



THE SECRETARY OF VETERANS AFFAIRS
WASHINGTON

July 16, 2025

The Honorable Jerry Moran
Chairman
Committee on Veterans' Affairs
United States Senate
Washington, DC 20510

Dear Mr. Chairman:

In accordance with the requirements of section 502 of the Honoring our Promise to Address Comprehensive Toxics Act of 2022 (P.L. 117-168; 38 U.S.C. § 527, note), the Department of Veterans Affairs (VA) report on the treatment of Veterans for medical conditions related to toxic exposure is enclosed. VA remains committed to honoring the Nation's Veterans by ensuring a safe environment to deliver exceptional health care.

This report reflects previous actions. VA is currently in the process of reviewing processes and procedures to put Veterans first. This will result in ongoing changes and adjustments that will streamline operations and improve outcomes.

In addition, as required by 38 U.S.C. § 116, an estimate of the cost to prepare the report is included. This report has been sent to the leaders of the House and Senate Committees on Veterans' Affairs.

Sincerely,

A handwritten signature in blue ink, appearing to read "D. Collins", written over a horizontal line.

Douglas A. Collins

Enclosures

DEPARTMENT OF VETERANS AFFAIRS



Congressionally Mandated Report: Treatment of Veterans for Medical Conditions Related to Toxic Exposure

July 2025

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Report Language

Section 502 of The Sergeant First Class Heath Robinson Honoring our Promise to Address Comprehensive Toxics (PACT) Act of 2022 (P.L. 117-168; 38 U.S.C. § 527, note) requires the Department of Veterans Affairs (VA) to continuously analyze all clinical data that it has obtained in connection with furnishing hospital care, medical services and nursing home care under 38 U.S.C. § 1710(a)(2)(F) that is likely to be scientifically useful in determining the association, if any, between the medical condition of a Veteran and a toxic exposure.

Beginning no later than 1 year from the enactment of the PACT Act, VA must submit an annual report containing the following:

- 1) The aggregate data described above,
- 2) An analysis of such data,
- 3) A description of the types and incidences of medical conditions identified by VA and as described above,
- 4) VA's explanation for the incidence of such medical conditions and other explanations for the incidence of such conditions as VA considers reasonable, and
- 5) VA's views on the scientific validity of drawing conclusions from the incidence of such medical conditions, as evidenced by the data described above regarding any association between such conditions and toxic exposures.

Summation of Findings

- Consistency of disease presentation
 - Examining the most frequently treated diseases across four combat era deployed cohorts (Vietnam, 1990-91 Gulf War, Pre-9/11, and Post-9/11) and non-deployed peers, VA found significant consistency of disease presentation across the cohorts regardless of deployment.
- Patterns may be related to military environmental exposures
 - The diseases treated in VA may be, at least in part, determined by those chronic diseases that become more prevalent with age. Examination of deployed cohorts can reveal patterns of disease which may be related to military environmental exposures.
- Caution should be used in generalizing findings
 - The estimates for prevalence and incidence of disease based on VA hospital encounters may not be directly comparable to general population estimates as these VA findings are based on hospital-based records, which likely do not include healthy members of the Veteran population, inflating the appearance of increased burden of illness.

Background

This report provides disease incidence¹ and prevalence² estimates for defined cohorts (Vietnam, 1990-1991 Gulf War, Pre-9/11 and Post-9/11). The analytical approach for this report extends the inquiry to comparisons with the Veterans Health Administration (VHA) users who had contemporaneous service but did not deploy to the overseas regions of Southwest Asia and Vietnam. VA anticipates that future reports will include additional data and analysis and will include additional cohorts. This report provides aggregate data (incidence and prevalence) and analysis on the health conditions for deployed Veterans and a non-deployed comparison group, who have received treatment from VHA.

“Toxic exposures,”³ as well as other military environmental exposures military personnel encounter,⁴ may occur during normal occupational duties but are often a greater concern in deployed and combat settings. Military activities during deployment may involve conditions in which normally anticipated cautions, process controls, and personal protective equipment may not be available. Conflicts since the Vietnam War through the Post-9/11 operations in Afghanistan and Iraq have offered evidence that many of the same hazards are common across battlefields: exposure to pesticides, liquid or fume exposures to fuels and solvents, emissions from weapons systems, emissions from vehicles or other motorized materiel, contamination from local industrial sites, certain medications and vaccinations and smoke from burning of buildings, vegetation, human waste, and other trash created during the housing of personnel in theaters of combat operations. We emphasize, though, that not all of these exposures are toxic; these are potential exposures common to battlefield operations independent of an era or geography.

Each conflict since the Vietnam War has also had unique experiences or exposures associated with the specific operation. In Vietnam, it was herbicide and the dioxin contaminant in some of the herbicide formulations, including Agent Orange, used to destroy crops and vegetation. In the 1990-1991 Gulf War, multiple unique hazards of potential concern were identified, including burning oil well fires and potential exposure to sarin gas and other chemical weapons agents, vaccines protecting against anthrax or prophylactic medications such as pyridostigmine bromide. Again, Veterans who were exposed to these contaminants did not necessarily experience a “toxic” level of exposure. In Post-9/11 combat deployments in Iraq and Afghanistan, a series of exposures rose to the fore, including heightened understanding of the risk of blast forces resulting in traumatic brain injury and the improvised explosive devices that often carried not only blast forces but the risk of exposure to other hazardous materials meant

¹ Incidence refers to the occurrence of new cases of disease or injury in a population over a specified period of time. Incidence can mean the number of new cases in a community or the number of new cases per unit of population.

² Prevalence is the proportion of a population who have a specific characteristic in a given time period.

³ In section 502, the term “toxic exposure” is specifically defined with reference to 38 U.S.C. 101.

⁴ Veterans may have been exposed to a range of chemical, physical, and environmental hazards during military service. While there are multiple categories of exposures (chemical, radiation, air pollutants, occupational and warfare agents), it is important to note that not all are considered toxic. While section 502 uses the term “toxic exposure,” this report will primarily utilize the more accurate term military environmental exposures.

to extend harm from chemical or physical agents. While blast forces are not generally thought of as “toxic” exposures, they can be environmental exposures that produce toxic results; blast forces and associated trauma can result in traumatic brain injury and damage to other organs, including the lungs. This most recent conflict period was also notable for the use of industrial scale waste burning, or burn pits, the emissions from which combined with high levels of endemic airborne particulate to create inhalational hazards for U.S. Service members. This report examines and analyzes aggregate clinical data obtained by VA in connection with hospital care, medical services, and nursing home care under 38 U.S.C. § 1710(a)(2)(F).

The care VA-enrolled Veterans receive is recorded in VA’s electronic health care records, which enumerates all encounters and provides detail regarding diagnostic codes for specific diseases or conditions for which hospital care, medical services, and nursing home care were provided. Through incorporation of and reliance upon electronic health records for Veterans with specific duty locations (deployments) and periods of service, the types of health conditions can be identified for which Veterans are seeking care. This report provides a description of the frequency (incidence and prevalence) of diseases for which covered Veterans are seeking care and explanations for the incidence of such conditions as VA considers reasonable.

Methodology

Data Sources

Health Care Data: The data used in this report are based on health care encounters captured in VA’s electronic health record. Among the data recorded during these encounters are the diseases or health conditions being treated. The coding scheme of the International Statistical Classification of Diseases and Related Health Problems, 10th revision (ICD-10) describes diseases and health conditions. These data are retained in VHA’s Corporate Data Warehouse (CDW), a national repository of data from VHA clinical and administrative systems. CDW is a relational database organized into data domains. This organization into domains allows for user queries of logically or conceptually related data tables. This report relied upon queries of tables identified in the following domains: Inpatient (including nursing home), Outpatient, Purchased Care, ICD-10 Codes, and Patient Information. Queries supporting this report relied on information in the domain tables and allowed identification of health care visits and enumeration of disease in the populations of interest.

Identifying Medical Conditions: To ensure an accurate identification of a medical condition and minimize false positives, an algorithm was applied to the VA health care data whereby 2 health care visits for the same condition within 365 days were used to ascertain a case of a true medical condition.⁵ This determination is based on previous work in VHA’s Health Outcomes Military Exposures (HOME) office and by others that

⁵ Dursa EK, Tadesse BE, Carter CE, Culpepper WJ, Schneiderman AI, Rumm, PD. Respiratory Illness Among Gulf War and Gulf War Era Veterans Who Use the Department of Veterans Affairs for Healthcare. *Am J Ind Med* 2020; 63: 980-987. Doi: 10.1002/ajim.23172.

supports this approach to identifying real cases of disease and excluding those that are suspected and being evaluated.

Population (VA/Department of Defense (DoD) Identity Repository (VADIR)): For this report, VA examined clinical data for Veterans who served in the Vietnam War; the Southwest Asia theater of operations after August 2, 1990, (including the Gulf War between August 2, 1990, and July 31, 1991) and Pre-9/11 (August 1, 1991, through September 10, 2001), and those who served on or after September 11, 2001, in Southwest Asia, to include contingency operations (Post-9/11). Comparison groups for each conflict cohort above were selected from the Department of Defense (DoD) records to include Veterans with service during the same time-period who did not deploy to the overseas location in support of combat activities.

Veterans in the deployed population groups defined above were identified through a variety of data resources that provided demographic and military characteristics, information on period of service, and confirmation of military deployment. VADIR was the primary source file (extract date: January 1, 2023). VADIR contains tables DoD provided to VA with information on deployment and military service characteristics. The data are considered a comprehensive record of Service members and Veterans who had military service in the Pre- and Post-9/11 era. Some data from the Vietnam era is included in VADIR. In assembling the Vietnam population for this report, HOME also relied on a historical file DoD provided to VA in the 1990s. Recognizing the possibility of this historical file being an incomplete record from DoD due to the absence of computerized records during the Vietnam War and general concerns regarding the completeness of the file, HOME sought later enhancements through efforts to match with Veterans Benefits Administration, Beneficiary Identification Records Locator Subsystem and eliciting data from States that offered special benefits to Vietnam Veterans.

The 1990-1991 Gulf War population identification relied on VADIR indicators of Gulf War deployment but also matched with an historical combat deployment roster DoD Defense Manpower Data Center provided to HOME Epidemiology Program in the 1990s and which served as the original source relied upon for VA morbidity and mortality surveillance. VA CDW-based tables were used to provide demographic and military characteristics data; missing data were supplemented from VA U.S. Veterans Eligibility Tracking System file and other sources. Some data fields in these categories remain either missing or unknown due to limitations of the contributing files.

Exposure Assessment

Individual-level exposure assessments for members of these combat populations are generally not available. Historically, VA epidemiological surveillance and research has been limited to comparisons of disease prevalence between Veterans that deployed versus similar Veterans that did not deploy to a given theater, conflict, or operation. This approach has only allowed for determining whether a health outcome may be related to deployment to a given location but does not allow establishing an association of a health outcome with a specific exposure.

Aggregation of Cases and Statistical Methods

The population file of deployed Service members and Veterans was merged with the health care data extracted from CDW. A predetermined list of ICD-10 codes across the categories of diseases by organ system (for example, respiratory system or circulatory system) or disease type (for example, cancers and infectious diseases) is based on an expansion of previous VA health care reporting ([Post Deployment Health Surveillance Report, January 1, 2010 and December 31, 2019](#)).

The statistical methods applied to disease counts derived two distinct measures of disease occurrence: period prevalence and incidence proportion. Period prevalence measures the total number of individuals in a population with a disease during a specific time interval and reflects the total burden of disease in the target population. Incidence proportion measures new instances of people falling ill with disease in the population of interest during a defined period and reflects the emerging burden of disease.

Calculation of incidence proportion relies on ensuring that members of the population under study are free of disease at the beginning of the period of observation. Disease-free status was assessed for the period fiscal year (FY) 2016 through FY 2017 and annual incidence for FY 2018 through FY 2022 was computed. Incidence proportion is presented in this report on an annual basis, and period prevalence is presented as an 8-year period prevalence, or an estimate of the number of people in the observed population with disease over the 8-year observation period (from the beginning of FY 2016 through the end of FY 2023). Incidence and prevalence are reported as the “number of cases per 100,000 Veterans.”

The association between deployment to a conflict and disease/condition outcome was assessed through calculation of adjusted relative risk (aRR). This statistic quantifies the association between a predictor (deployment) and a binary outcome (disease: yes/no). The association between deployment to a conflict and disease/condition outcome was assessed using a generalized linear model with the PROC GENMOD⁶ procedure in SAS Software (SAS Enterprise Guide 8.3

<https://documentation.sas.com/doc/en/egug/8.3/titlepage.htm>). To find the aRR, the following confounding variables were controlled for: age, sex, race, service branch, service component, and officer/enlisted status. In cases where the maximum likelihood estimation (MLE) of the parameters in the model could not converge, we dropped one or more confounders until the MLE converged. The aRRs represent the ratio of the risk – the probability of the disease/condition occurring in the deployed group compared to the probability of the disease/condition occurring in the appropriate control group – adjusted for the demographic and military fields listed above.

⁶ GENMOD procedure fits generalized linear models. The class of generalized linear models is an extension of traditional linear models that allows the mean of a population to depend on a linear predictor through a nonlinear link function and allows the response probability distribution to be any member of an exponential family of distributions. Many widely used statistical models are generalized linear models
<https://support.sas.com/documentation/onlinedoc/stat/142/genmod.pdf>.

Results

Population Characteristics

Table 1. Population File Demographic and Military Characteristics of Vietnam, 1990-1991 Gulf War, Pre-9/11, and Post-9/11 Deployed Veterans

Race	Vietnam		Gulf War		Pre-9/11		Post-9/11	
	N	%	N	%	N	%	N	%
White	2,345,810	83.63	418,682	65.13	341,170	70.36	2,168,826	63.56
Black/African American	306,159	10.92	136,545	21.24	78,307	16.15	509,824	14.94
Other	60,932	2.17	41,235	6.41	46,590	9.62	621,610	18.21
Unknown	91,966	3.27	46,361	7.21	18,795	3.88	111,971	3.28
Sex								
Female	16,359	0.58	46,504	7.23	35,697	7.36	445,247	13.05
Male	2,712,554	96.71	596,160	92.74	449,081	92.62	2,966,942	86.95
Missing	75,954	2.71	159	0.02	84	0.02	42	0.00
Age Group *								
18-29	-	-	-	-	-	-	390,205	11.44
30-39	-	-	-	-	55	0.01	1,297,628	38.03
40-49	-	-	98	0.02	109,971	22.68	1,025,443	30.05
50-59	-	-	387,581	60.29	248,509	51.25	494,838	14.50
60-69	50,758	1.81	184,478	28.70	104,069	21.46	173,626	5.09
70-79	2,046,054	72.95	62,894	9.78	21,016	4.33	30,079	0.88
80+	706,586	25.19	7,754	1.21	1,242	0.26	412	0.01
Missing	1,469	0.05	18	-	-	-	-	-
Branch								
Air Force	507,041	18.08	75,300	11.71	128,889	26.58	724,244	21.22
Army	1,589,238	56.66	335,506	52.19	76,465	15.77	1,541,441	45.17
Coast Guard	6,527	0.23	330	0.05	810	0.17	8,582	0.25
Marine Corps	193,338	6.89	92,352	14.37	32,210	6.64	467,761	13.71
Navy	343,458	12.25	138,665	21.57	246,359	50.81	669,408	19.62
Missing/Unknown	165,265	5.89	670	0.10	129	0.03	795	0.02
Component								
Active Duty	2,107,622	75.14	525,940	81.82	455,505	93.95	2,552,133	74.79
National Guard	75,523	2.69	36,017	5.60	9,667	1.99	427,941	12.54
Reserves	94,440	3.37	80,209	12.48	19,572	4.04	431,477	12.65
Missing/Unknown	527,282	18.80	657	0.10	118	0.02	680	0.02
Total	2,804,867		642,823		484,862		3,412,231	

*Age as of data extraction date 5/2/23

Table 1 provides the demographic characteristics for each of the four conflict cohorts presented in this report. These demographic characteristics vary across cohorts in a predictable manner. For example, the proportion of females comprising each cohort increased from the Vietnam (0.58%) to the Post-9/11 (13.05%) cohort paralleling the increase in the proportion of women in the military in general and those serving in combat-related occupations. Similarly, the age distribution shifts to younger ages across these cohorts with 72.95% falling into the 70-79 age range in the Vietnam cohort to only 0.88% in the Post-9/11 cohort.

Service in the Army was predominant in the Vietnam War (56.66%), Gulf War (52.19%), and Post-9/11 (45.17%) cohorts. The Navy was the predominant branch represented in the Pre-9/11 era cohort (50.81%) and approximately 20% and 22% in Post-9/11 and the Gulf War, respectively, and 12.25% of the forces during the Vietnam War. The Air Force represented 18.08% in Vietnam, 11.71% in Gulf War, 26.58% in Pre-9/11, and 21.22% in Post-9/11. Service members in the Marine Corps were 6.89% of those serving in Vietnam, 14.37% of the Gulf War forces, 6.64% of those in Pre-9/11, and 13.71% of the Post-9/11 forces analyzed.

VA provides this demographic analysis because demographics can have a large effect on disease and injury. Some cancers, for example, may have a genetic component, which can result in some populations being at greater risk than others, and for many cancers incidence increases with age. The occurrence of many diseases increases with age and taking note of the population distribution for age can be informative in interpreting the health outcome data.

Health Outcomes

Health outcomes data for prevalence of treated diseases for each deployed cohort are presented in separate tables (Tables 2-5). The tables list the 25 most frequently diagnosed diseases and are organized in descending order of most frequently recorded diagnoses as measured by period-prevalence in the deployed cohort. In addition, the prevalence for the non-deployed comparison groups is presented, accompanied by the aRR and the associated 95% confidence limit (CL). The adjusted relative risk measures the magnitude of increased (or decreased) likelihood of VHA treatment for the specific disease among the deployed. For example, in Table 2 the first listing is Hypertension with prevalence for deployed = 57,844 per 100,000 Veterans and prevalence in non-deployed = 52,447 per 100,000 Veterans in the non-deployed. The aRR = 1.05. This figure suggests that deployed Vietnam Veterans are 5% more likely to be treated for Hypertension in VA than non-deployed Vietnam-era Veterans. The magnitude of the 95% CLs for the adjusted relative risk are very close which suggests a high level of precision in the estimate of risk. When the aRR is below 1.0 it suggests the risk of treatment for disease in the deployed is lower than the non-deployed, in other words, the non-deployed have an increased illness burden.

Accompanying figures present annual incidence (2018-2022) for the five most prevalent conditions in three categories: mental health, chronic conditions, and cancers. These

charts present another way to see both the magnitude and pattern of diseases Veterans are seeking care for at VHA.

Finally, a summary table (Table 6) and an accompanying figure (Figure 13) assemble all 4 cohorts together and present the 16 diseases seen across all 4 cohorts. This data presentation helps to consolidate the findings and depicts similarities and differences across cohorts.

Vietnam War Era

The most commonly treated diagnosed diseases in the Vietnam War cohort (Table 2) include hypertension, diabetes, other forms of heart disease, posttraumatic stress disorder (PTSD), depression, and ischemic heart disease. Hypertension, diabetes, and ischemic heart disease are presumptively service-connected disorders related to herbicide (Agent Orange) and dioxin exposure, are recognized to increase with age regardless of exposure status and are chronic conditions that often require routine monitoring in health care environments. This combination of factors is likely a key driver of these diseases leading frequency of treatment encounters.

The VA population is screened for PTSD and depression; providers and systems of care especially designed for the Veteran are likely drivers for high treatment utilization. The aRR (3.77; 95% CL: 3.74, 3.80) for the comparison by deployment status is higher than the aRRs for all other prevalent diseases enumerated. The much lower prevalence of PTSD in the non-deployed comparison group is notable and results in the increased aRR, recognition of the increased treatment provided for this disease to the deployed Veterans.

The pattern of increased aRR in these most frequently treated diseases among deployed compared to non-deployed is confirmation that deployers do tend to present to VA for care with increased burden of disease. Another factor that may be driving this finding is that deployed Veterans are more likely to have increased access to VA care due to eligibility rules. A further informative observation is that the trend and magnitude of frequently treated diseases is very similar in the deployed and non-deployed populations. In the Vietnam War Era Veteran population, notwithstanding deployment status, this is some evidence that Veteran populations, especially as they age, experience the same age-related maladies regardless of the potential effects of military environmental exposures.

Table 2. Prevalence per 100,000 Vietnam Era Veterans (Deployed and Non-deployed) seen in Veterans Affairs Health Care System, aRR* and 95% CL for 25 Frequently Treated Conditions.

Condition	Prevalence				
	Deployed	Nondeployed	aRR	95%CL	
Hypertension	57,844	53,447	1.05	1.05	1.05
Diabetes	32,286	27,929	1.08	1.08	1.09
Other Forms of Heart Disease	22,559	20,680	1.03	1.02	1.03
PTSD**	21,779	5,488	3.77	3.74	3.80
Ischemic Heart Disease	21,410	18,095	1.09	1.08	1.09
Sleep Apnea	19,211	15,237	1.19	1.18	1.19
Depression	18,982	15,530	1.19	1.19	1.20
Arthritis	16,446	14,681	1.09	1.09	1.10
Other Chronic Obstructive Pulmonary Disease (COPD)	15,946	14,957	1.02	1.01	1.02
Anemia	14,086	12,863	1.05	1.04	1.06
Disorders of Thyroid Gland	9,899	9,203	1.06	1.05	1.07
Anxiety Disorder	9,343	8,772	1.08	1.07	1.08
Stroke	8,578	7,866	1.02	1.01	1.02
Nicotine Dependence	7,792	8,003	1.03	1.02	1.04
Allergic Rhinitis	6,119	5,395	1.13	1.12	1.14
Malignant Neoplasm of Prostate	6,071	4,773	1.12	1.11	1.13
Significant Hearing Loss	5,871	4,845	1.11	1.10	1.12
Dementia	4,769	4,137	1.05	1.03	1.06
Other and Unspecified Malignant Neoplasm of Skin	4,745	3,928	1.09	1.08	1.10
Carcinoma In Situ of Other and Unspecified Genital Organs	3,251	2,263	1.24	1.22	1.26
Diverticulitis	2,780	2,471	1.06	1.04	1.07
Asthma	2,705	2,708	1.05	1.03	1.06
Headache	2,569	2,462	1.09	1.07	1.11
Parkinson's Disease	2,334	1,586	1.27	1.24	1.29
Hepatitis C	2,326	3,148	0.92	0.90	0.93

Note: 95% CL = here arrayed as lower in the left column and upper in the right column). Race categories for adjusted models were White, Black, and Other. Age categories = Under 68, 69 to 70, 71 to 72, 73 to 75, 76 to 78, 79 to 82 and 83+. Because of small numbers Coast Guard and Navy were combined into one category.

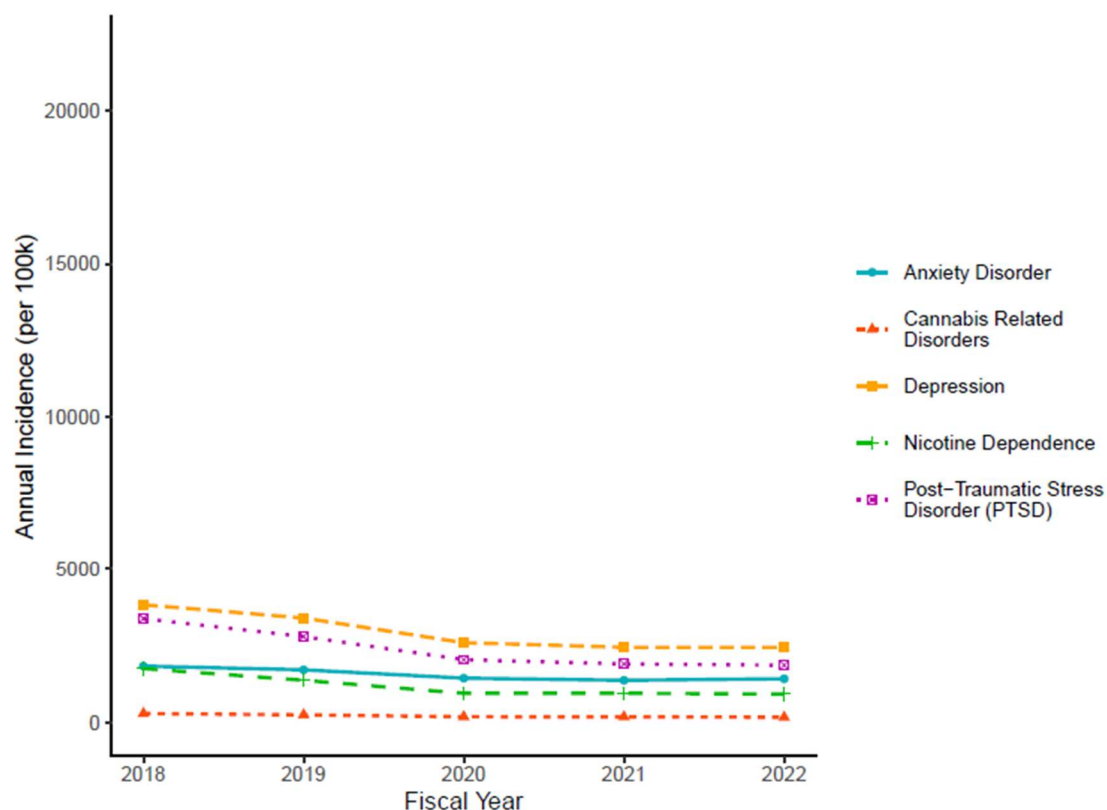
* Adjusted models, unless otherwise noted, include age, sex, branch of service, race.

** Adjusted model includes race, sex, branch of service.

Figures 1-3 present incidence (newly diagnosed cases) of the most prevalent diseases for deployed Vietnam War Veterans treated at VA for the period 2018-2022. The figures are grouped to present the five most prevalent diseases in each of the following categories: mental health conditions; chronic conditions⁷; and cancers. These figures

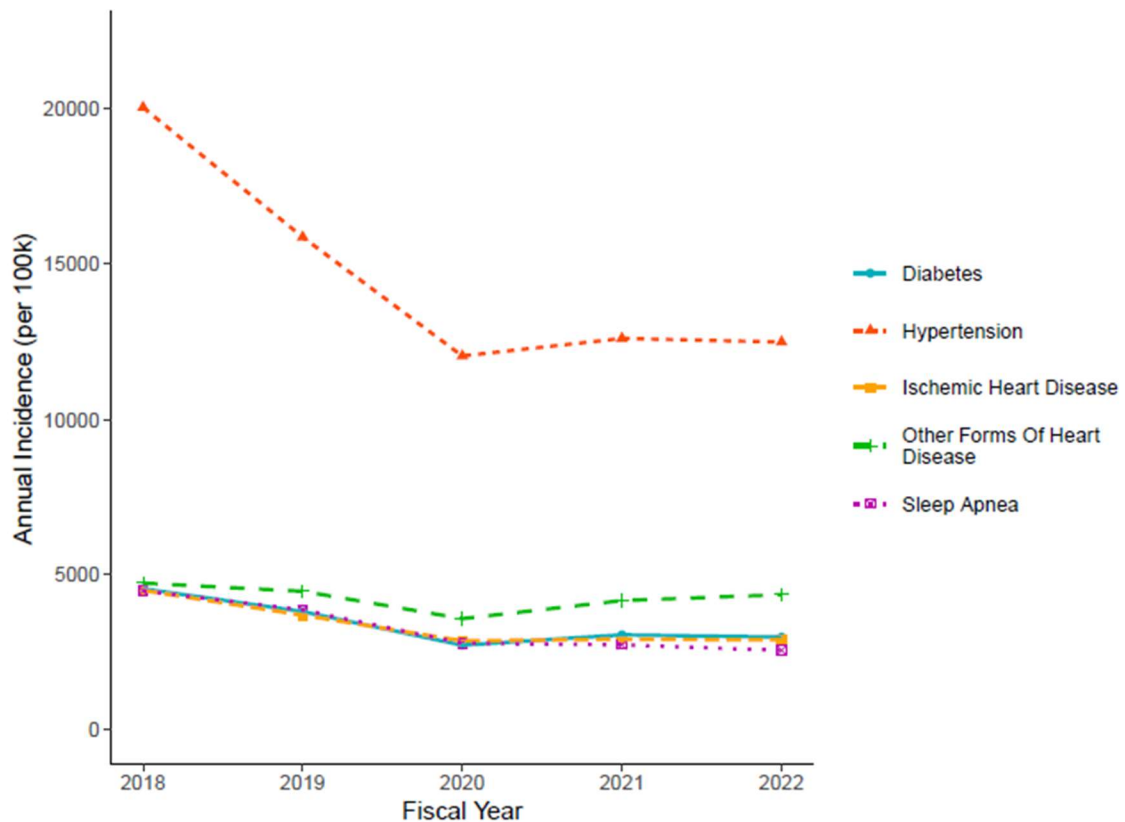
⁷ For the purposes of this report, chronic conditions refer to non-acute medical conditions excluding mental health conditions and cancers.

help to visualize patterns of newly diagnosed diseases treated in Vietnam War deployed Veterans during the period of observation (2018-2022). Information about disease prevalence is provided in Table 2 and at the bottom of each graphic.



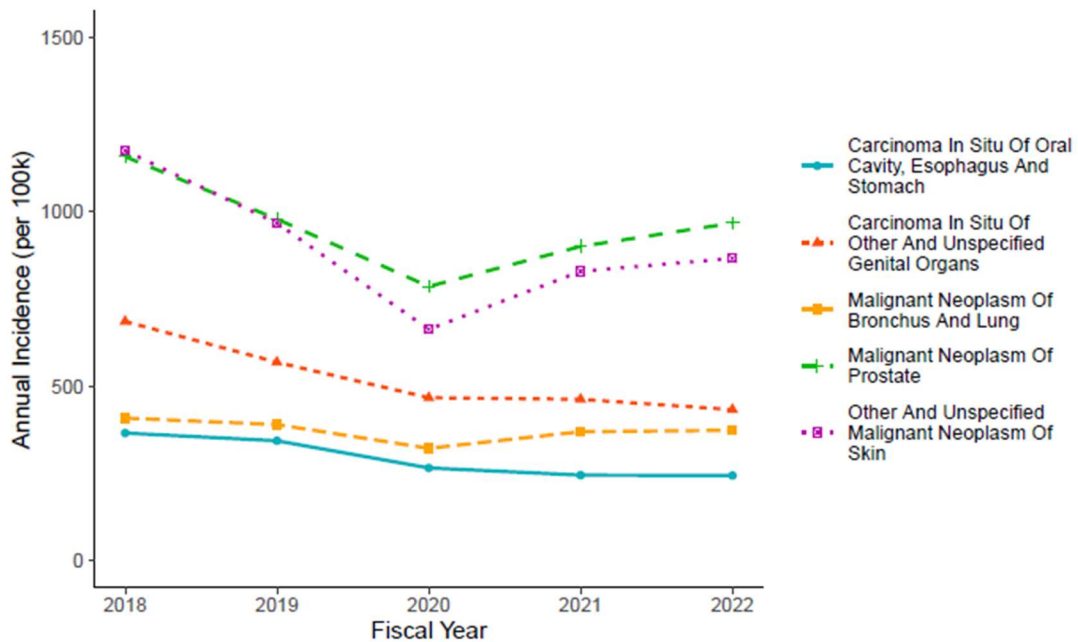
Condition	Prevalence	Adjusted RR	Lower CL	Upper CL
Post-Traumatic Stress Disorder (PTSD)	21779	3.770	3.744	3.797
Depression	18982	1.194	1.187	1.200
Anxiety Disorder	9343	1.076	1.067	1.084
Nicotine Dependence	7792	1.031	1.022	1.040
Cannabis Related Disorders	1398	1.125	1.102	1.149

Figure 1. Incidence 2018-2022 of the Five Most Prevalent Mental Health Conditions treated at VA (Vietnam War Veterans). Prevalence is per 100,000 Veterans. Adjusted relative risk models compare to same era non-deployed Veterans. Models adjusted for sex, race, service branch, component, rank, except where models failed to converge.



Condition	Prevalence	Adjusted RR	Lower CL	Upper CL
Hypertension	57844	1.049	1.047	1.052
Diabetes	32286	1.085	1.081	1.089
Other Forms Of Heart Disease	22559	1.025	1.020	1.030
Ischemic Heart Disease	21410	1.085	1.080	1.090
Sleep Apnea	19211	1.188	1.182	1.195

Figure 2. Incidence 2018-2022 of the Five Most Prevalent Chronic Conditions treated at VA (Vietnam War Veterans). Prevalence is per 100,000 Veterans. Adjusted relative risk models compare to same era non-deployed Veterans. Models adjusted for sex, race, service branch, component, rank, except where models failed to converge.



Condition	Prevalence	Adjusted RR	Lower CL	Upper CL
Malignant Neoplasm Of Prostate	6071	1.120	1.109	1.132
Other And Unspecified Malignant Neoplasm Of Skin	4745	1.088	1.076	1.101
Carcinoma In Situ Of Other And Unspecified Genital Organs	3251	1.238	1.220	1.256
Malignant Neoplasm Of Bronchus And Lung	2074	1.016	0.998	1.033
Carcinoma In Situ Of Oral Cavity, Esophagus And Stomach	1751	1.020	1.001	1.040

Figure 3. Incidence 2018-2022 of the Five Most Prevalent Cancers treated at VA (Vietnam War Veterans). Prevalence is per 100,000 Veterans. Adjusted relative risk models compare to same era non-deployed Veterans. Models adjusted for sex, race, service branch, component, rank, except where models failed to converge.

1990-1991 Gulf War Era

The medical conditions VA treated most frequently in the Gulf War Veteran population (see Table 3) are hypertension, sleep apnea, depression, and PTSD. These findings are consistent with other VA health care utilization reporting, which has identified mental disorders and musculoskeletal diseases, such as arthritis, as common concerns in deployed populations. The high prevalence of hypertension and diabetes in this population may be reflective of the onset of diseases associated with aging and suggests both as disease entities for further exploration and opportunities for prevention.

As observed in the Vietnam Era population, the 1990-1991 Gulf War Era population demonstrates increased aRRs in the deployed for all 25 frequently treated conditions presented in Table 3 on page 14. Deployed Gulf War Veterans may receive more treatment from VA than non-deployed peers, similar to the observation among Vietnam War Veterans, due to potential bias for disease ascertainment introduced from the different criteria for eligibility for treatment based on overseas deployment. It is striking that 7 of the most frequently treated diseases in Vietnam Veterans are observed in the top 10 most frequently treated diseases in the Gulf War deployed Veterans. This commonality may suggest that these highly prevalent diseases are observed across both deployed and non-deployed cohorts, especially those diseases associated with aging.

Notable for the 1990-1991 Gulf War Era comparison is the elevated aRRs observed for diseases that are commonly included under the definition of Gulf War Illness: irritable bowel syndrome (aRR = 2.16; 95%CL: 2.11, 2.21) and fibromyalgia (aRR = 1.98; 95%CL: 1.93, 2.04). As with Vietnam Veterans, PTSD also presents with an elevated aRR of 1.65; 95% CL: 1.64, 1.66) demonstrating again what is likely the dual consequence of military related stressors and a system of care at VA which is prepared to provide specialty mental health care services to Veterans.

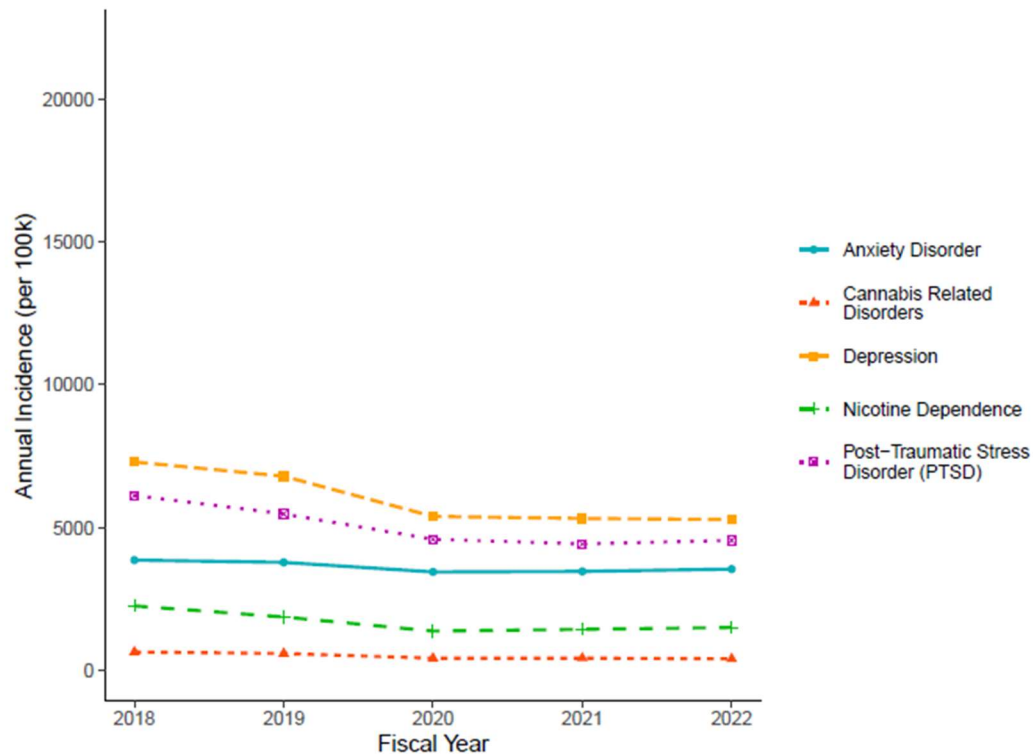
Figures 4–6 plot the annual incidence (newly diagnosed cases) of the most prevalent diseases for deployed 1990-1991 Gulf War Veterans treated at VA for the period 2018-2022. The figures are grouped to present the five most prevalent diseases in each of the following categories: mental health conditions, chronic conditions, and cancers. Information about disease prevalence that may be seen in Table 3 is reiterated below each graphic for ease of reference. However, some of the diseases presented graphically in the three categories (mental health, chronic disease, and cancers) may not be among the 25 most prevalent diseases VA treated, so some of this information on disease prevalence is presented only with these figures.

Table 3. Prevalence per 100,000 1990-91 Gulf War Era Veterans (deployed and non-deployed) seen in Veterans Affairs Health Care System, aRR* and 95% CL for 25 Frequently Treated Conditions.

Condition	Prevalence				
	Deployed	Nondeployed	aRR	95% CL	
Hypertension	43,041	38,823	1.09	1.09	1.10
Sleep Apnea	30,405	22,053	1.16	1.15	1.16
Depression	27,968	20,542	1.17	1.17	1.18
PTSD	27,153	13,379	1.65	1.64	1.66
Diabetes	21,449	19,685	1.11	1.10	1.11
Anxiety Disorder	16,979	12,790	1.13	1.12	1.14
Arthritis	15,952	13,603	1.10	1.09	1.11
Allergic Rhinitis	9,132	7,213	1.16	1.15	1.17
Nicotine Dependence	8,567	6,196	1.15	1.13	1.16
Other Forms of Heart Disease	8,185	9,601	1.07	1.06	1.08
Tinnitus	7,735	7,191	1.05	1.04	1.06
Anemia	7,438	7,664	1.10	1.08	1.11
Disorders of Thyroid Gland	6,584	7,136	1.08	1.06	1.09
Headache	6,501	4,441	1.20	1.19	1.22
Ischemic Heart Disease	6,490	7,902	1.08	1.07	1.10
Migraine	6,045	4,225	1.21	1.19	1.23
Other COPD	4,956	5,526	1.20	1.18	1.22
Asthma	4,803	3,759	1.17	1.15	1.19
Sinusitis	3,409	2,557	1.19	1.16	1.21
Irritable Bowel Syndrome	3,088	1,313	2.16	2.11	2.21
Stroke	3,050	3,633	1.05	1.03	1.07
Cannabis Related Disorders	2,738	1,656	1.20	1.17	1.22
Significant Hearing Loss	2,601	3,219	1.03	1.01	1.06
Manic-Depressive Disorder	2,312	2,053	0.98	0.95	1.00
Fibromyalgia	2,145	900	1.98	1.93	2.04

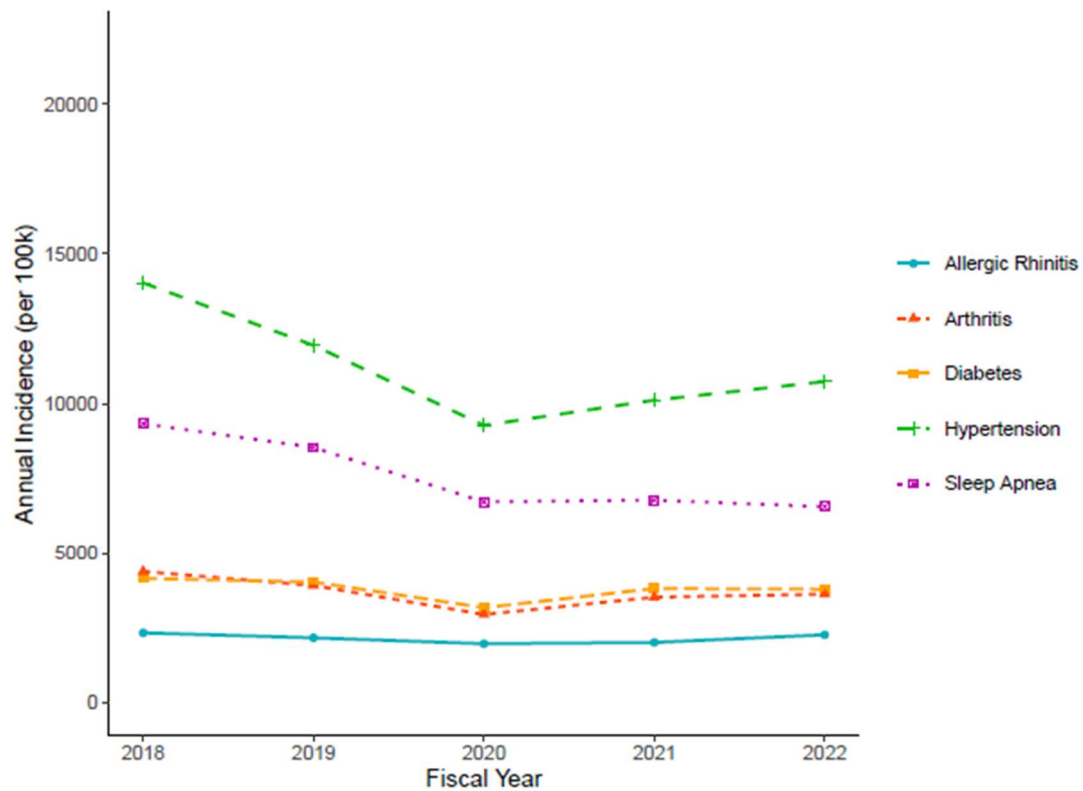
Note: 95% CL = here arrayed as lower in the left column and upper in the right column.

* Adjusted models, unless otherwise noted, include age, sex, branch of service, service component, race, rank (enlisted vs. officer).



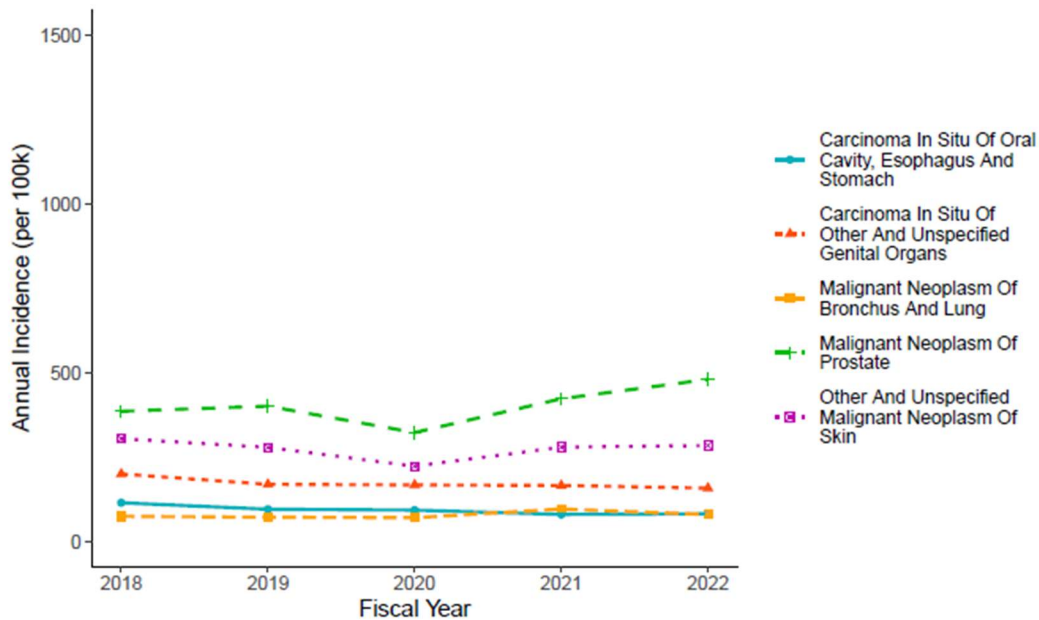
Condition	Prevalence	Adjusted RR	Lower CL	Upper CL
Depression	27968	1.174	1.167	1.181
Posttraumatic Stress Disorder (PTSD)	27153	1.653	1.642	1.664
Anxiety Disorder	16979	1.131	1.122	1.140
Nicotine Dependence	8567	1.145	1.131	1.159
Cannabis Related Disorders	2738	1.195	1.168	1.223

Figure 4. Incidence 2018-2022 of the Five Most Prevalent Mental Health Conditions treated at VA (1990-1991 Gulf War Veterans). Prevalence is per 100,000 Veterans. Adjusted relative risk models compare to same era non-deployed Veterans. Models adjusted for sex, race, service branch, component, rank, except where models failed to converge.



Condition	Prevalence	Adjusted RR	Lower CL	Upper CL
Hypertension	43041	1.091	1.086	1.095
Sleep Apnea	30405	1.156	1.149	1.162
Diabetes	21449	1.105	1.097	1.112
Arthritis	15952	1.098	1.088	1.107
Allergic Rhinitis	9132	1.158	1.145	1.172

Figure 5. Incidence 2018-2022 of the Five Most Prevalent Chronic Conditions treated at VA (1990-1991 Gulf War Veterans). Prevalence is per 100,000 Veterans. Adjusted relative risk models compare to same era non-deployed Veterans. Models adjusted for sex, race, service branch, component, rank, except where models failed to converge.



Condition	Prevalence	Adjusted RR	Lower CL	Upper CL
Malignant Neoplasm of Prostate	1984	1.076	1.050	1.103
Other and Unspecified Malignant Neoplasm of Skin	1264	1.074	1.041	1.108
Carcinoma In Situ of Other and Unspecified Genital Organs	810	1.046	1.006	1.088
Carcinoma In Situ of Oral Cavity, Esophagus and Stomach	464	1.090	1.034	1.149
Malignant Neoplasm of Bronchus and Lung	384	1.132	1.069	1.200

Figure 6. Incidence 2018-2022 of the Five Most Prevalent Cancers treated at VA (1990-1991 Gulf War Veterans). Prevalence is per 100,000 Veterans. Adjusted relative risk models compare to same era non-deployed Veterans. Models adjusted for sex, race, service branch, component, rank, except where models failed to converge.

Pre-9/11 Era Veterans

The Pre-9/11 cohort represents the smallest of the deployment groups presented in this report and may also have the lowest exposure to ground-based combat operations (Table 4). During this period, Army and Marine Corps deployments to the Southwest Asia theater were lower than Navy deployments, suggesting very different operational requirements. Hypertension and sleep apnea are the highest prevalence conditions receiving treatment in this cohort. Depression, PTSD, and anxiety disorder are among the top five leading diseases requiring VA treatment. This may be indicative of a VA system of care that provides specialized service for mental health, resulting in increased identification and treatment of these diagnoses. As noted previously, sleep apnea is an increasing concern among combat Veterans and is often diagnosed as a co-morbid condition due to being a recognized risk factor for other chronic conditions; diagnosis and treatment of sleep apnea is a preventative intervention.

The comparison here between deployed and non-deployed shows a similar pattern regarding the most prevalent diseases for which Veterans are seeking VA treatment. An important difference for this Pre-9/11 Era compared to the Vietnam and 1990-1991 Gulf War Era is the lower magnitude of the adjusted relative risk measures. Those values that are less than one and have 95% confidence limit parameters that are also less than one would suggest there is NOT an increased risk for treatment seeking associated with deployment (that is, Hypertension aRR = 0.98, CL: 0.98, 0.99). A finding with this pattern can be described as a protective effect of deployment, however, in this case the explanation is likely due to the healthy warrior effect. The determination of health status and fitness of DoD uniformed personnel are included in considerations of deployability and this health advantage is likely to persist following deployment and extend into post-separation health status. Another notable finding in the Table 4 comparison between deployed and non-deployed is Allergic Rhinitis, aRR = 1.00, 95% CL: 0.99, 1.02. The result of an aRR = 1.0 suggests no difference in seeking VA treatment for Allergic Rhinitis between the two groups being compared—here the deployed and non-deployed Pre-9/11 Veterans.

Table 4. Prevalence per 100,000 Pre-9/11 Era Veterans (deployed and non-deployed) seen in Veterans Affairs Health Care System, aRR* and 95% CL for 25 Frequently Treated Conditions.					
Condition	Prevalence				
	Deployed	Nondeployed	aRR	95% CL	
Hypertension	30,632	31,447	0.98	0.97	0.98
Sleep Apnea	26,255	22,714	1.05	1.04	1.06
Depression	21,789	24,178	0.94	0.93	0.94
PTSD	15,569	18,247	1.04	1.03	1.05
Anxiety Disorder	14,974	16,414	0.92	0.91	0.93
Diabetes	14,579	15,126	0.98	0.97	0.99
Arthritis	10,302	11,053	0.95	0.94	0.96
Allergic Rhinitis	7,709	7,578	1.00	0.99	1.02
Nicotine Dependence	5,748	6,608	0.88	0.86	0.89
Migraine	5,669	6,379	0.98	0.96	0.99
Headache	4,928	5,802	0.91	0.89	0.92
Other Forms of Heart Disease	4,845	6,980	0.86	0.84	0.87
Disorders of Thyroid Gland	4,813	6,110	0.92	0.90	0.94
Anemia**	4,810	6,422	0.91	0.90	0.93
Asthma	3,595	4,050	0.92	0.90	0.94
Ischemic Heart Disease	3,506	5,277	0.87	0.85	0.89
Sinusitis	2,551	2,665	0.94	0.92	0.97
Other COPD	2,215	3,785	0.83	0.81	0.86
Manic-Depressive Disorder	1,983	2,666	0.74	0.72	0.76

Table 4. Prevalence per 100,000 Pre-9/11 Era Veterans (deployed and non-deployed) seen in Veterans Affairs Health Care System, aRR* and 95% CL for 25 Frequently Treated Conditions.

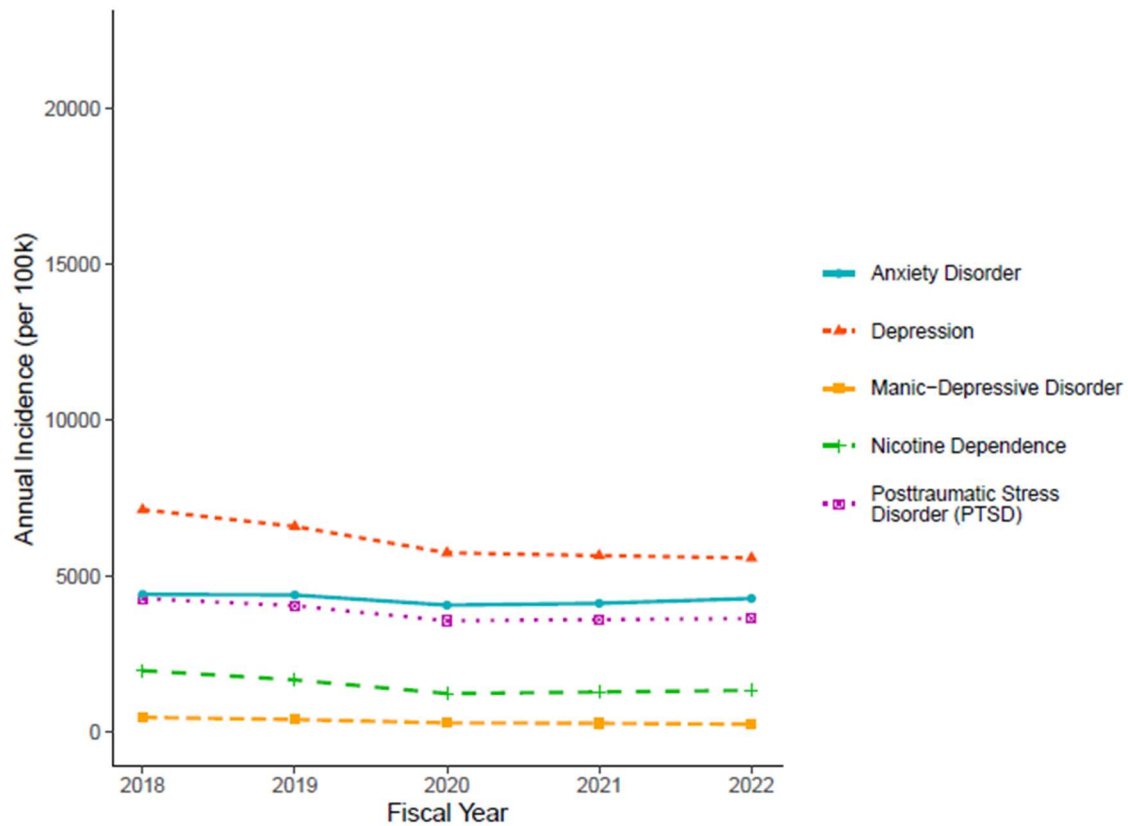
Condition	Prevalence				
	Deployed	Nondeployed	aRR	95% CL	
Cannabis Related Disorders	1,919	2,474	0.81	0.79	0.84
Significant Hearing Loss	1,818	2,403	0.94	0.91	0.96
Irritable Bowel Syndrome	1,755	1,785	1.09	1.06	1.12
Stroke	1,735	2,525	0.89	0.86	0.92
Diverticulitis	1,266	1,413	0.88	0.84	0.91
Schizophrenia or Psychosis	990	1,521	0.71	0.68	0.74

Note: 95% CL = here arrayed as lower in the left column and upper in the right column.

* Adjusted models, unless otherwise noted, include age, sex, branch of service, service component, race, rank (enlisted vs. officer).

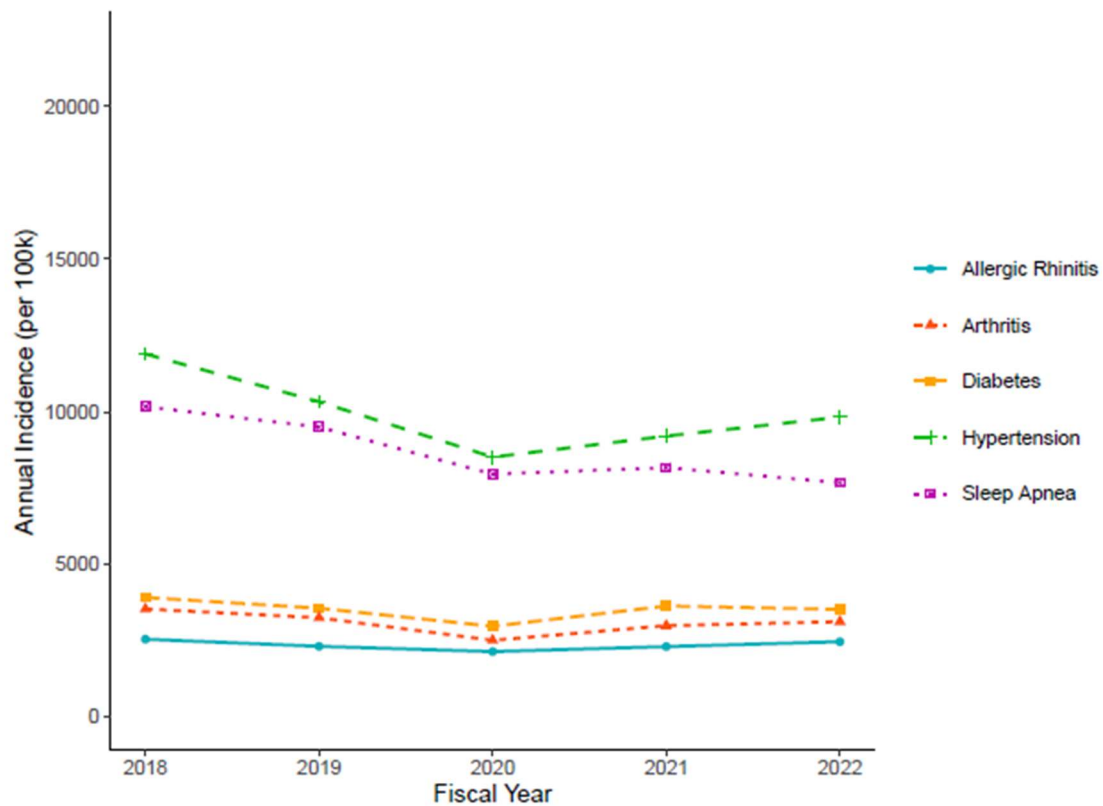
** Adjusted model includes age, sex, branch due to model nonconvergence with all adjustment variables included.

Figures 7–9 present incidence (newly diagnosed cases) of the most prevalent diseases for deployed Pre-9/11 Veterans treated at VA for the period 2018-2022. The figures are grouped to present the five most prevalent diseases in each of the following categories: mental health conditions, chronic conditions, and cancers. These figures help to demonstrate the recent experience of newly identified diseases VA treated in Pre-9/11 deployed Veterans during the period of observation (2018-2022). Information about disease prevalence that may be seen in Table 4 is reiterated below each graphic for ease of reference. However, some of the diseases presented graphically in the 3 categories (mental health, chronic disease, and cancers) are not among the 25 most prevalent diseases treated at VA, so some of this information on disease prevalence is presented only with these figures.



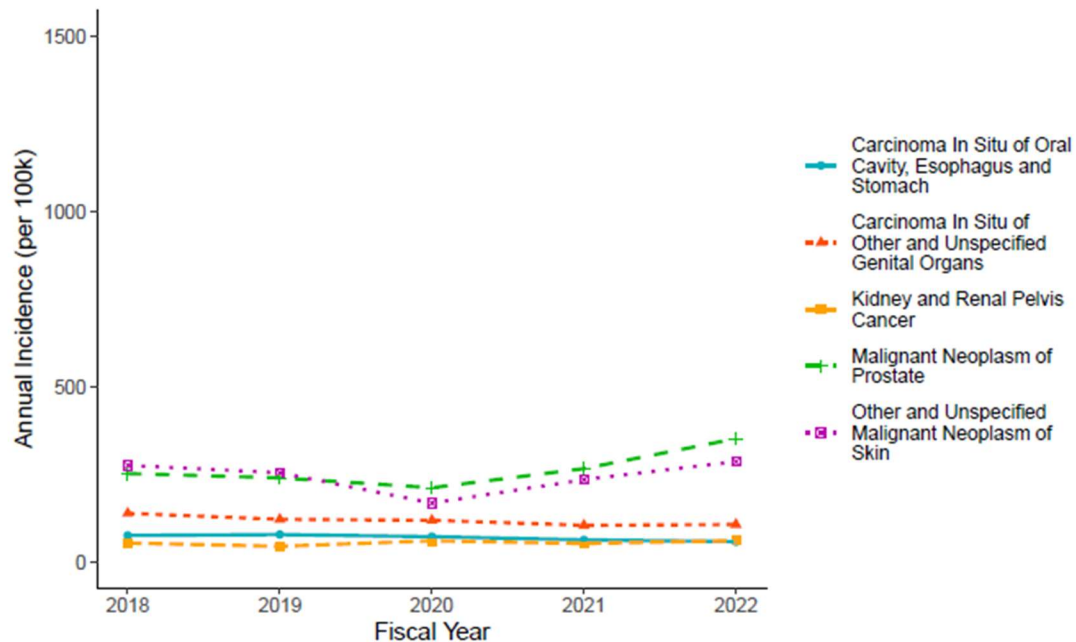
Condition	Prevalence	Adjusted RR	Lower CL	Upper CL
Depression	21789	0.935	0.928	0.943
Posttraumatic Stress Disorder (PTSD)	15569	1.043	1.033	1.053
Anxiety Disorder	14974	0.923	0.914	0.932
Nicotine Dependence	5748	0.876	0.862	0.891
Manic-Depressive Disorder	1983	0.742	0.721	0.764

Figure 7. Incidence 2018-2022 of the Five Most Mental Health conditions treated at VA for Pre-9/11 Veterans. Prevalence is per 100,000 Veterans. Adjusted relative risk models compare to same era non-deployed Veterans. Models adjusted for sex, race, service branch, component, rank, except where models failed to converge.



Condition	Prevalence	Adjusted RR	Lower CL	Upper CL
Hypertension	30632	0.978	0.972	0.984
Sleep Apnea	26255	1.052	1.044	1.059
Diabetes	14579	0.979	0.970	0.989
Arthritis	10302	0.947	0.935	0.958
Allergic Rhinitis	7709	1.004	0.989	1.018

Figure 8. Incidence 2018-2022 of the Five Most Prevalent Chronic Conditions treated at VA for Pre-9/11 Veterans. Prevalence is per 100,000 Veterans. Adjusted relative risk models compare to same era non-deployed Veterans. Models adjusted for sex, race, service branch, component, rank, except where models failed to converge.



Condition	Prevalence	Adjusted RR	Lower CL	Upper CL
Malignant Neoplasm of Prostate	982	0.942	0.904	0.982
Other and Unspecified Malignant Neoplasm of Skin	891	0.928	0.889	0.970
Carcinoma In Situ of Other and Unspecified Genital Organs	414	0.961	0.902	1.024
Carcinoma In Situ of Oral Cavity, Esophagus and Stomach	264	0.952	0.878	1.032
Kidney and Renal Pelvis Cancer	204	0.970	0.884	1.063

Figure 9. Incidence 2018-2022 of the Five Most Prevalent Cancers treated at VA Pre-9/11 Veterans. Prevalence is per 100,000 Veterans. Adjusted relative risk models compare to same era non-deployed Veterans. Models adjusted for sex, race, service branch, component, rank, except where models failed to converge.

Post-9/11 Era Veterans

The most frequently treated diseases in the Post-9/11 population (Table 5): PTSD (aRR = 2.12; 95% CL: 2.11, 2.13), depression (aRR = 1.16; 95% CL: 1.16, 1.17), sleep apnea (aRR = 1.36; 95% CL: 1.36, 1.37), anxiety (aRR = 1.11; 95% CL: 1.10, 1.11), and hypertension (aRR = 1.06; 95% CL: 1.06, 1.07), are very similar to that of Pre-9/11 Veterans but these are arrayed in a different order for Pre-9/11 Veterans. The increased prevalence of hypertension with age and the different age distribution of Pre-9/11 and Post-9/11 may provide some explanation for the difference in magnitude of treatment seeking.

Migraine is included in the top 10 diagnosed conditions for both Post-9/11 (aRR = 1.36; 95% CL: 1.35, 1.37) and Pre-9/11 (aRR = 1.04; 95% CL: 1.03, 1.05) Veterans, which

reflects an increased recognition and diagnosis of headache in this newest cohort. The contribution of blast exposures and mild traumatic brain injury to this increased presentation and identification of migraine has been a question of active research since early in the Post-9/11 Era and coincident with recognition of mild traumatic brain injuries.

Identifying diseases of the respiratory and cardiovascular system in the top 25 diseases of this list merits notice for two reasons. First, sinusitis (aRR = 1.11; 95% CL: 1.10, 1.13) and asthma (aRR = 1.12; 95% CL: 1.10, 1.13) are recognized as presumptions for service connection for the Post-9/11 cohort. Second, the creation of the presumption relied on recognition of the frequent presentation of disease in recent Veterans and scientific evidence supporting the decision. The existence of the presumption may contribute to increased diagnoses as eligible Veterans are newly enrolled and identified as having these diseases. In other words, there may be a selection bias resulting from VA establishing a presumption regarding service connection that leads Veterans with these conditions to apply for benefits and health care at greater rates. Cardiovascular diseases are recognized as having a multifactorial etiology and military environmental exposures may be contributory to disease etiology for some Veterans. This is important as many cardiovascular diseases may be amenable to preventative interventions to reduce lifetime risk.

Table 5. Prevalence per 100,000 Post-9/11 Era Veterans (deployed and non-deployed) seen in Veterans Affairs Health Care System, aRR* and 95% CL for 25 Frequently Treated Conditions.					
Condition	Prevalence				
	Deployed	Nondeployed	aRR	95% CL	
PTSD	30,718	12,828	2.12	2.11	2.13
Depression	29,449	23,648	1.16	1.16	1.17
Sleep Apnea	23,166	14,999	1.36	1.36	1.37
Anxiety Disorder	21,651	17,585	1.11	1.10	1.11
Hypertension	16,388	18,020	1.06	1.06	1.07
Migraine	8,783	5,953	1.36	1.35	1.37
Headache	7,530	4,897	1.33	1.32	1.34
Allergic Rhinitis	7,183	5,542	1.24	1.23	1.25
Nicotine Dependence	6,412	4,732	1.08	1.07	1.09
Diabetes	6,041	8,529	0.93	0.92	0.94
Arthritis	5,796	6,313	1.11	1.10	1.12
Cannabis Related Disorders	3,947	2,828	1.03	1.02	1.04
Asthma	3,636	3,107	1.12	1.10	1.13
Disorders of Thyroid Gland **	3,266	3,943	0.90	0.89	0.91
Anemia **	3,080	4,299	0.81	0.80	0.81
Manic-Depressive Disorder	2,514	2,873	0.73	0.72	0.74
Other Forms of Heart Disease	2,458	4,071	0.89	0.88	0.90

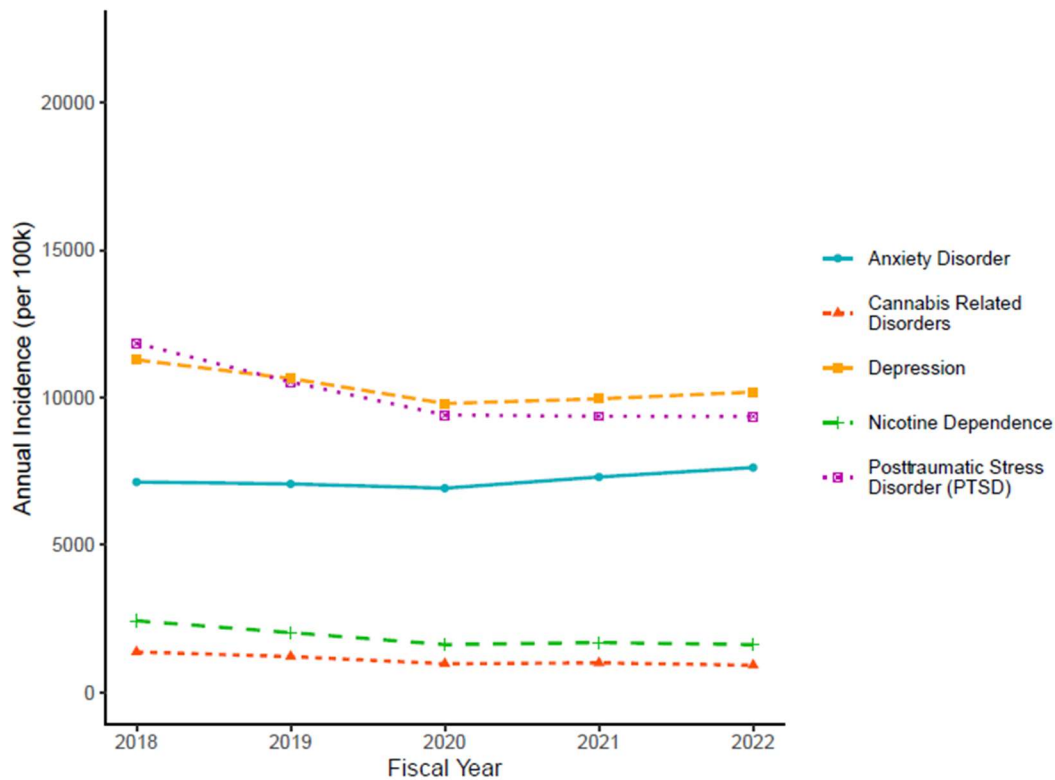
Table 5. Prevalence per 100,000 Post-9/11 Era Veterans (deployed and non-deployed) seen in Veterans Affairs Health Care System, aRR* and 95% CL for 25 Frequently Treated Conditions.					
Sinusitis	2,271	1,844	1.11	1.10	1.13
Irritable Bowel Syndrome	2,259	1,535	1.32	1.30	1.34
Opioid Related Disorders	1,417	1,070	0.80	0.79	0.82
Significant Hearing Loss	1,313	1,397	1.21	1.18	1.23
Other Psychoactive Substance Related Disorders	1,312	962	0.90	0.88	0.92
Schizophrenia or Psychosis	1,155	1,654	0.67	0.65	0.68
Other Stimulant Related Disorders	1,140	870	0.78	0.76	0.80
Ischemic Heart Disease	1,102	2,780	0.83	0.81	0.84

Note: 95% CL = here arrayed as lower in the left column and upper in the right column.

* Adjusted models, unless otherwise noted, include age, sex, branch of service, service component, race, rank (enlisted vs. officer).

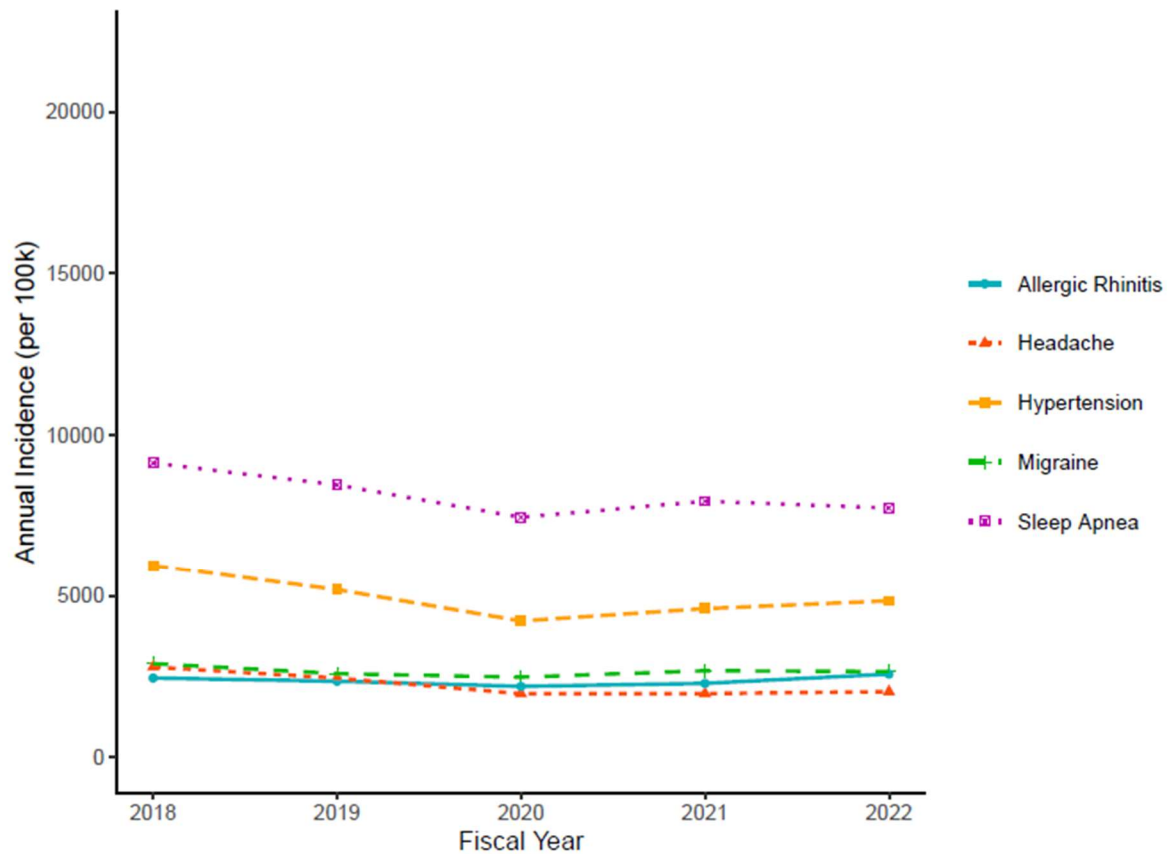
** Adjusted model includes age, branch/service component, and enlisted (vs. officer) due to model nonconvergence with all adjustment variables included.

Figures 10-12 present incidence (newly diagnosed cases) of the most prevalent diseases for deployed Post-9/11 Veterans treated at VA for the period 2018-2022. The figures are grouped to present the five most prevalent diseases in each of the following categories: mental health conditions, chronic conditions, and cancers. These graphics help to demonstrate the recent experience of newly identified diseases treated in Post-9/11 deployed Veterans during the period of observation (2018-2022). Information about disease prevalence that may be seen in Table 5 (page 23) is reiterated below each graphic for ease of reference. However, some of the diseases presented graphically in the 3 categories (mental health, chronic disease, and cancers) may not be among the 25 most prevalent diseases treated at VA, so some of this information on disease prevalence is presented only with these figures.



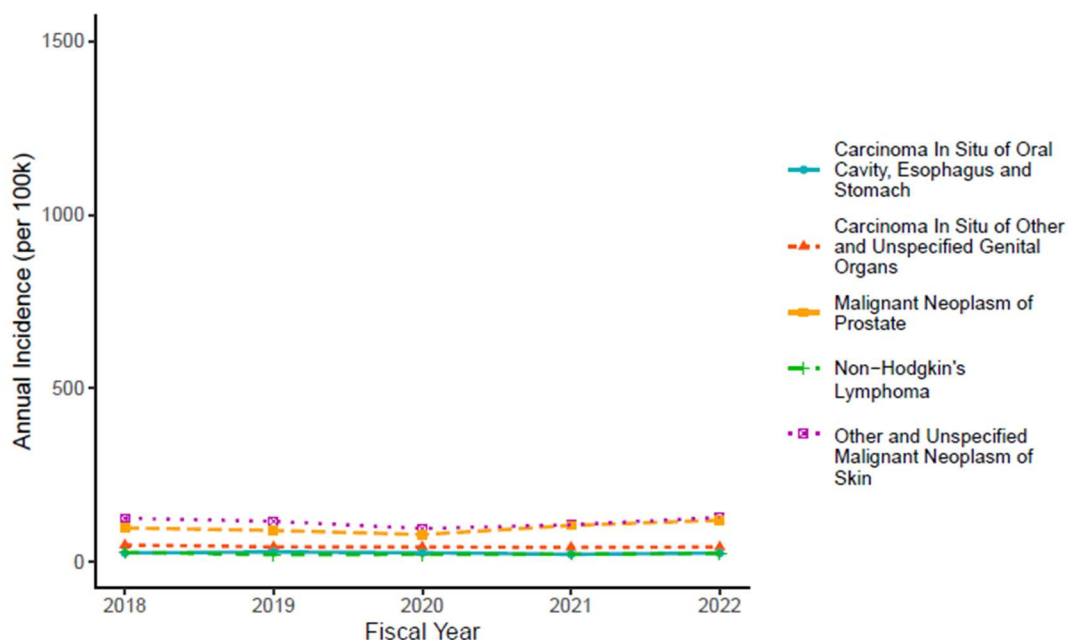
Condition	Prevalence	Adjusted RR	Lower CL	Upper CL
Posttraumatic Stress Disorder (PTSD)	30718	2.111	2.101	2.121
Depression	29449	1.158	1.154	1.162
Anxiety Disorder	21651	1.102	1.097	1.107
Nicotine Dependence	6412	1.078	1.069	1.088
Cannabis Related Disorders	3947	1.029	1.017	1.041

Figure 10. Incidence 2018-2022 of the Five Most Mental Health conditions treated at VA among Post-9/11 Veterans. Prevalence is per 100,000 Veterans. Adjusted relative risk models compare to same era non-deployed Veterans. Models adjusted for sex, race, service branch, component, rank, except where models failed to converge.



Condition	Prevalence	Adjusted RR	Lower CL	Upper CL
Sleep Apnea	23166	1.361	1.354	1.367
Hypertension	16388	1.064	1.060	1.069
Migraine	8783	1.351	1.341	1.362
Headache	7530	1.328	1.317	1.340
Allergic Rhinitis	7183	1.234	1.223	1.244

Figure 11. Incidence 2018-2022 of the Five Most Prevalent Chronic Conditions treated at VA among Post-9/11 Veterans. Prevalence is per 100,000 Veterans. Adjusted relative risk models compare to same era non-deployed Veterans. Models adjusted for sex, race, service branch, component, rank, except where models failed to converge.



Condition	Prevalence	Adjusted RR	Lower CL	Upper CL
Other and Unspecified Malignant Neoplasm of Skin	366	1.094	1.057	1.132
Malignant Neoplasm of Prostate	326	1.101	1.066	1.137
Carcinoma In Situ of Other and Unspecified Genital Organs	142	1.052	1.003	1.105
Carcinoma In Situ of Oral Cavity, Esophagus and Stomach	89	0.927	0.869	0.990
Non-Hodgkin's Lymphoma	88	0.977	0.910	1.048

Figure 12. Incidence 2018-2022 of the Five Most Prevalent Cancers treated at VA among Post-9/11 Veterans. Prevalence is per 100,000 Veterans. Adjusted relative risk models compare to same era non-deployed Veterans. Models adjusted for sex, race, service branch, component, rank, except where models failed to converge.

Comparison of Prevalent Diseases Across Cohorts

Figure 13 and Table 6 present the most prevalent diseases treated at VA across all four deployed cohorts: Vietnam, 1990-1991 Gulf War, Pre-9/11, and Post-9/11. These 16 diseases are found among the 25 most common in each of the cohorts and have been presented together here to allow for direct comparison across the different cohorts of Veterans who have served in uniform between the 1960s and the 2020s. Both the table and the figure can provide information about the magnitude of disease in the cohorts, but the graphical display should help to demonstrate what the cohorts have in common and how the experience of the oldest Veterans—those who served in Vietnam—might foreshadow the experience of the other cohorts. Notwithstanding the recognition of the known different military environmental exposures, for example, herbicides in Vietnam, and open burn pits and airborne particulate matter exposures in Southwest Asia, and

acknowledged presumptions by regulation or law, we can observe similar patterns of disease.

Several of these diseases (anemia, arthritis, diabetes, thyroid disorders, hypertension, ischemic heart disease, other forms of heart disease, and hearing loss) show what appears to be an age-related decreased prevalence in pattern of disease across the deployment eras. A notable exception is the increased prevalence of PTSD, depression anxiety disorder, sleep apnea, and headache. The mental health diagnoses may be attributable to multiple effects, including the recognized challenges and documented stressors of the prolonged combat conflict in Southwest Asia. There has been over the course of the Post-9/11 conflict era significant commitment of resources to VA for identifying and treating mental health presentations. Concurrently both VA and DoD (and the wider mental health community) have worked toward destigmatization of mental health and treatment seeking for mental health symptoms. Earlier cohorts may have had more significant burden of mental health disorders which have ameliorated with treatment.

Headache diagnoses may be co-morbid effects of mental health disorders or may be related to other co-morbid conditions, including traumatic brain injury or other injury mechanisms. Increased attention to identifying and treating headache is an important treatment initiative within VA. Recognition of sleep apnea has been on the increase and may be related to a variety of other health conditions (PTSD, obesity, other respiratory conditions, and so forth). Recognized as an independent risk factor for other co-morbidities, identifying and treating sleep apnea is an important preventative intervention.

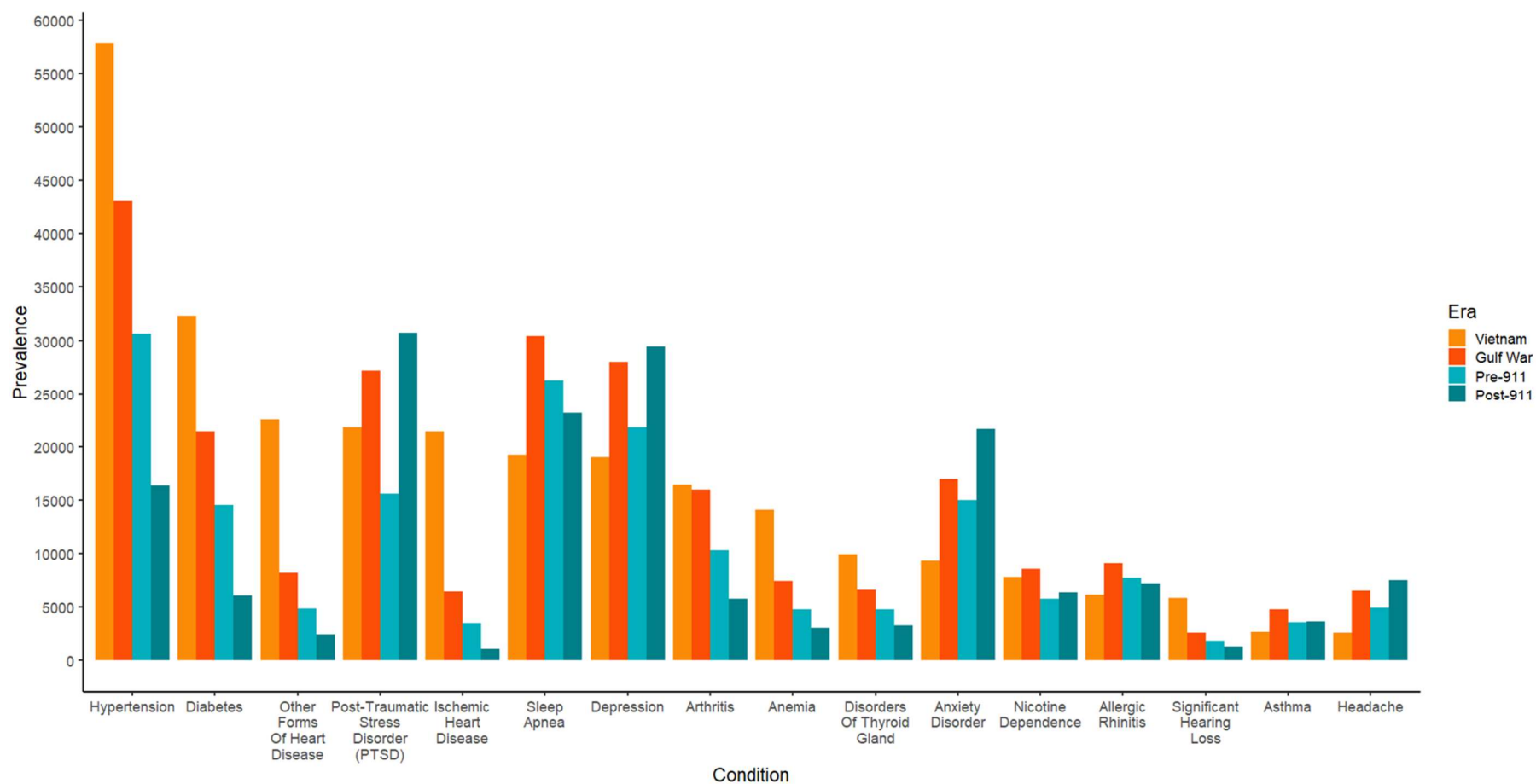


Figure 13. Histogram of prevalence of 16 diseases found across the 25 most prevalent diseases in all 4 deployed Veteran cohorts treated at VA medical facilities (Vietnam, 1990-91 Gulf War, Pre-9/11, Post-9/11). Prevalence is cases per 100,000 Veterans.

Table 6. Prevalence per 100,000 Veterans and 95% CL for Deployed Veterans by Conflict for Diseases Treated at VA. This table includes diseases present in the top 25 most prevalent conditions that are present across all cohorts, ordered by the magnitude of prevalence in the Vietnam Veterans.

Condition	Vietnam	Gulf War	Pre-9/11	Post-9/11
Hypertension	57,844 (57,786 – 57,902)	43,041 (42,920 – 43,162)	30,632 (30,502 – 30,762)	16,388 (16,349 – 16,427)
Diabetes	32,286 (32,231 – 32,341)	21,449 (21,349 – 21,549)	14,579 (14,480 – 14,678)	6,041 (6,016 – 6,066)
Other Forms of Heart Disease	22,559 (22,510 – 22,608)	8,185 (8,118 – 8,252)	4,845 (4,785 – 4,905)	2,458 (2,442 – 2,474)
PTSD	21,779 (21,731 – 21,827)	27,153 (27,044 – 27,262)	15,569 (15,467 – 15,671)	30,718 (30,669 – 30,767)
Ischemic Heart Disease	21,410 (21,362 – 21,458)	6,490 (6,430 – 6,550)	3,506 (3,454 – 3,558)	1,102 (1,091 – 1,113)
Sleep Apnea	19,211 (19,165 – 19,257)	30,405 (30,293 – 30,517)	26,255 (26,131 – 26,379)	23,166 (23,121 – 23,211)
Depression	18,982 (18,936 – 19,028)	27,968 (27,858 – 28,078)	21,789 (21,673 – 21,905)	29,449 (29,401 – 29,497)
Arthritis	16,446 (16,403 – 16,489)	15,952 (15,862 – 16,042)	10,302 (10,216 – 10,388)	5,796 (5,771 – 5,821)
Anemia	14,086 (14,045 – 14,127)	7,438 (7,374 – 7,502)	4,810 (4,750 – 4,870)	3,080 (3,062 – 3,098)
Disorders of Thyroid Gland	9,899 (9,864 – 9,934)	6,584 (9,864 – 9,934)	4,813 (4,753 – 4,873)	3,266 (3,247 – 3,285)
Anxiety Disorder	9,343 (9,309 - 9377)	16,979 (16,887 – 17,071)	14,974 (14,874 – 15,074)	21,651 (21,607 – 21,695)
Nicotine Dependence	7,792 (7,761 - 7823)	8,567 (8,499 – 8,635)	5,748 (5,682 – 5,814)	6,412 (6,386 – 6,438)
Allergic Rhinitis	6,119 (6,091 – 6,147)	9,132 (9,062 – 9,202)	7,709 (7,634 – 7,784)	7,183 (7,156 – 7,210)
Significant Hearing Loss	5,871 (5,843 – 5,899)	2,601 (2,562 – 2,640)	1,818 (1,780 – 1,856)	1,313 (1,301 – 1,325)
Asthma	2,705 (2,686 – 2,724)	4,803 (4,751 – 4,855)	3,595 (3,543 – 3,647)	3,636 (3,616 – 3,656)
Headache	2,569 (2,550 – 2,588)	6,501 (6,441 – 6,561)	4,928 (4,867 – 4,989)	7,530 (7,502 – 7,558)

Discussion

This report focused on four population cohorts: Vietnam War Era, 1990-1991 Gulf War Era, and the Pre- and Post-9/11 Eras. The results present surveillance of health care encounters to assess the conditions for which Veterans are seeking care so that we can better understand the population parameters of disease (prevalence and incidence proportion) in Veterans with a history of deployment related military environmental exposures during service in the largest DoD combat operations of the last 60 years. This study also included examination of Veterans with contemporaneous military service, but who did not have deployment to the conflict theaters. This extension allowed for comparison within service era cohorts to better understand the effects of deployment and associated potential toxic hazards.

Health surveillance using medical encounter data can provide insights into the health status of populations and allow for comparisons of population measures of disease. VA can examine health and illness within a population of deployed individuals to assess signals of increased disease occurrence, which may be attributable to military environmental exposures or other experiences associated with deployment. A surveillance report of this type can also allow for comparison across populations to assess patterns of disease, which may be expected as members of the population age or reveal unanticipated patterns which differ within or across populations, suggesting an area for further inquiry. The scientific validity of these data for drawing conclusions regarding associations between health conditions and military environmental exposures remains constrained by the absence of individual-level exposure assessments. To determine if deployment is associated with an increased risk of disease, comparisons between deployed and non-deployed Veterans of a given conflict cohort may provide insights into possible associations that can aid VA decision-making. For most historical cohorts, VA and DoD lack individual level data on specific exposures, so VA is limited in its ability to draw conclusions regarding associations between exposure and disease.

Surveillance of medical conditions in a designated population may have inherent biases for the VA health care system; these biases do not detract from the importance of the findings but must be acknowledged and assessed. VA beneficiary eligibility and the high quality of health care provided at VA means that eligible beneficiaries with disease are seeking services and are enumerated in our surveillance activities.

This report is unable to include data for those not seeking VA care and those who are healthy and do not require health care; it also does not include data for those who died without receiving care (although it does include data for Veterans VA treated who subsequently died, regardless of the cause of death). The results of VA surveillance provided in this report are important indicators regarding population parameters of those with disease states VA treated but does not reflect the experience of the entire population of Veterans. This limitation of incomplete population coverage is an important consideration when comparing VA's surveillance findings to other U.S. estimates of disease. These estimates by VA generally do not include the healthy Veteran population in the denominator (or universe of all Veterans) when calculating

estimates of disease incidence and prevalence, which may inflate these estimates. A well-designed epidemiological study that employs scientifically valid sampling and strategically controls for confounding variables can make estimates while limiting the effect of biases and confounding inherent in studies that use hospital-based records. Relying on electronic health care data likely represents a “worst case” scenario for estimating disease incidence and prevalence on the one-hand, while at the same time providing a systematic way of tracking diseases at the population level. The results of studies such as this allows for meaningful insights on trends of disease, which can be a useful resource for planning and policy development.

Surveillance of health care encounters, or treatment for disease, can provide insights to outcomes that may be associated with military environmental exposures. At the level of inquiry provided here, the evidence *may* point to differences in patterns of disease between deployed and non-deployed populations as well as across eras of service. As additional information on potential exposures becomes available and is incorporated with the VA health care data available for this report, the ability of these results to provide more detailed understanding of how some exposures or experiences affect health may be realized.

VA uses the Individual Longitudinal Exposure Record (ILER) for cohort inquiries and when the exposure data contained in ILER are categorized and analyzed, information from this source may be able to increase the detail available for assessing associations between military environmental exposure and disease. The functional capabilities designed into ILER for the retention and presentation of military environmental exposure data are poised to provide information DoD collects on potential exposures. As the quality of these data improve through DoD’s adoption of new and improved sampling and measurement tools, the capability of ILER to support inquiries found in this surveillance report will be enhanced.

This review observes the effect of the Coronavirus Disease 2019 (COVID-19) pandemic on health care utilization in 2020 and subsequent years. This study has not specifically sought to enumerate COVID-19 incidence in the deployment era cohorts under examination and there is no marked effect in disease that might be associated with sequela of infection. What is noticeable when examining some of the figures that display a graphical depiction of annual incidence is a slight dip in the year 2020. It is most noticeable in the presentation of chronic diseases and cancers, and most recognizable in the older populations. This likely reflects the decrease in health care utilization for non-emergent conditions in 2020 and the rapid response of VA in employing both telehealth access and a return to face-to-face interactions for Veterans and health care providers with minimal interruption of service.

Strengths

In conducting this type of health surveillance, VA has a tremendous advantage through access to an electronic health record that from the year 2000 forward provides computer readable files to ease analyses and discovery. DoD can provide computer readable records of Service members and Veterans who have served in discrete

operations; over the course of time, these files have been enhanced through efforts to provide better quality data. Note that the scope, quality, and availability of historical data will not match that of current data resources. The anticipation is that future data resources will offer even greater detail regarding military experiences.

Limitations

As noted, there are limitations inherent in the data available regarding individual exposure experiences. This has historically been among the most challenging aspects of military environmental epidemiology. The development of ILER will provide enhanced access to available information on potential exposures, although it may not be complete or sufficiently granular for individual exposure assessment in the near term. In the future, it will provide increased capabilities for surveillance activities and population researchers to discern potentially exposed from unexposed populations. There are also inherent limitations with some of these comparisons given the different sizes of the populations involved, the different time periods in which Veterans served, the different preventive or protective factors that may have been used, and countless other variables.

Conclusion

This report presents the surveillance results of treatment VA provided as required by section 502 of the PACT Act. The results demonstrate that VA is providing care for a range of diseases across the four cohorts included here, categorized generally into two theaters of combat operations: Vietnam and Southwest Asia between August 2, 1990, and November 30, 2022. There is a consistency in the most frequently treated diseases across the cohorts that may be influenced by factors including access to benefits for diseases covered by presumptions determined by law and others that are recognized as potential consequence of military experiences and combat related trauma. Mental health disorders are prevalent in both Veteran and non-Veteran populations, and VA has systems of care that prioritize case identification and treatment, so these findings are not surprising.

It is notable that chronic diseases of the circulatory system, especially hypertension, is common across cohorts. This finding may be influenced by recent definitional changes by the American Heart Association in 2017 that have lowered the threshold for diagnosis of hypertension. Additionally, this finding means that preventive measures can be employed in the context of the Veteran-provider relationship to ensure good management of hypertension to reduce the risk of developing known complications. Because hypertension is common across cohorts and is recognized as being a disease with multifactorial etiology, it may merit investigation in the future, but VA is unable to conclude there is an association between hypertension and military environmental exposures at this time.

VA continues to assess frequently treated diseases across cohorts and notes that examination of deployed cohorts can reveal patterns of disease which may be related to military environmental exposures. As noted in the pattern of hypertension incidence and

prevalence across the observed cohorts, there is a demonstrable age effect; higher average age of the deployment era cohort is associated with increased disease burden. There is also increased treatment for hypertension in the deployed Veterans in these two oldest cohorts, Vietnam War and 1990-1991 Gulf War, compared to the non-deployed.

A further important conclusion of this report is the consistency of diseases that are commonly treated across the four combat-deployed cohorts reported on here (Vietnam, 1990-1991 Gulf War, Pre-9/11, and Post-9/11). The inclusion of non-deployed peers as a comparison group demonstrates the extent to which the presentation of common diseases may not be an effect of deployment. In some comparisons the deployed experience higher prevalence for treatment, but this is not universally observed. In the absence of more detailed exposure information, additional comparisons to population-based samples of Veterans who are demographically similar but do not receive care at VA may be another assessment of military environmental exposures and the effect of selection into VA care.

With any study or report, it is important to interpret the results critically and exercise caution regarding generalization. The VA treatment-seeking population is unique, because access to care may be conditioned on history of service that resulted in injury or illness or is specific to having experienced potential hazards in high-risk settings such as combat deployments. The estimates for prevalence and incidence of disease based on VA hospital encounters may not be directly comparable to general population estimates, as these VA findings are based on hospital-based records, which likely do not include healthy members of the Veteran population, inflating the appearance of increased burden of illness. However, in combination with well-designed epidemiological studies and other data on Service member and Veteran health, these findings contribute to a fuller understanding of the potentially toxic effects of military environmental exposures.

Department of Veterans Affairs
July 2025