that Vietnam Veterans with diagnosed presumptive conditions would be heavier users of the VA healthcare system than those without these conditions. In our analysis of 85,699 Vietnam Veterans, we used binary and cumulative logit multivariable regression to assess associations between diagnosed presumptive conditions and VA healthcare utilization in 2013. We found that diagnosed presumptive conditions were associated with higher odds of 5+ VHA primary care visits (OR=2.01, 95% CI: 1.93–2.07), 5+ specialty care visits (OR=2.11, 95% CI: 2.04–2.18), emergency department use (OR=1.22, 95% CI: 1.11–1.34), and hospitalization (OR=1.23, 95% CI: 1.17–1.29). Consistent with legislative intent, presumptive policies appear to facilitate greater VA system utilization for Vietnam Veterans who may have been exposed to AO.

**Abbreviations:** AO = Agent Orange, ICD-9 = International Classification of Diseases Ninth Revision, IU = VBA Individual Unemployment, PTSD = post-traumatic stress disorder, RVN = Republic of Vietnam, SMC = VBA Special Monthly Compensation, VA = Department of Veterans Affairs, VBA = Veterans Benefits Administration, VETSNET = Veterans Service Network Corporate Mini Master File, VHA = Veterans Health Administration, VHA Event = VHA Outpatient Event File, VHA PTF = VHA Patient Treatment File, VRE = vocational rehabilitation and education, VT = Vietnam Theater.

**Keywords:** health care, health status, military, policy, presumed service-connected diagnosis, veterans, Vietnam

## 1. Introduction

The Department of Veterans Affairs (VA) spent \$54 billion in FY2013 on disability compensation benefits for veterans with

service-connected conditions.<sup>[1]</sup> “Service-connected” refers to conditions that were caused or aggravated by military service.<sup>[2]</sup> VA service-connected disability compensation is administered by the Veterans Benefits Administration (VBA) and is based on severity of medically evaluated service-connected disability as well as number of dependents. A combined disability rating percentage expresses service-connected disability severity on a graduated scale from 0% (least disabling) to 100% (most disabling) in increments of 10%. A disability rating of 0%, while noncompensable, nevertheless entitles a veteran to receive priority Veterans Health Administration (VHA) healthcare for the noted condition.<sup>[3]</sup> Higher disability ratings result in greater compensation and more generous healthcare access—veterans with disability ratings of 50% or higher receive highest priority VHA care for all conditions, at little or no cost. Other VA benefits are also tied to the combined disability rating.<sup>[4]</sup>

To establish service connection, a veteran with a diagnosed condition must *typically* prove a “nexus” (causal relationship) between the condition and military service.<sup>[5]</sup> However, establishing service connection can be difficult when a condition manifests long after service (e.g., Type 2 diabetes), or evidence supporting any nexus between the condition and service is unavailable.<sup>[2,5]</sup> To reduce this burden, Congress and the VA have relied on presumptions, which are regulatory mechanisms that presume service-connection for specified groups of veterans and conditions.<sup>[5]</sup>

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The legislative intent underlying a presumption is promotion of fairness through simplification of the VBA disability compensation claims process.<sup>[6]</sup> Since 1921, the US Congress has recognized that lack of military service exposure information may unfairly deprive some veterans of the evidence necessary to establish direct service-connection (causality).<sup>[7]</sup> In response, the pathways to VBA disability compensation have been made less burdensome for those with diagnosed presumptive conditions. It has been suggested that presumptive policies, by making it easier for Vietnam Veterans with diagnosed presumptive conditions to access VBA service-connection benefits, may be driving recent dramatic increases in VHA healthcare system utilization.<sup>[8]</sup>

**1.1. Vietnam War**

Between 1962 and 1971, the US military sprayed almost 20 million gallons of Agent Orange (AO) over the Republic of Vietnam (RVN).<sup>[2]</sup> AO refers broadly to herbicides that were used to defoliate areas of the jungle.<sup>[3]</sup> These herbicides were contaminated with dioxin, a known cause of certain cancers and other adverse health effects.<sup>[7]</sup> Currently, 14 conditions (see Supplemental Content, <http://links.lww.com/MD/C240>, which provides ICD-9 and CPT codes) that may be associated with exposure to AO have been designated by the Secretary of Veterans Affairs as “presumptive.”<sup>[8]</sup>

Recognition of the difficulty of proving exposure to AO led to presumptive policies. Under current presumptive policy, a Vietnam Veteran seeking to establish service connection for a presumptive condition need only provide evidence of a clinical diagnosis, and of having “stepped-foot” in the RVN between January 9, 1962 and May 7, 1975.<sup>[9]</sup> Once these requirements are satisfied, exposure to AO is presumed because it cannot be documented and presumptive service-connection is granted.

Presumptive policy makes it easier for veterans with specified conditions (e.g., Type 2 diabetes, Ischemic heart disease) to receive VA service-connected disability benefits. However, the extent to which VA presumptive policies translate to greater

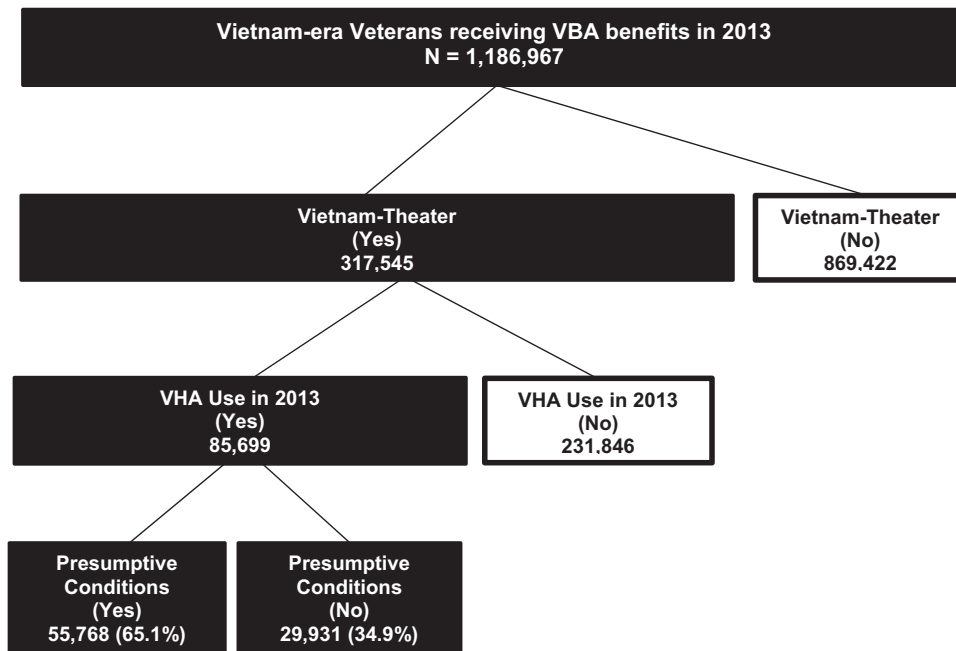
VHA healthcare utilization among Vietnam Veterans has never been empirically examined. In this study, we hypothesized that among Vietnam-Theater (VT) Veterans (a group eligible for presumed service-connection benefits), the presence of diagnosed presumptive conditions would be associated with significantly greater VHA healthcare utilization.

**2. Methods**

The sample for this cross-sectional study was assembled from the Veterans Service Network Corporate Mini Master File (VETS-NET), the primary source of information regarding VBA benefits. Scrambled Social Security Numbers are used to link VETSNET to VHA clinical data.<sup>[10]</sup> The VETSNET data extract available to us provided cross-sectional information as of April 2013 for 1,186,967 Vietnam-era Veterans who were receiving VBA benefits for service-connected disabilities.

**2.1. Sample selection**

Because we were interested in veterans who were likely to have stepped-foot in RVN, we initially selected 317,545 VT Veterans, excluding 869,422 veterans whose presence in the VT was uncertain. The “Vietnam Theater” includes Vietnam, Laos, and Cambodia, the activities of flight crews based in Thailand, as well as those of sailors in adjacent South China Sea waters. We then selected 85,699 with at least one inpatient visit recorded in the VHA Patient Treatment File FY2013 (VHA PTF contains information on each inpatient care episode) or one outpatient visit recorded in the VHA Outpatient Event File FY2013 (VHA Event contains information on each outpatient encounter). In the process, we excluded 231,846 with no VHA use in FY2013. Among the final analytic sample, 55,768 (65.1%) had at least 1 of 13 diagnosed presumptive conditions (AL Amyloidosis was excluded as a presumptive condition due to too few cases), and 29,931 (34.9%) had no diagnosed presumptive conditions (Fig. 1).



**Figure 1.** Black boxes represented included subjects; white boxes represent excluded subjects.

## 2.2. Conceptual framework

The Andersen Model of Healthcare Use (1995), a conceptual framework that has been used to assess determinants of VBA disability compensation (and VHA healthcare utilization),<sup>[11]</sup> guided this analysis. The framework posits that healthcare utilization is influenced by 3 categories of individual-level determinants: need determinants, which are illness-related factors that directly compel healthcare use (e.g., comorbidities); predisposing determinants, which are those characteristics which existed prior to the disability and which make one more or less amenable to potential healthcare use (e.g., age); enabling determinants, which are those resources that facilitate or impede actual healthcare use (e.g., diagnosed presumptive conditions).<sup>[11]</sup>

## 2.3. Dependent variables

Five dependent variables were used to represent healthcare utilization in FY2013: VHA primary healthcare visits, VHA specialty healthcare visits, VHA mental healthcare visits, VHA emergency department visits, and VHA inpatient hospitalization. In deriving outpatient care variables from the VHA Event File, clinic stop codes (three-digit codes that characterize VHA ambulatory care clinic visits by specialty) were used to categorize visits into primary, specialty, mental, and emergency department care (a veteran could have more than one ambulatory care visit on any given day) (see Supplemental Content, <http://links.lww.com/MD/C240>, which provides ICD-9 and CPT codes). Visits were further categorized as: 0, 1–2, 3–4, or 5 or more VHA primary care visits; 0, 1–2, 3–4, or 5 or more VHA specialty care visits; 0, or at least 1 VHA mental healthcare visit; 0, or at least 1 VHA emergency department visit. In deriving the inpatient care variable, the VHA PTF was used to capture VHA inpatient utilization (hospitalized/not hospitalized) during FY2013.

## 2.4. Enabling independent variables

The main predictor of interest, a binary enabling variable, was diagnosed presumptive conditions in FY2013 (at least one diagnosed presumptive condition/no diagnosed presumptive conditions). Using previously described methods,<sup>[12]</sup> these conditions were identified by International Classification of Diseases Ninth Revision (ICD-9 codes). A veteran was considered to have a diagnosed presumptive condition in FY2013 if for any 1 of 13 different presumptive conditions, he/she had at least 2 ICD-9 codes recorded in the VHA PTF or the VHA Event files on at least 2 separate occasions during a 24-month window (FY2012 or FY2013) to avoid unconfirmed or rule-out diagnoses.<sup>[13]</sup>

Continuous variable age (extracted from VHA PTF) was transformed into a dichotomous enabling variable representing subjects who were 66 years of age or older in 2013 (“Medicare enrollment age”), or <66 years of age (“Not Medicare enrollment age”).

Because we wanted to capture veterans whose service-connected disabilities entitled them to cost-free, priority VHA healthcare, combined disability rating percentage (0–100%) (extracted from VETSNET) was transformed into a 3-level enabling variable representing subjects with ratings of 0% to 40%, 50% to 90%, or 100%.

In addition to monthly VBA disability compensation, a continuous variable, 3 dichotomous enabling factors (extracted from VETSNET) were used to represent presence or absence of the following: VBA Individual Unemployability (IU) provides compensation to veterans who, due to service-connected disabilities, cannot maintain employment<sup>[14]</sup>; VBA Special

Monthly Compensation (SMC) provides additional compensation for special circumstances (e.g., loss of use of an extremity)<sup>[14]</sup>; VBA Special/Ancillary disability benefits provide additional types of compensation to veterans with particularly severe service-connected conditions.<sup>[14]</sup> A veteran was considered to have a VBA Special/Ancillary disability benefit if he or she was receiving clothing allowance, vocational rehabilitation and education (VRE), and/or specially adaptive equipment or housing grants.

## 2.5. Need independent variables

Charlson comorbidity index score, which assesses the overall burden of disease, was based on the medical impact of up to 19 chronic conditions as recorded in the VHA PTF or the VHA Event Files in FY2013.<sup>[17]</sup> Further details on Charlson scores can be found elsewhere.<sup>[15]</sup> The continuous score was transformed into an ordinal variable representing subjects with scores of 0, 1–2, or 3 or higher.

Two continuous need indicators were used as measures of disability. Number of service-connected disabilities, and total number (service and nonservice connected) of disabilities in 2013 were both extracted from VETSNET.

Further reflecting need, posttraumatic stress disorder (PTSD) was dichotomized (present/absent). A veteran had PTSD in FY2013 if he or she had ICD-9 code “309.81”<sup>[16]</sup> recorded in the VHA PTF or the VHA Event files on at least 2 separate occasions during a 24-month window (FY2012–FY2013) to avoid unconfirmed or rule-out diagnoses.<sup>[15]</sup>

## 2.6. Predisposing independent variables

Two predisposing variables (extracted from VETSNET) were used as military service indicators. Branch of service at discharge was operationalized as a 5-level nominal variable representing subjects who were discharged from the Army, Navy, Air Force, Marines, or all other branches. Rank at discharge was operationalized as a 3-level categorical variable representing subjects who were discharged as officers, enlisted or non-commissioned officers, or whose rank was unknown or missing. Other predisposing variables (extracted from the VHA PTF) included sex (male/female), marital status (married/unmarried/unknown or missing), and race/ethnicity (white/non-white/unknown or missing). Additionally, number of dependents (at least one/none) was also extracted from VETSNET.

To better characterize the sample, additional VHA healthcare utilization measures (not modeled) from FY2013 are presented: Total number of VHA outpatient healthcare visits, a continuous variable derived by summing clinic stop codes (a veteran could have more than one ambulatory care visit on any given day) was extracted from VHA Event file; total number of VHA outpatient healthcare visits (use/no use) was extracted from VHA Event file; VHA specialty cardiac care (use/no use), VHA specialty diabetes/endocrine care (use/no use), and VHA specialty urology care (use/no use) were also extracted from VHA Event file. In addition, length of VHA hospitalization stay in days, a continuous variable was extracted from the VHA PTF file.

## 2.7. Statistical analyses

The VA-New Jersey Health Care System Institutional Review Board approved this descriptive study. All analyses were performed with SAS 9.3 (SAS Corp: Cary, NC), were two-tailed, and conducted with  $\alpha=0.05$  significance level.

Descriptive statistics for the sample were presented as percentages for all categorical variables. Given non-normal distributions, all continuous variables were represented by means (and corresponding 95% confidence intervals), as well as medians (and corresponding Interquartile Ranges).

In bivariate analyses, logistic regression with a logit link (binary outcomes) and separately with a cumulative logit link (ordinal outcomes) were used to explore associations between the outcomes and each candidate predictor, using a  $P$ -value of  $\alpha = .25$  as a cutoff point.<sup>[17]</sup>

In multivariable analyses, binary logistic regression was used to separately model relationships between binary dependent variables (VHA mental healthcare visits, VHA emergency department visits, and VHA hospitalization), and diagnosed presumptive conditions, adjusting for all other covariates. Binary logistic regression is a generalized linear model that uses the binomial distribution and a logit link function.<sup>[18]</sup> Model coefficients are estimated by a maximum-likelihood algorithm and exponentiation of the coefficients provides odds ratios for independent variables.

Similarly, cumulative logit regression was used to separately model relationships between VHA primary care visits and VHA specialty care visits (ordinal outcomes) and diagnosed presumptive conditions, adjusting for all other covariates. Logistic regression with a cumulative logit link is based on a multinomial distribution, and is appropriate when modeling a multilevel ordinal outcome. In this study, the cumulative logit model contrasted the higher level of the outcome (e.g., 5 or more visits) with the lower levels of the outcome (e.g., 0, 1–2, or 3–4 visits). Model coefficients are estimated by a maximum-likelihood algorithm and their exponentiation provides odds ratios for the independent variables. The odds ratios are interpreted as the association between an independent variable and being in the higher level of the dependent variable.<sup>[19]</sup>

In multivariable modeling, because missing observations were <5%, they were deleted through an automated process of listwise deletion. In all multivariable models, marital status (24.7% unknown or missing), race/ethnicity (83.8% unknown or missing), and rank at discharge (10.9% unknown or missing) were excluded as covariates due to excessive unknown or missing observations.

### 3. Results

The characteristics of 85,699 VT Veterans with and without diagnosed presumptive conditions (Fig. 1), all of whom were service connected in some way in 2013 are presented (Table 1). Overall, veterans with diagnosed presumptive conditions, compared to those without these conditions, were more likely to have comorbidity scores of 3 or higher (37.1% vs 5.69%,  $P < .001$ ), and had higher median total number of disabilities (5 vs 3 disabilities,  $P < .001$ ). While they were less likely than those without these conditions to have a combined disability rating of 100% (21% vs 35.9%,  $P < .001$ ), they were more likely to have IU (20.3% vs 16.2%,  $P < .001$ ), SMC (45.7% vs 15.7%,  $P < .001$ ), and higher median monthly VBA disability compensation (\$2,816 vs \$1,120,  $P < .001$ ). Among just those with diagnosed presumptive conditions, 73.4% had type 2 diabetes, 44.3% had ischemic heart disease (IHD), 37% had PTSD, and almost 16% had at least 1 of 7 presumptive cancers.

In terms of VHA healthcare utilization in FY2013 (Table 2), veterans with diagnosed presumptive conditions, compared to those without these conditions, were more likely to have 5 or

more primary care visits (34.9% vs 14.7%,  $P < .001$ ), 5 or more specialty care visits (44.8% vs 17.5%,  $P < .001$ ), at least 1 inpatient care visit (37.2% vs 16.4%,  $P < .001$ ), at least 1 mental healthcare visit (37.1% vs 35.7%,  $P < .001$ ), and at least 1 emergency department visit (5.78% vs 3.11%,  $P < .001$ ). Where specialty care is concerned, those with diagnosed presumptive conditions used more VHA cardiac, diabetes/endocrine, and urologic specialty care services than those without these conditions.

Multivariable modeling (Table 3) revealed that veterans with diagnosed presumptive conditions were 101% more likely than those without these conditions to have 5 or more VHA primary care visits (OR=2.01, 95% CI: 1.93–2.07), and 111% more likely to have 5 or more VHA specialty care visits in FY2013 (OR=2.11, 95% CI: 2.04–2.18). They were also 22–23% more likely than those without these conditions to have visited the VHA emergency department (OR=1.22, 95% CI: 1.11–1.34), or to have been hospitalized at the VHA in FY2013 (OR=1.23, 95% CI: 1.17–1.29). Importantly, VHA mental healthcare utilization between those with and without presumptive conditions was not meaningfully different in FY2013 (OR=1.06, 95% CI: 1.01–1.11).

### 4. Discussion

We sought to determine whether the VHA healthcare utilization patterns of VT Veterans were consistent with the motive underlying presumptive service-connection policy. We found that controlling for other factors, VT Veterans with diagnosed presumptive conditions were more extensive users of the VHA healthcare system in 2013 than those without these conditions—they were particularly heavy users of medical ambulatory care. These findings suggest that presumptions, as regulatory mechanisms aimed at increasing VHA healthcare access for those who may have been exposed to AO, may be critical enablers of VHA system use.

Our data revealed that after controlling for other need, predisposing, and enabling variables, those with diagnosed presumptive conditions were more likely than those without these conditions to rely on VHA medical care services. In particular, they were at least twice as likely to be heavier users of VHA primary and specialty care in 2013, and about 22% more likely to have visited the VHA emergency department or to have been hospitalized at the VHA in 2013. In the Andersen conceptualization, health needs are among the strongest correlates of healthcare utilization.<sup>[10,18,19]</sup> However, our findings suggest that among Vietnam Veterans, the presence of a diagnosed presumptive condition—perhaps even more so than health-related needs—may be an important determinant of VHA healthcare access. These findings are critical in revealing the potential value of regulatory initiatives aimed at helping Vietnam Veterans access needed healthcare services. Importantly, the fact that VHA mental healthcare utilization did not differ meaningfully between those with and without diagnosed presumptive conditions (OR=1.06, 95% CI: 1.01–1.11) corroborates this interpretation, as no mental health conditions are presumed to be service connected for Vietnam-era Veterans.

The association of a presumed service-connected diagnosis with greater VHA healthcare utilization likely also reflects the influence of other VA programs which enable healthcare access. The VA offers a wide array of social support programs aimed at helping veterans deal with the social, emotional, and economic problems associated with the stresses of chronic illness.<sup>[20]</sup> The



**Table 1**  
**Characteristics of VT Veterans with and without diagnosed presumptive conditions.**

	Overall	Diagnosed presumptive conditions in FY2012–2013	No diagnosed presumptive conditions in FY2012–2013	P-values
Total (n, %)	85,699	55,768, 65.1%	29,931, 34.9%	
Need				
Charlson comorbidity score				<.0001
0 (%)	28.6	8.19	66.6	
1–2 (%)	45.2	54.7	27.6	
3+ (%)	26.1	37.1	5.69	
Total number of service-connected disabilities				
Mean (95% CI)	4.67 (4.65–4.69)	5.22 (5.19–5.25)	3.65 (3.62–3.68)	<.0001
Median (IQR)	4.0 (2.0–6.0)	5.0 (2.0–7.0)	3.0 (2.0–5.0)	<.0001
Total number of disabilities				
Mean (95% CI)	7.90 (7.86–7.94)	8.67 (8.62–8.72)	6.47 (6.41–6.52)	<.0001
Median (IQR)	7.0 (4.0–11.0)	8.0 (5.0–12.0)	5.0 (3.0–9.0)	<.0001
Post-traumatic stress disorder (%)	36.8	37.0	36.4	.0859
Enabling				
Age as of 2013				
Mean (95% CI)	67.2 (67.2–67.3)	67.1 (67.0–67.1)	67.5 (67.5–67.6)	<.0001
Median (IQR)	66.0 (64.0–69.0)	66.0 (64.0–68.0)	66.0 (64.0–68.0)	.0005
Medicare Enrollment age as of 2013 (%)	72.5	73.2	71.1	<.0001
Combined disability rating percentage				<.0001
0%–40%	26.9	30.9	19.5	
50%–90%	46.7	47.9	44.5	
100%	26.2	21.0	35.9	
Monthly VA disability compensation payment (\$)				
Mean (95% CI)	1869 (1860–1876)	2047 (2037–2057)	1535 (1522–1549)	<.0001
Median (IQR)	1628 (669–2973)	2816 (988–3073)	1120 (442–2916)	<.0001
VA Individual Unemployability Award (%)	18.9	20.3	16.2	<.0001
VA Special Monthly Compensation Award (%)	35.3	45.7	15.7	<.0001
VA Ancillary Disability Benefit Award (%)	1.33	1.37	1.24	.1111
Predisposing				
Male sex (%)	99.8	99.8	99.7	.0003
Marital Status				<.0001
Married (%)	54.5	51.7	59.8	
Unmarried (%)	20.7	19.7	22.5	
Unknown or missing (%)	24.6	28.4	17.6	
Race/Ethnicity				.0003
White (%)	11.4	11.1	11.8	
Non-white (%)	4.78	4.95	4.46	
Unknown or missing (%)	83.8	83.8	83.7	
Number of dependents				<.0001
None (%)	43.2	40.5	48.2	
At least one (%)	56.7	59.4	51.7	
Branch of Service at Discharge				<.0001
Army (%)	65.5	66.8	63.0	
Navy (%)	8.54	7.97	9.62	
Air Force (%)	10.6	9.82	12.2	
Marines (%)	15.0	15.1	14.8	
All others (%)	0.17	0.16	0.18	
Rank at Discharge				<.0001
Officer (%)	6.05	4.08	9.72	
Enlisted or noncommissioned officer (%)	83.0	84.4	80.3	
Unknown or missing (%)	10.9	11.4	9.92	
Presumptive conditions*				
Type 2 diabetes (%) [N=40,952]	–	73.4	–	–
Ischemic heart Disease (%) [N=24,743]	–	44.3	–	–
Presumptive Cancers <sup>§</sup> (%) [N=5478]	–	15.6	–	–
Parkinson's Disease (%) [N=1017]	–	2.65	–	–
Peripheral Neuropathy (%) [N=1078]	–	4.12	–	–
Chloracne (%) [N=55]	–	0.19	–	–
Porphyria Cutanea Tarda (%) [N=22]	–	0.05	–	–

Notes: For categorical variables, chi-square used to test for statistically significant differences: all categorical variables demonstrated statistically significant differences at  $\alpha < 0.05$  significance level. For continuous variables, Wilcoxon used to test for statistically significant median differences and *t*-test used to test for statistically significant mean differences: all continuous variables demonstrated statistically significant differences at  $\alpha < 0.05$  significance level.

IQR = interquartile range.

\* AL Amyloidosis excluded from analysis due to too few cases. Presumptive cancers include: Chronic b-cell leukemias, Hodgkin's disease, non-Hodgkin's lymphoma, multiple myeloma, prostate cancer, respiratory cancers (lung, bronchus, larynx, trachea), and soft-tissue sarcoma.

**Table 2**

**VHA healthcare utilization among VT Veterans with and without diagnosed presumptive conditions.**

	Overall	Diagnosed presumptive conditions <sup>†</sup> in FY2012–2013	No diagnosed presumptive conditions in FY2012–2013	P-values
Total (n, %)	85,699	55,768, 65.1%	29,931, 34.9%	
At least 1 VHA Outpatient Visit (%)	77.6	72.1	87.7	<.0001
Total VHA Outpatient Visits				
Mean (95% CI)	34.4 (34.1–34.6)	41.6 (41.2–41.9)	20.9 (20.64–21.3)	<.0001
Median (IQR)	22.0 (9.0–47.0)	30.0 (14.0–56.0)	10.0 (4.0–27.0)	<.0001
At least 1 VHA Inpatient Visit (%)	29.9	37.2	16.4	<.0001
VHA primary care visits (%)				<.0001
No visits	6.48	2.69	13.5	
1–2 visits	38.6	31.9	51.0	
3–4 visits	26.9	30.3	20.6	
5 or more Visits	27.8	34.9	14.7	
At least 1 VHA mental health care visit (%)	36.6	37.1	35.7	<.0001
At least 1 VHA Emergency care visit (%)	4.85	5.78	3.11	<.0001
VHA specialty Care visits (%)				<.0001
No Visits	27.4	16.5	47.7	
1–2 Visits	23.3	22.8	23.9	
3–4 Visits	14.0	15.8	10.7	
5 or more Visits	35.3	44.8	17.5	
At least 1 VHA cardiac specialty care Visit (%)	19.2	25.8	6.83	<.0001
At least 1 VHA Endocrine Specialty care visit (%)	7.65	10.8	1.71	<.0001
At least 1 VHA Urology specialty care visit (%)	13.7	17.1	7.24	<.0001

Notes: For categorical variables, chi-square used to test for statistically significant differences: all categorical variables demonstrated statistically significant differences at  $\alpha < 0.05$  significance level. For continuous variables, Wilcoxon used to test for statistically significant median differences and t-test used to test for statistically significant mean differences: all continuous variables demonstrated statistically significant differences at  $\alpha < 0.05$  significance level.

<sup>†</sup> AL Amyloidosis excluded from analysis due to too few cases. Presumptive cancers include: Chronic b-cell leukemias, Hodgkin’s disease, non-Hodgkin’s lymphoma, multiple myeloma, prostate cancer, respiratory cancers (lung, bronchus, larynx, trachea), and soft-tissue sarcoma; 95%CI=95% confidence interval; IQR=interquartile range.

VHA = Veterans Health Administration.

VA also offers vocational and educational training to eligible veterans, through programs like VRE. Consequently, the VA can be both, a source of healthcare as well as a social and vocational support system. In view of our finding in this study that 20% of veterans with diagnosed presumptive conditions were receiving IU benefits—reflecting severe service-connected joblessness—it is conceivable that social and vocational support, in addition to compensation, further enable VHA healthcare access.

Given that the legislative intent of presumptions is promotion of “fairness,” to what extent do Vietnam-era presumptions satisfy intent? In view of the perceived harms caused by AO exposure, and the inability of veterans to document such exposure, the VA has tried to mitigate the harms to some by extending presumptive benefits to many.<sup>[7]</sup> In the process, designation of certain age-related, chronic conditions as presumptive (e.g., Type 2 diabetes, Ischemic heart disease) has made more Vietnam Veterans with these conditions—an

unknown proportion of whom were not actually exposed to AO—eligible for VBA disability benefits.<sup>[7]</sup> Absent these presumptions, Vietnam Veterans would have great difficulty establishing service connection for any of the illnesses associated with AO exposure.<sup>[7]</sup> In this context, fairness rests in assurances by the VA that those with AO exposure will not be denied disability and healthcare benefits.

On the other hand, efforts aimed at greater fairness may also inadvertently produce inequities. Among Vietnam Veterans with presumptive conditions who have not been exposed to AO, ease of access may result in the perceived need to have their conditions diagnosed at the VA so as to get disability benefits. If large enough numbers of these veterans seek healthcare services, demand for VHA services may exceed supply. Rather than enabling access, presumptive policies might then instead create barriers to care, such as longer wait times for clinic appointments. Recent reports suggest that this may already be occurring. In 2010, IHD,

**Table 3**

**Crude and adjusted multivariable modeling of VHA primary, specialty, mental, emergency, and inpatient care among Vietnam-Theater Veterans who were VBA users in 2013.**

		5 or more VHA primary care visits FY2013	5 or more VHA specialty care visits in FY2013	At least 1 VHA mental health care visit in FY2013	At least 1 VHA emergency department visit in FY2013	At least 1 VHA inpatient visit in FY2013
Crude ORs (95% CI)	Diagnosed presumptive conditions (Yes vs No)	3.56 (3.46–3.66)	4.19 (4.08–4.30)	1.06 (1.03–1.09)	1.91 (1.77–2.06)	3.02 (2.92–3.13)
Adjusted ORs (95% CI)	Diagnosed Presumptive Conditions (Yes vs No)	2.01 (1.93–2.07)	2.11 (2.04–2.18)	1.06 (1.01–1.11)	1.22 (1.11–1.34)	1.23 (1.17–1.29)

Notes: All models adjusted for Charlson comorbidity scores (0, 1–2, 3+), total number of disabilities, posttraumatic stress disorder (Yes/No), medicare enrollment age (Yes/No), combined disability rating percentage (0–40, 50–90, 100), VBA individual unemployability award (Yes/No), VBA special monthly compensation award (Yes/No), sex (Male/Female), branch of service at discharge (Army, Navy, Air Force, Marine Corps., All Others).

95% CI=95% confidence intervals, ORs=odds ratios, VBA=Veterans Benefits Administration, VHA=Veterans Health Administration.

Parkinson's disease, and certain leukemias were designated as presumptive. By 2013, the VBA had processed 280,000 claims and made \$4.5 billion in retroactive payments for those newly declared presumptive conditions.<sup>[8]</sup> Accurate estimates of the impact on healthcare utilization of changes to presumptive policy are clearly important, but also challenging. The results of this analysis illustrate the importance of these calculations.

Our findings also have implications for the budgeting of future VBA disability compensation and VHA healthcare programs for Vietnam Veterans with presumptive conditions. As codified (38 US Code § 1114), veterans with service-connected disabilities are entitled to VBA disability compensation, with higher payments going to those with more severe service-connected conditions. We were, therefore, not surprised to find that among our sample median monthly VBA disability compensation for veterans with diagnosed presumptive conditions (\$2816 or \$33,792 annualized) was 2.5 times higher than for those without these conditions (\$1120 or \$13,440 annualized). Importantly, almost 70% of these same veterans had combined disability ratings of 50% or higher, entitling them to highest priority, cost-free VHA healthcare for all service and nonservice-connected conditions. These findings are consistent with recent reports noting rising disability benefits costs for Vietnam Veterans overall as well as for those with presumptive conditions.<sup>[2,4]</sup>

Our finding that Vietnam-era Veterans with diagnosed presumptive conditions are more likely to use the VA system highlights a fundamental change in VBA program participation that has been occurring since the early 2000s. According to the Institute for Defense Analyses, the share of veterans (all periods of service) receiving VBA benefits was remarkably consistent from 1960 to 2001, with approximately 8% receiving VBA disability compensation benefits. Since then, the share of veterans receiving these benefits has more than doubled to about 16%.<sup>[21]</sup> Importantly, since 2001, many new disability compensation recipients are not recently separated veterans, but rather file for and receive an initial service-connection award many years, if not decades, after leaving military service.<sup>[21]</sup> This underscores the importance of forecasting studies using up-to-date information, which can predict the long-term costs of VBA disability compensation and healthcare for veterans with and without presumed service-connected conditions.

It is worth noting that presumptive policy extends beyond the Vietnam-era to include veterans of other eras and conflicts. Presently, the following groups are eligible for presumptive benefits: Former prisoners of war; veterans who were exposed to ionizing radiation; Gulf War veterans with medically unexplained chronic multi-symptom illness; veterans diagnosed with certain chronic diseases and/or tropical diseases; and veterans diagnosed with amyotrophic lateral sclerosis.<sup>[20]</sup> Policy makers might consider our findings in the planning and budgeting of future VA programs for veterans with any diagnosed presumptive condition.

This study has limitations. This study examines the association between VHA presumptive policy and VHA utilization among VT Veterans in the VA system. Because exposure to Agent Orange among Veterans cannot be ascertained, this study does not evaluate relationships between Agent Orange exposure and presumed diagnoses and VHA utilization. The cross-sectional design precludes establishing causality between diagnosed presumptive conditions and VHA healthcare utilization. Also, although we only included veterans whose service in the "Vietnam-Theater" had been verified by the VBA, there is some possibility of misclassification. Inaccurate inclusion in the sample would not affect our conclusion, however, as we were not looking at actual service-

connection for these conditions. In fact, we focused on diagnosis of presumed service-connected conditions, not the presence of a presumptive service-connection award to explore the empiric evidence supporting the legislative intent. Future work should explore the effect of actual award of presumptive service connection for these conditions on the totality of healthcare utilization, not just VHA healthcare utilization. Finally, because our study sample was comprised of VT Veterans who were VBA and VHA system users in 2013, results are not generalizable to all VT Veterans.

## 5. Conclusion

This is the first study to produce evidence of the desired legislative and regulatory intent to lower the threshold for accessing VBA and VHA benefits for Vietnam Veterans who may have been exposed to dioxin. As hypothesized, we found that Vietnam Veterans with diagnosed presumptive conditions used significantly more VHA healthcare in FY2013 than those without these conditions. Our findings highlight the importance of presumptive service connection for resource allocation and provide redress for the adverse health effects of AO exposure.

## Author contributions

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