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Sepsis Hospitalizations Among Active Component Service Members, U.S. Armed Forces, 2011–2020

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The objective of this study was to assess the incidence and trends of sepsis hospitalizations in the active component U.S. military over the past decade. Between 1 January 2011 and 31 December 2020, there were 5,278 sepsis hospitalizations of any severity recorded among the active component. The overall incidence was 39.8 hospitalizations per 100,000 person-years (p-yrs). Annual incidence increased 64% from 2011 through 2019, then dropped considerably in 2020. Compared to their respective counterparts, rates were highest among female service members, the oldest and youngest age groups, and recruits. The gap in sepsis hospitalization rates between female and male service members increased over the surveillance period. Pneumonia was the most commonly co-occurring infection, followed by genitourinary infections. Among female service members, genitourinary infections were more commonly diagnosed compared to pneumonia. The most common non-infection co-occurring diagnoses were acute kidney failure and acute respiratory failure. This study demonstrates an apparent sex disparity in sepsis rates and further study is recommended to understand its cause.

WHAT ARE THE NEW FINDINGS?

Incidence of sepsis hospitalizations is increasing in the active component. The highest rates were seen in female service members, the oldest and youngest age groups, and recruits. The incidence rate gap between male and female service members increased over time. There was a sharp decline in sepsis diagnoses in 2020 during the COVID-19 pandemic.

WHAT IS THE IMPACT ON READINESS AND FORCE HEALTH PROTECTION?

Sepsis is a severe, life-threatening condition that poses an increasing risk to U.S. military members. It leads to long hospital stays and recovery periods and detracts from readiness and deployability. Sex disparities in sepsis rates highlight a women's force health protection issue that requires further investigation.

Sepsis is a life-threatening organ dysfunction caused by a dysregulated host response to infection.[1] Septic shock is a more severe manifestation of the same process with hypotension and inadequate tissue perfusion. Septicemia is an older term no longer in clinical use because it is nonspecific and blends the concepts of sepsis and bloodstream infection which are not necessarily synonymous.

The third international consensus definitions for sepsis and septic shock (Sepsis-3) were published in 2016.[1] Prior to this, the term sepsis was used for a dysregulated host response without organ dysfunction and severe sepsis was used if organ dysfunction was present. Sepsis-3, however, makes organ dysfunction a component of sepsis, thereby making severe sepsis a superfluous term. Severe sepsis is, however, still used in administrative coding practices.

Sepsis and septic shock are common causes of hospitalization, morbidity, and mortality requiring rapid, protocol-based treatment, usually with broad-spectrum empiric antibiotics. Understanding the epidemiology of sepsis and septic shock as well as the underlying infections and co-occurring conditions is vital for recognition of risk factors and implementation of appropriate empiric treatment protocols.

Recent studies have found 50 million cases of sepsis (of any severity) worldwide and over 1 million cases in the U.S. in 2017, among which 189,623 deaths occurred.[2] Despite evidence of increased incidence of sepsis in the general population, the current impact of this condition on the U.S. military is largely unknown. The only military surveillance study, published in 2013, reviewed the annual incidence of septicemia among active component service members for the years 2000 –2012.[3] This study found an overall incidence of 13.2 cases per 100,000 p-yrs. Incident cases increased dramatically over the surveillance period, in particular from 2004 through 2012 when there was a 570% increase in the annual incidence rate of septicemia as a primary diagnosis, likely attributable to changes in definitions and coding practices.[3] In addition, there were differences in sepsis rates between demographic groups, with higher overall rates of septicemia in female compared to male service members, the youngest and oldest individuals (age <20 and 45+) compared to those aged 20–44, Marines compared to members of other services, recruits in basic training compared to non-recruits, junior enlisted compared to senior enlisted service members, and senior officers compared to junior officers.[3]

In addition to changes in clinical definitions and criteria, the Military Healthcare System (MHS) transitioned from using the 9th revision of the International Classification of Diseases (ICD-9) to the 10th revision (ICD-10) for coding purposes in October 2015. ICD-10 did not include septicemia, but added more specific codes which include the causative organisms (when known). In light of major

substantive changes to the definition of sepsis, both clinical and administrative, updated surveillance data on the impact of sepsis on the U.S. military are needed. This report summarizes the frequencies, rates, and trends of incident diagnoses of septicemia, sepsis, severe sepsis, and septic shock among members of the active component of the U.S. Armed Forces over the past decade. It also describes frequencies of diagnoses of sepsis, infectious agents, and co-occurring conditions during hospitalizations with incident diagnoses of septicemia, sepsis, severe sepsis, and septic shock.

METHODS

This study included all U.S. Army, Air Force, Navy, and Marine Corps members who served in the active component at any time between 1 January 2011 and 31 December 2020. All data used in this analysis were derived from the Defense Medical Surveillance System (DMSS), which maintains electronic records of all actively serving U.S. military members' hospitalizations and ambulatory visits in U.S. military and civilian (contracted/purchased care through the MHS) medical facilities worldwide. Defense Manpower Data Center (DMDC) Contingency Tracking System (CTS) records for service member deployments are also maintained in the DMSS, which include the dates and countries of deployment.

Several studies have attempted to validate and optimize case definitions for sepsis using ICD-10 data, and have recommended using broad search criteria.[4,5] In this study, incident sepsis cases of any severity (i.e., septicemia, sepsis, severe sepsis, or septic shock) were identified from records of hospitalizations that included any diagnostic codes (ICD-9 and ICD-10) specific for these conditions **(Table 1)**. Cases from hospitalization records were included if they had any of these codes recorded in any diagnostic position. An individual could account for multiple incident cases if there were more than 14 days between the dates of consecutive incident case-defining encounters. Co-occurring conditions were identified by ICD-9 and ICD-10 codes from the incident hospitalizations with a concurrent sepsis-related code.

Data were obtained from DMSS for 9 covariates: age group, race/ethnicity group, sex, branch of service, rank, geographic region, deployed status, recruit status, and military occupation. An Armed Forces Health Surveillance Division algorithm based on age, rank, duty location, and time since entry into military service was used to determine recruit basic training status. Deployed status was defined as being currently deployed on the date of diagnosis or deployed within the past 30 days to any known location (deployments to unknown locations or bodies of water were excluded).

Incidence rates were calculated as incident cases per 100,000 p-yrs. Overall incidence rates as well as rates stratified by covariates were calculated for both the total surveillance period and for each calendar year of surveillance. For the purpose of describing frequencies of diagnoses for sepsis, infections, and co-occurring conditions, ICD-9 and ICD-10 codes were placed in three categories: 1) sepsis codes which included all case-defining codes in **Table 1**; 2) infection codes which included codes for co-occurring infections; and 3) co-occurring diagnoses which included other codes that do not fit into the other 2 categories and could represent risk factors for sepsis, sequelae from sepsis, or be unrelated to sepsis. Based on clinical experience some codes which did not specify an infection were included in the infection codes category because they are potentially causal for sepsis (e.g., acute pancreatitis, non-infective gastroenteritis and colitis). All analyses were performed using SAS/STAT software, version 9.4 (2014, SAS Institute, Cary, NC).

TABLE 1. Case-defining ICD codes for sepsis

ICD-9	Description
003.1	*Salmonella* septicemia
022.3	Anthrax septicemia
038*	Septicemia
995.91	Sepsis
995.92	Severe sepsis
785.52	Septic shock
998.02	Postoperative septic shock
670.2*	Puerperal sepsis
ICD-10	**Description**
A02.1	*Salmonella* sepsis
A22.7	Anthrax sepsis
A26.7	*Erysipelothrix* sepsis
A32.7	*Listeria* sepsis
A40*	Streptococcal sepsis
A41*	Other sepsis
A42.7	Actinomycotic sepsis
A54.86	Gonococcal sepsis
B37.7	*Candida* sepsis
O03.*	Sepsis following spontaneous abortion
O04.87	Sepsis following induced termination of pregnancy
O07.37	Sepsis following failed attempted termination of pregnancy
O08.82	Sepsis following ectopic and molar pregnancy
O85	Puerperal sepsis
O86.04	Sepsis following an obstetric procedure
R65.2*	Severe sepsis
T81.12*	Postprocedural septic shock

[a]An asterisk (*) indicates that any subsequent digit/character is included.
ICD, International Classification of Diseases.

RESULTS

Overall, there were a total of 5,278 incident hospitalizations with any sepsis diagnosis (i.e., sepsis, severe sepsis, septic shock, septicemia) during the study period **(Table 2)**. These 5,278 hospitalizations occurred among 5,039 unique individuals. A total of 4,842 service members had 1 hospitalization during the study period, and 197 service members had 2 or more hospitalizations **(Table 3)**. Service members who had multiple hospitalizations during the study period were more likely to be male (84.3%) and older (39.6% aged 35 or older), compared to those with only 1 hospitalization during the study period (74.2% male and 24.4% aged 35 or older).

The crude overall incidence of sepsis hospitalization was 39.8 cases per 100,000 p-yrs and there was a 64% increase in annual rates from 2011 through 2019 (31.1 cases to 51.0 cases per 100,000 p-yrs, respectively). In 2020, the crude incidence

of sepsis declined to 42.0 cases per 100,000 p-yrs **(data not shown)**.

Incidence was higher among female than male service members (63.4 vs 35.4 cases per 100,000 p-yrs, respectively; incidence rate ratio [IRR]=1.8). The incidence of sepsis among male service members was relatively consistent over time, while that among female service members showed an increasing trend, peaking in 2019 at a rate of 91.8 cases per 100,000 p-yrs **(Figure 1)**. Overall incidence was highest among those under 20 years old (63.1 cases per 100,000 p-yrs) and older than 45 years (70.2 cases per 100,000 p-yrs) compared to those aged 20 –45. There were no pronounced differences in overall incidence rates of sepsis diagnoses between race/ethnicity groups.

Marines had a higher overall incidence compared to their counterparts in the Army, Navy, or Air Force **(Table 2)**. This was primarily due to higher annual incidence in Marines from 2011 through 2013. After 2013, annual rates were similar and stable among the branches, except for 2019 when Marines again had a higher rate **(Figure 2)**. Recruits had nearly double the overall incidence of non-recruit active component members (72.6 vs 39.1 cases per 100,000 p-yrs, respectively, IRR=1.9). Junior officers had the lowest overall rate of incident sepsis diagnoses. Pilots and air crew had the lowest overall incidence rate of sepsis compared to other occupations, while health care workers had the highest.

Among active component service members stationed within the continental U.S., those in the Northeast had lower overall rates compared to the Midwest, South, and West. Service members stationed overseas had considerably lower rates than those in any continental U.S. regions. Deployed or recently deployed service members had a lower overall incidence rate than those who were non-deployed.

Case-defining codes

The most frequent case-defining ICD-9 diagnoses **(Table 4)** were unspecified septicemia and sepsis, followed by severe sepsis and septic shock. Combination codes containing specific infectious organisms were used infrequently. The most frequent case-defining ICD-10 diagnoses were sepsis of unspecified organism, severe sepsis without shock, severe sepsis with shock, and other specified sepsis. Combination ICD-10 codes were also used infrequently.

Among all sepsis combination codes, *Escherichia coli* (*E. coli*) was used most frequently under both ICD-9 and ICD-10, followed by *Streptococcus*, methicillin susceptible *Staphylococcus aureus* (MSSA), and unspecified gram-negative organisms under ICD-9, and MSSA and puerperal sepsis under ICD-10.

Infections

The most common co-occurring infections based on ICD-9 codes were pneumonia with unspecified organism, unspecified pyelonephritis, urinary tract infection, postoperative infection, and cellulitis of the leg **(Table 5)**. Based on ICD-10 codes, the most frequent infections were pneumonia from unspecified organism, acute tubulo-interstitial nephritis, unspecified urinary tract infection, unspecified *E. coli* infection, and unspecified tubulo-interstitial nephritis. While pneumonia was commonly diagnosed in both male and female service members, urinary tract infections, pyelonephritis, and pyonephrosis were much more frequently seen in female service members whereas cellulitis was much more common in males. Some codes such as puerperal sepsis were only applicable to female service members, although these accounted for a small proportion of sepsis codes in female service members. Pneumonia was by far the most frequently diagnosed infection in both recruits and non-recruits. Codes for cellulitis were more frequently documented in recruits than non-recruits, while pyelonephritis and urinary tract infections were more frequently documented in non-recruits **(data not shown)**.

Co-occurring diagnoses

The most frequent co-occurring diagnoses other than infections based on ICD-9 codes were unspecified acute kidney failure, acute respiratory failure, tobacco use disorder, hypoosmolality and/or hyponatremia, and hypopotassemia **(Table 6)**. Under ICD-10, the most frequent co-occurring diagnoses were unspecified acute kidney failure,

TABLE 2. Rate of sepsis hospitalizations, active component, U.S. Armed Forces, 2011–2020

	No.	Rate[a]
Total	5,278	39.8
Sex		
Male	3,963	35.4
Female	1,315	63.4
Age group (years)		
<20	553	63.1
20–24	1,614	38.3
25–29	1,020	32.2
30–34	724	34.1
35–39	603	39.5
40–44	411	47.5
45+	353	70.2
Race/ethnicity group		
Non-Hispanic White	3,092	40.0
Non-Hispanic Black	810	38.0
Hispanic	760	39.7
Other/unknown	616	41.2
Service		
Army	1,933	38.9
Navy	1,157	36.0
Air Force	1,236	38.5
Marine Corps	952	50.7
Recruit		
Yes	205	72.6
No	5,073	39.1
Rank		
Junior enlisted (E1–E4)	2,534	44.2
Senior enlisted (E5–E9)	2,051	39.4
Junior officer (O1–O3; W01–W03)	334	23.1
Senior officer (O4–O10; W04–W05)	359	40.5
Military occupation		
Combat-specific[b]	730	38.4
Motor transport	163	42.2
Pilot/air crew	119	24.1
Repair/engineering	1,387	35.5
Communications/ intelligence	1,164	40.3
Health care	547	46.7
Other/unknown	1,168	46.2
Region of assignment		
Northeast	145	40.1
Midwest	415	52.7
South	2,528	44.9
West	1,411	45.3
Overseas	431	20.5
Unknown/missing	348	27.4
Deployed		
Yes	136	19.2
No	5,142	40.9

ED, emergency department; No., number.
[a]Rate per 100,000 person-years.
[b]Infantry/artillery/combat engineering/armor.

acute respiratory failure with hypoxia, hypo-osmolality and hyponatremia, hypokalemia, and dehydration. Male and female service members had similar co-occurring diagnoses, though respiratory failure and tobacco use disorder were less frequently diagnosed in female service members **(data not shown)**.

EDITORIAL COMMENT

Overall, annual sepsis rates increased between 1 January 2011 and 31 December 2020, with the exception of a sharp decrease in 2020. The highest overall rates were seen among female service members, the oldest and youngest age groups, and recruits. The incidence rate gap between male and female service members widened over the surveillance period. Overall, pneumonia was the most commonly coded co-occurring infection, followed by various infections of the urinary tract with genitourinary infections being more common in female service members and pneumonia and cellulitis more common in male service members. Various codes for pneumonia, followed by cellulitis, made up the majority of coded infections among recruits, with very few genitourinary infections. The most common co-occurring diagnoses were acute kidney failure and acute respiratory failure.

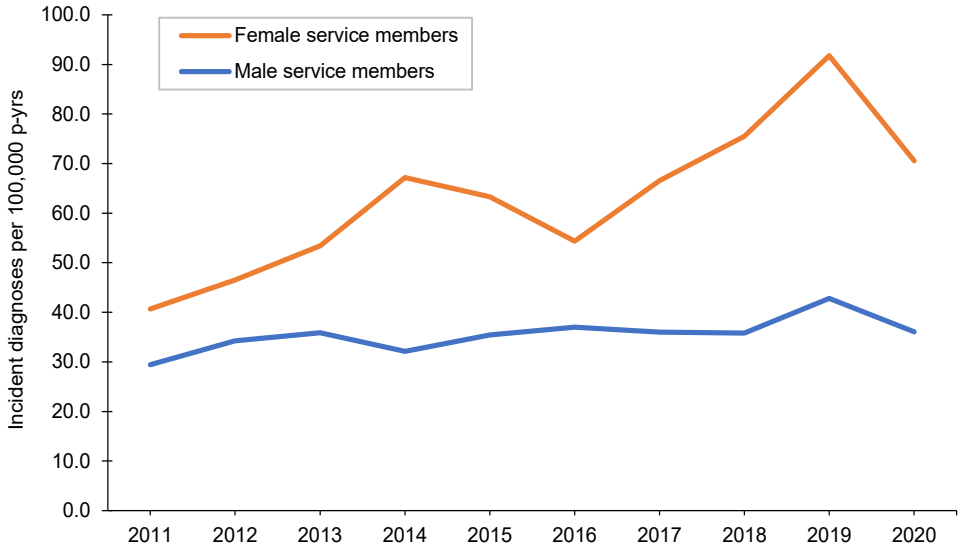
Studies using administrative data to assess the incidence of sepsis in the general U.S. population have produced results that have varied widely depending on the spectrum of sepsis evaluated (e.g., all sepsis vs only severe sepsis) and the coding case definition used.[6] Reported sepsis rates in the U.S. are higher than active component rates (U.S. in 2017 had 254.9 cases per 100,000 population compared to 39.8 per 100,000 p-yrs in the active component), though the results are not directly comparable because of significant demographic differences between the general U.S. and military populations.[2] Despite the varying results in the overall annual rates, U.S. population-based studies did show consistent findings in certain demographic groups. They consistently show higher rates of sepsis among males, which is the inverse of this study's

TABLE 3. Number of individuals who had one or multiple sepsis hospitalizations, active component, 2011–2020

	One hospitalization		Two or more hospitalizations[a]	
	No.	%	No.	%
Total	4,842	100.0	197	100.0
Sex				
Male	3,595	74.2	166	84.3
Female	1,247	25.8	31	15.7
Age group (years)				
<20	536	11.1	9	4.6
20–24	1,530	31.6	40	20.3
25–29	942	19.5	34	17.3
30–34	652	13.5	36	18.3
35–39	522	10.8	34	17.3
40–44	364	7.5	20	10.2
45+	296	6.1	24	12.2
Race/ethnicity group				
Non-Hispanic White	2,837	58.6	116	58.9
Non-Hispanic Black	761	15.7	23	11.7
Hispanic	688	14.2	31	15.7
Other/unknown	556	11.5	27	13.7
Service				
Army	1,757	36.3	81	41.1
Navy	1,054	21.8	46	23.4
Air Force	1,131	23.4	47	23.9
Marine Corps	900	18.6	23	11.7
Recruit				
Yes	198	4.1	5	2.5
No	4,644	95.9	192	97.5
Rank				
Junior enlisted (E1–E4)	2,404	49.6	63	32.0
Senior enlisted (E5–E9)	1,821	37.6	102	51.8
Junior officer (O1–O3; W01–W03)	303	6.3	14	7.1
Senior officer (O4–O10; W04–W05)	314	6.5	18	9.1
Military occupation				
Combat-specific[b]	664	13.7	28	14.2
Motor transport	148	3.1	7	3.6
Pilot/air crew	104	2.1	7	3.6
Repair/engineering	1,279	26.4	48	24.4
Communications/intelligence	1,072	22.1	42	21.3
Health care	489	10.1	26	13.2
Other/unknown	1,086	22.4	39	19.8
Region of assignment				
Northeast	131	2.7	6	3.0
Midwest	368	7.6	17	8.6
South	2,329	48.1	90	45.7
West	1,275	26.3	58	29.4
Overseas	409	8.4	15	7.6
Unknown/missing	330	6.8	11	5.6
Deployed				
Yes	130	2.7	4	2.0
No	4,712	97.3	193	98.0

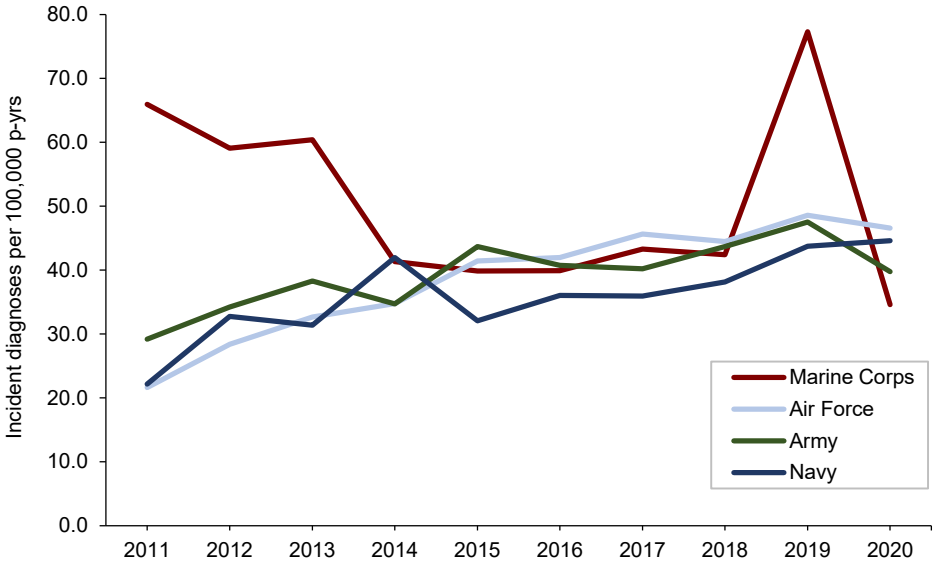
[a]Demographic/military characteristics measured at the time of the first hospitalization admission.
[b]Infantry/artillery/combat engineering/armor.

FIGURE 1. Annual sepsis hospitalization incidence, by sex, active component, U.S. Armed Forces, 2011–2020



P-yrs, person-years.

FIGURE 2. Annual sepsis hospitalization incidence by service branch, active component, U.S. Armed Forces, 2011–2020



P-yrs, person-years.

findings in the active component. The reasons for this difference are unknown, but this trend has persisted since 2006 and deserves further study.[3] Infections that are specific to female service members such as pregnancy-related infections were seen, but in relatively small numbers. Another major difference seen in this study was the lack of racial disparities with regards to sepsis incidence. In contrast, U.S. population-based studies have consistently reported higher sepsis rates among non-Hispanic Blacks compared to non-Hispanic Whites. One possible explanation for this difference is universal health coverage and access to care among the active component population. Additionally, some underlying risk factors for more severe infections such as diabetes mellitus and chronic lung disease, which disproportionately affect the American Indian/Alaska Native, non-Hispanic Black and Hispanic communities, are less prevalent in the active component than in the U.S. civilian population.[7]

There are several major challenges in current epidemiological surveillance of sepsis, particularly stemming from changing clinical definitions and coding practices, in addition to the lack of universal acceptance of any specific set of definitions. Sepsis-3 moved away from using systemic inflammatory response syndrome (SIRS) criteria and began using the more comprehensive sequential organ failure assessment (SOFA) score, but there is still no specific diagnostic definition nor any specific laboratory test that universally confirms the diagnosis of sepsis.[8] Likely due to this study's broad case definition, there were no drastic changes in sepsis rates between 2015 and 2016 despite the new clinical definitions and ICD-10 turnover around that time. For cases prior to the transition to ICD-10, ICD-9 codes consistent with septicemia, sepsis, or septic shock were used, but codes for bacteremia or other infection which did not imply sepsis were omitted, which explains the slight difference in ICD-9 codes used here compared to prior articles looking at active component military members.

Use of coding data for sepsis, where there are no clear diagnostic criteria, has inherent potential for misclassification bias. Because there is clinical variability in the diagnosis, there is also potential for different diagnostic patterns from different medical specialties which could have a differential impact. For example, if obstetricians were more likely than internal medicine physicians to diagnose patients under their care with sepsis, this could impact the apparent difference in incidence between male and female service members. This study did not evaluate underlying risk factors unless they were coded during the same encounter. There also is potential for confounding between covariates such as race/ethnicity outcomes being attenuated by occupation or branch of service (or vice versa).

TABLE 4. Frequency distribution of case-defining ICD codes for sepsis among hospitalized members of active component, U.S, Armed Forces, 2011–2020

ICD-9	Description	No.	ICD-10	Description	No.
389	Unspecified septicemia	1,568	A419	Sepsis, unspecified organism	2,040
99591	Sepsis	1,536	R6520	Severe sepsis without septic shock	316
99592	Severe sepsis	474	R6521	Severe sepsis with septic shock	308
78552	Septic shock	266	A4189	Other specified sepsis	243
3842	Septicemia due to *Escherichia coli* (*E. coli)*	115	A4151	Sepsis due to *E. coli*	139
380	Streptococcal septicemia	96	A4101	Sepsis due to Methicillin susceptible *S. aureus*	73
3811	Methicillin susceptible *Staphylococcus aureus (S. aureus)* septicemia	77	O85	Puerperal sepsis	68
3849	Other septicemia due to gram-negative organisms	76	A400	Sepsis due to *streptococcus*, group A	47
388	Other specified septicemias	59	A4102	Sepsis due to Methicillin resistant *S. aureus*	35
3812	Methicillin resistant *S. aureus* septicemia	62	A4159	Other Gram-negative sepsis	32

ICD, International Classification of Diseases; No., number.

TABLE 5. Frequency distribution of co-occurring infections among hospitalized cases of sepsis, active component, U.S, Armed Forces, 2011–2020

ICD-9	Description	No.	ICD-10	Description	No.
486	Pneumonia, organism unspecified	493	J189	Pneumonia, unspecified organism	420
59080	Pyelonephritis, unspecified	129	N10	Acute tubulo-interstitial nephritis	166
5990	Urinary tract infection, site not specified	128	N390	Urinary tract infection, site not specified	161
99859	Other postoperative infection	124	B9620	Unspecified *Escherichia coli* as the cause of diseases classified elsewhere	104
6826	Cellulitis and abscess of leg, except foot	102	N12	Tubulo-interstitial nephritis, not specified as acute or chronic	104
59010	Acute pyelonephritis without lesion of renal medullary necrosis	66	Z20828	Contact with and (suspected) exposure to other viral communicable diseases	89
5770	Acute pancreatitis	55	T814XXA	Infection following a procedure, initial encounter	87
845	Intestinal infection due to *Clostridium difficile*	54	L03115	Cellulitis of right lower limb	75
481	Pneumococcal pneumonia (*Streptococcus pneumoniae pneumonia*)	52	J181	Lobar pneumonia, unspecified organism	69
6823	Cellulitis and abscess of upper arm and forearm	49	B9689	Other specified bacterial agents as the cause of diseases classified elsewhere	60

ICD, International Classification of Diseases; No., number.

TABLE 6. Frequency distribution of other co-occurring diagnoses of non-infectious conditions among hospitalized cases of sepsis, active component, U.S, Armed Forces, 2011–2020

ICD-9	Description	No.	ICD-10	Description	No.
5849	Acute kidney failure, unspecified	349	N179	Acute kidney failure, unspecified	509
51881	Acute respiratory failure	272	J9601	Acute respiratory failure with hypoxia	360
3051	Tobacco use disorder	262	E871	Hypo-osmolality and hyponatremia	345
2761	Hypo-osmolality and/or hyponatremia	205	E876	Hypokalemia	297
2768	Hypopotassemia	177	E860	Dehydration	263
27651	Dehydration	158	E872	Acidosis	240
5119	Unspecified pleural effusion	147	D649	Anemia, unspecified	176
2859	Anemia, unspecified	137	I10	Essential (primary) hypertension	170
2762	Acidosis	118	F17210	Nicotine dependence, cigarettes, uncomplicated	164
4019	Unspecified essential hypertension	117	Z87891	Personal history of nicotine dependence	126

ICD, International Classification of Diseases; No., number.

The findings of this study suggest that sepsis is an increasing threat to force health protection and is a growing women's health threat as well. Further research is required to evaluate key findings, especially the apparent sex disparity in sepsis rates in the active component which is the inverse of the pattern in the general U.S. population. Such future research should also include adjusted (e.g., age, sex) rates. Studies using clinical and microbiological data would be useful to better understand this growing threat. Additionally, looking into the reasons behind the decline in sepsis diagnoses in 2020 during the COVID-19 pandemic is important. Changes in health care-seeking behavior may play a role, although how much this would be the case for a life-threatening condition like sepsis is unknown. It is possible that mitigation measures put in place during the pandemic impacted the overall incidence of sepsis by decreasing other infections, especially other respiratory diseases. For example, smaller numbers of recruits, restriction of movement procedures, and enforced social distancing during recruit training may have played a role, and if so could provide valuable information to help structure recruit training in the future in a way that minimizes unnecessary infection risk.

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REFERENCES

1. Singer M, Deutschman CS, Seymour CW, et al. The Third International Consensus definitions for sepsis and septic shock (Sepsis-3). *JAMA*. 2016;315(8):801–810.
2. Rudd KE, Johnson SC, Agesa KM, et al. Global, regional, and national sepsis incidence and mortality, 1990–2017: analysis for the Global Burden of Disease Study. *Lancet*. 2020;395(10219):200–211.
3. Septicemia diagnosed during hospitalizations, active component service members, U.S. Armed Forces, 2000–2012. *MSMR*. 2013;20(8):10–16.
4. Jolley RJ, Quan H, Jetté N, et al. Validation and optimisation of an ICD-10-coded case definition for sepsis using administrative health data. *BMJ Open*. 2015;5(12):e009487.
5. Jolley RJ, Sawka KJ, Yergens DW, Quan H, Jetté N, Doig CJ. Validity of administrative data in recording sepsis: a systematic review. *Crit Care*. 2015;19(1):139.
6. Kempker JA, Martin GS. The changing epidemiology and definitions of sepsis. *Clin Chest Med*. 2016;37(2):165–179.
7. Williams VF, Oh G, Stahlman S, Shell D. Diabetes mellitus and gestational diabetes, active and reserve component service members and dependents, 2008–2018. *MSMR*. 2020;27(2):8–17.
8. Centers for Disease Control and Prevention. Hospital toolkit for adult sepsis surveillance. Published March 2018. Accessed 16 July 2021. https://www.cdc.gov/sepsis/pdfs/Sepsis-Surveillance-Toolkit-Mar-2018_508.pdf

Brief Report

Prevalence of Hepatitis C Virus Infections in U.S. Air Force Basic Military Trainees Who Donated Blood, 2017–2020

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Chronic infection with hepatitis C virus (HCV) can cause significant morbidity to individuals due to inflammatory damage to the liver. This chronic inflammatory damage can lead to further complications, including cirrhosis, hepatocellular carcinoma, and fulminant liver failure. In the military, HCV presents a concern for fitness for duty, readiness, and health care costs of its members.

In the U.S., prevalence of chronic HCV infection is approximately 1%.[1] From 2010–2019, estimated annual acute HCV incidence increased 387%[2]; increased detection was driven at least in part by improved and expanded testing recommendations as well as increased injection drug use within the opioid abuse epidemic.[3,4] During this timeframe, the majority of new HCV infections occurred in those aged 20–39 (which approximates the ages of those joining the military).[2]

In 2020, the American Association for the Study of Liver Diseases (AASLD),[5] U.S. Preventive Services Task Force (USPSTF),[6] and Centers for Disease Control and Prevention (CDC)[7] expanded recommendations for HCV infection screening to include all adults age 18 years or older (and for all pregnant women during each pregnancy) because of cost effectiveness, limited success of risk-based screening, and availability of curative treatment.

Active HCV infection disqualifies an individual from military accession because its proper clinical management conflicts with initial training and mission readiness. Three disqualifying criteria for active or recent HCV infection include: history of chronic HCV without successful treatment or without documentation of cure 12 months after completion of a full course of therapy; acute infection within the preceding 6 months; or persistence of symptoms or evidence of impaired liver function. Force screening for HCV is not currently performed during U.S. Air Force (USAF) Basic Military Training (BMT) although screening is completed for other viral infections (including HIV, hepatitis A, and hepatitis B). As a result, the true prevalence of chronic HCV infection cannot be ascertained in the basic trainee population. However, the prevalence can be estimated based on the number of HCV infections confirmed following positive screening during trainee blood donations.

Trainees voluntarily donate blood near the end of BMT and are thus able to donate only once while at BMT. Concurrent testing for HCV antibody and HCV RNA occurs at the time of blood donation. If a trainee's blood tests positive for HCV antibody but negative for HCV RNA, a third generation enzyme immunoassay (EIA) is used for confirmation. A positive test for HCV antibody in addition to either a positive HCV RNA or EIA test indicates active infection. Alternatively, a positive HCV antibody test in an individual with negative RNA and EIA tests typically denotes a cleared infection.

From November 2013 through April 2016, the estimated prevalence of HCV infection among volunteer recruit blood donors at Joint Base San Antonio (JBSA)-Lackland Blood Donor Center was 0.007%.[8] The goal of this inquiry was to estimate the most recent prevalence of HCV infections within the USAF basic training population during 2017–2020.

METHODS

The JBSA-Lackland Blood Donor Center was queried for the results of HCV screening for all basic military trainees who donated blood between 1 January 2017 and 31 December 2020. All other blood donations (those from individuals other than basic trainees) during this time period were excluded. HCV prevalence in those who donated blood was calculated using the total trainee donations as the denominator. Since trainees are only able to donate once before departing BMT, these donations represent unique trainees. The numerator included those who screened positive upon donation and were also confirmed to have active infection upon subsequent testing. Positive HCV cases were ascertained from a local database, which included demographic, diagnostic, and laboratory data for all USAF recruits, maintained by Trainee Health Surveillance. This database was queried for International Classification of Diseases, 10th Revision (ICD-10) diagnostic codes K70–K77 (diseases of the liver) and B15–B19 (viral hepatitis); the codes for all hepatitides were initially utilized so as to conduct a wide search in case of coding errors. A possible case was defined as a trainee receiving a qualifying ICD-10 code in any diagnostic position during an outpatient medical encounter and was restricted to 1 case per person during the surveillance period. The electronic medical records of possible cases were reviewed and those diagnosed with current HCV infection due to blood screening from BMT blood donation were counted as true cases. Such screened positive BMT cases were confirmed by comparing them to those reported by the Blood Donation Center. The Fisher's exact test for count data was used to compare the prevalence computed for the period from 2017 through 2020 to the prevalence during the period from 2013 through 2016.

RESULTS

From 2017 through 2020, 29,615 unique individual trainees from USAF BMT donated blood (out of 146,325 total trainees attending BMT during that time) and had their blood donations screened for HCV. From this group, a total of 85 individuals screened positive for HCV antibodies; of these, 6 were confirmed to be positive for active HCV infection (positive HCV RNA or EIA) **(Table)**. The prevalence of HCV in those BMT trainees who were screened from 2017 through 2020 was 0.0203% (6 of 29,615 screened) **(data not shown)**, which is 3.1 times (p=.173) the prevalence of HCV infection in this population during 2013–2016 (0.0065%, 2 of 30,660 screened).[8] Of note, during 2017–2020, one additional case of HCV in BMT was diagnosed clinically based on symptoms; however, this case was excluded in the prevalence calculation because it was not from a blood donation.

TABLE. Demographics and disposition of the 6 confirmed HCV cases identified through blood donation screening at Air Force Basic Military Training, 2017–2020

Sex	Age	USAF component	Disposition
Male	18	Active	Separated
Male	32	Active	Separated
Male	21	Active	Separated
Male	25	Active	Separated
Male	25	Active	Separated
Female	31	Air National Guard	Separated

HCV, hepatitis C virus.

EDITORIAL COMMENT

The prevalence of HCV infection in BMT trainee blood donors from 2017 through 2020 was 3.1 times the prevalence among trainees who donated from 2013 through 2016.[8] While the difference in prevalence was not statistically significant (p=.173), it may reflect the recent increases in incidence among U.S. young adults, as noted by the CDC,[2] perhaps due to increased injection drug use.[3,4]

This study is limited in that the screened blood came from only those trainees attempting to donate blood, so the data do not directly estimate HCV prevalence for all trainees as would be the case from a random sample of the entire BMT trainee population. If the prevalence in blood donors reflected that in basic trainees overall, there would have been approximately 30 active HCV infections among basic trainees during the 4 year period; and of these, only approximately 20% were detected through blood donor screening.

Instituting accession-wide HCV screening at USAF BMT by adding it to the current lab evaluation would be an efficient method of ensuring that all new USAF enlisted service members are up to date on this screening as recommended by USPSTF, CDC, and AASLD.

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REFERENCES

1. Hofmeister MG, Rosenthal EM, Barker LK, et al. Estimating prevalence of hepatitis C virus infection in the United States, 2013–2016. *Hepatology*. 2019;69(3):1020–1031.
2. Centers for Disease Control and Prevention. 2019 Viral Hepatitis Surveillance Report-Hepatitis C. Published July 2021. Accessed 9 August 2021. https://www.cdc.gov/hepatitis/statistics/2019surveillance/HepC.htm
3. Zibbell JE, Asher AK, Patel RC, et al. Increases in acute hepatitis C virus infection related to a growing opioid epidemic and associated injection drug use, United States, 2004 to 2014. *Am J Public Health*. 2018;108(2):175–181.
4. Suryaprasad AG, White JZ, Xu F, et al. Emerging epidemic of hepatitis C virus infections among young nonurban persons who inject drugs in the United States, 2006-2012. *Clin Infect Dis*. 2014;59(10):1411–1419.
5. Ghany MG, Morgan TR; AASLD-IDSA Hepatitis C Guidance Panel. Hepatitis C Guidance 2019 Update: American Association for the Study of Liver Diseases – Infectious Diseases Society of America recommendations for testing, managing, and treating hepatitis C virus infection. *Hepatology*. 2020;71(2):686–721.
6. US Preventive Services Task Force; Owens DK, Davidson KW, et al. Screening for hepatitis C virus infection in adolescents and adults: US Preventive Services Task Force Recommendation Statement. *JAMA*. 2020;323(10):970–975.
7. Schillie S, Wester C, Osborne M, Wesolowski L, Ryerson AB. CDC Recommendations for hepatitis C screening among adults - United States, 2020. *MMWR Recomm Rep*. 2020;69(2):1–17.
8. Taylor DF, Cho RS, Okulicz JF, Webber BJ, Gancayco JG. Brief report: Prevalence of hepatitis B and C virus infections in U.S. Air Force basic military trainees who donated blood, 2013-2016. *MSMR*. 2017;24(12):20–22.

Update: Plant Dermatitis Among Active Component Service Members, U.S. Armed Forces, 2010–2020

Denise O. Daniele, MS; Stephen B. Taubman, PhD

Dermatitis (skin inflammation) caused by the oil of poisonous plants is an occupational hazard for U.S. military members who are assigned and train in endemic areas. Plant dermatitis can cause significant disability, substantial medical costs, and lost duty time. During the 11-year surveillance period there were 73,725 cases of plant dermatitis diagnosed in active component service members (rate: 5.3 per 1,000 person-years [p-yrs]). The overall incidence rates remained relatively stable between 2010 and 2015, increased in 2016 and 2017, then decreased in 2018 through 2020. Compared to their respective counterparts, incidence rates were highest among male service members (5.7 per 1,000 p-yrs), the youngest (<20 years) service members (8.4 per 1,000 p-yrs), non-Hispanic White service members (7.5 per 1,000 p-yrs), members of the Army (7.7 per 1,000 p-yrs) and Marine Corps (6.5 per 1,000 p-yrs), and among those in combat-related occupations (11.9 per 1,000 p-yrs). More than half of the cases occurred during summer months and about one-third of all cases were diagnosed at 4 installations: Fort Benning, Georgia (n=11,257); Camp Pendleton, CA (n=5,399); Fort Bragg, NC (n=4,259), and Fort Campbell, KY (n=3,221). Service members, particularly young individuals in combat-training in endemic states, should be informed of the risks associated with exposures to toxic plants and advised on personal protective measures.

WHAT ARE THE NEW FINDINGS?

The incidence of plant dermatitis among active component service members remained stable between 2010 and 2015, increased in 2016 and 2017, and then decreased from 2018 through 2020. The highest rates were seen among male and non-Hispanic White service members, those in the youngest and oldest age groups, and those in combat-related occupations. Most cases occurred in the summer months and at combat training installations.

WHAT IS THE IMPACT ON READINESS AND FORCE HEALTH PROTECTION?

Plant dermatitis can cause significant disability and lost duty time particularly in highly sensitized individuals. Service members should be informed of the risk of exposure particularly during combat-training in endemic areas, and should be advised on poisonous plant identification and personal protective measures to prevent exposure.

Plant dermatitis is an allergic inflammatory skin reaction in response to the oils of poisonous plants. In the U.S., the most common dermatitis-causing plant genus is *Toxicodendron* (formerly *Rhus*) (i.e., poison ivy, poison oak, and poison sumac).[1] Approximately 50%–75% of the U.S. adult population are susceptible to skin reactions upon exposure to *Toxicodendron* oil or oleoresin, called urushiol. In these sensitized individuals, responses to the oils at the sites of exposure produce intense redness and pruritus (itch); severe cases can result in edema, fluid-filled vesicles or bullae, and extreme discomfort. Plant dermatitis is generally self-resolving and lasts approximately 3 weeks; however, symptoms can persist up to 6 weeks in highly susceptible individuals.[1]

Toxicodendron species are indigenous to the United States and flourish in forests, fields, wetlands, road sides, parks, and backyards. Poisonous plants are an occupational hazard for U.S. military members who are assigned to and train in endemic areas. Plant dermatitis can cause significant disability as well as result in substantial medical costs and lost duty time. This report describes the numbers and incidence rates of plant dermatitis in active component service members, its seasonality, and its distribution across U.S. military installations during 2010–2020.

METHODS

The surveillance period was 1 January 2010 to 31 December 2020. The surveillance population included all individuals who served in the active component of the Army, Navy, Air Force, or Marine Corps at any time during this period. For this analysis, the Defense Medical Surveillance System (DMSS) was searched for records of inpatient and outpatient care for diagnoses of plant dermatitis. A case was defined by the recording of 1 inpatient or outpatient diagnosis of plant dermatitis (International Classification of Diseases, 9th Revision Clinical Modification [ICD-9-CM]: 692.6; ICD-10-CM: L23.7, L24.7, L25.5) in any diagnostic position; an individual could be an incident case once every 30 days. Diagnoses were also derived from records of medical encounters of deployed service members documented in the Theater Medical Data Store (TMDS), which is incorporated into the DMSS.

RESULTS

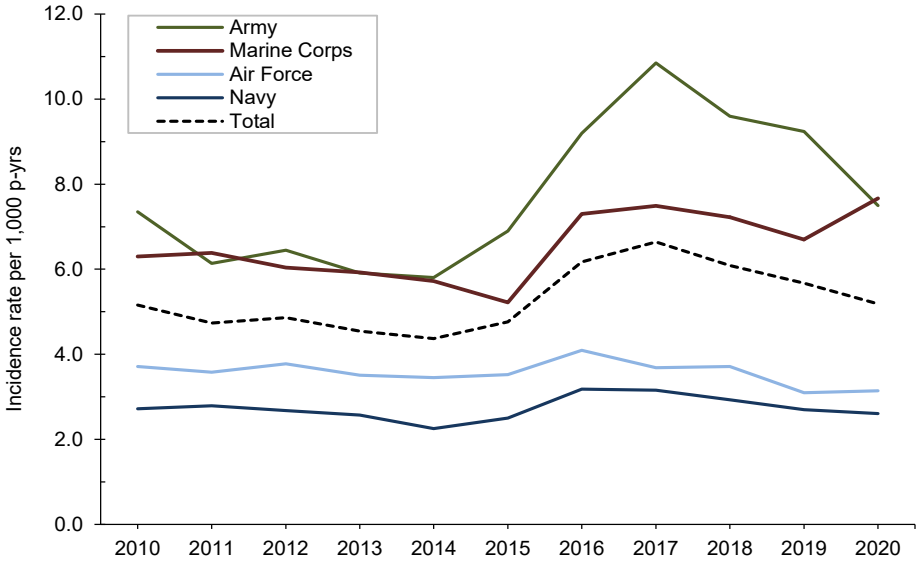
During the surveillance period, there were 73,725 diagnoses of plant dermatitis (crude incidence rate: 5.3 per 1,000

TABLE 1. Incident cases and incidence rates of dermatitis due to plants, by demographic and military characteristics, active component, U.S. Armed Forces, 2010–2020

	No.	Rate[a]
Total	73,725	5.3
Encounter type		
Hospitalizations	111	0.0
Outpatient visits	73,614	5.3
Sex		
Male	67,533	5.7
Female	6,192	2.8
Age group (years)		
< 20	8,189	8.4
20–24	23,362	5.3
25–29	15,805	4.8
30–34	9,931	4.5
35–39	7,526	4.7
40+	8,912	6.2
Race/ethnicity group		
Non-Hispanic White	60,769	7.5
Non-Hispanic Black	2,573	1.1
Hispanic	5,582	2.8
Other/unknown	4,801	3.0
Service		
Army	39,182	7.7
Navy	9,523	2.7
Air Force	12,056	3.6
Marine Corps	12,964	6.5
Occupation		
Combat-related[b]	22,987	11.9
Motor transport	1,490	3.6
Pilot/air crew	3,039	6.0
Repair/engineering	15,327	3.7
Communications/ intelligence	12,563	4.2
Health care	4,289	3.4
Other/unknown	14,030	5.2

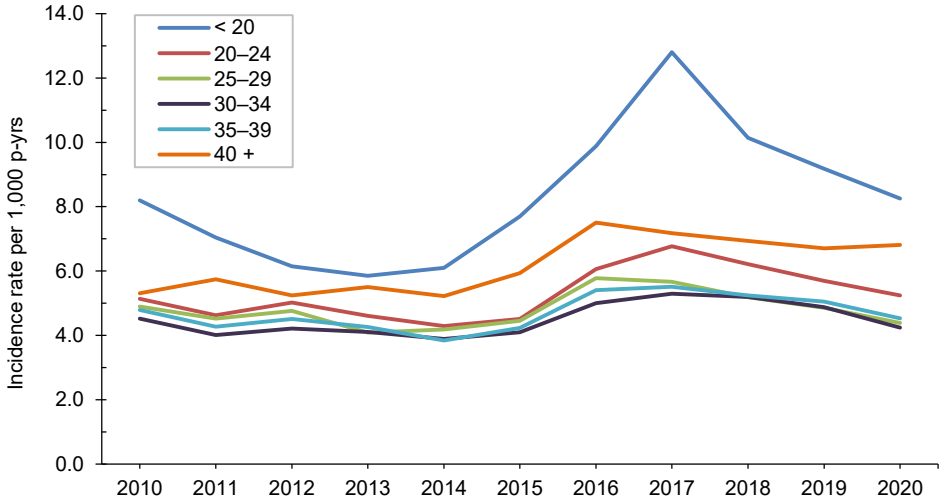
[a]Rate per 1,000 person-years.
[b]Infantry/artillery/combat engineering/armor.
No., number.

FIGURE 1. Annual incidence rates of plant dermatitis, by service, active component, U.S. Armed Forces, 2010–2020



P-yrs, person-years.

FIGURE 2. Annual incidence rates of plant dermatitis by age group, active component, U.S. Armed Forces, 2010–2020

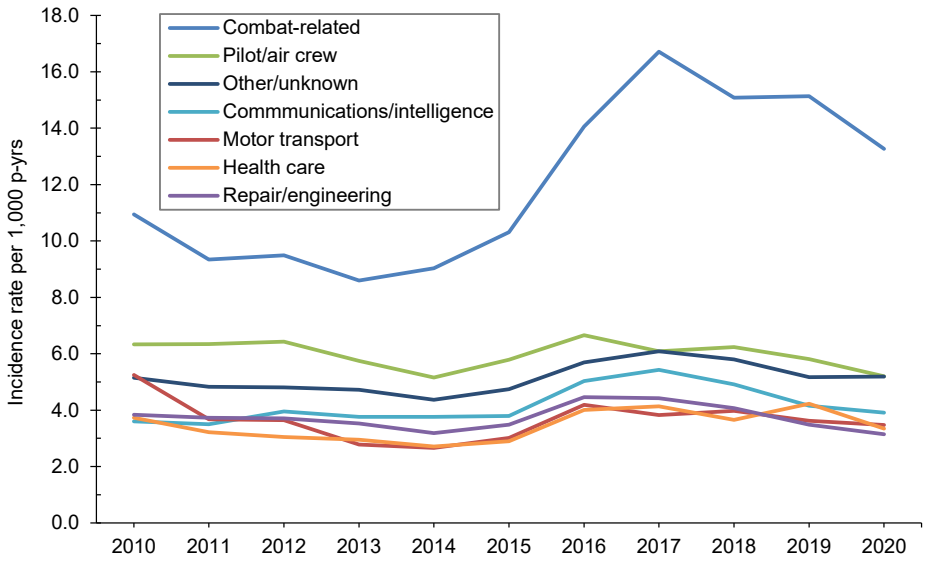


P-yrs, person-years.

person-years [p-yrs]) **(Table 1)**. Most of the cases (99.9%) were diagnosed in outpatient facilities; 111 service members had hospitalizations with a case-defining diagnosis for plant dermatitis. Sixty-four hospitalizations (57.7%) had a case-defining diagnosis in the first or second diagnostic position compared to 98.0% of outpatient encounters **(data not shown)**. Overall incidence rates remained relatively stable between 2010 and 2015, increased in 2016 and 2017, then decreased in 2018 through 2020 **(Figure 1)**. The highest annual rate was in 2017 (6.6 per 1,000 p-yrs).

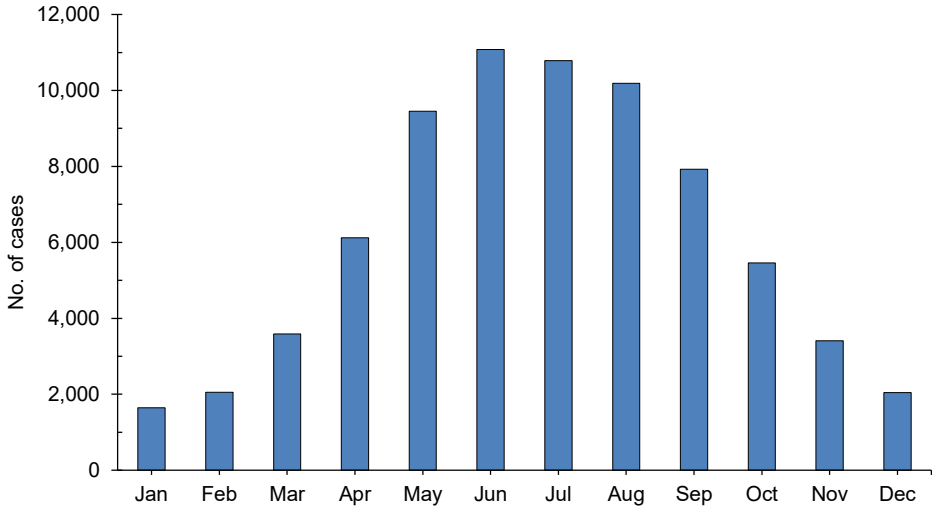
Compared to their respective counterparts, incidence rates of plant dermatitis were higher among male service members (5.7 per 1,000 p-yrs) and in the youngest (<20) and oldest (40+) service members (8.4 and 6.2 per 1,000 p-yrs, respectively) **(Table 1)**. The annual incidence rates among those under age 20 were highest during the period 2016–2020 **(Figure 2)**. Incidence rates among non-Hispanic White service members (7.5 per 1,000 p-yrs) were more than 6 times those among non-Hispanic Black service members (1.1 per 1,000 p-yrs). Rates were also higher among members of the Army and Marine Corps (7.7 and 6.5 per 1,000 p-yrs, respectively) compared to

FIGURE 3. Annual incidence rates of plant dermatitis, by military occupation, active component, U.S. Armed Forces, 2010–2020



P-yrs, person-years.

FIGURE 4. Cumulative numbers of cases of plant dermatitis, by month, active component, U.S. Armed Forces, 2010–2020



No., number.

their respective counterparts. The increases in the rates of plant dermatitis from 2015 through 2017 were driven by increases in the Army and Marine Corps; rates in the Air Force and Navy remained comparatively low and stable **(Figure 1)**. Of note, in 2020, the rate of plant dermatitis among Marine Corps members exceeded that of the Army for the first time since 2011.

The incidence rate among those in combat-related occupations (11.9 per 1,000 p-yrs) was almost double the rate among the next highest occupational rate, pilot/air crew (6.0 per 1,000 p-yrs) **(Table 1)**. The rates in combat-related occupations remained consistently higher than other military occupations; there was a notable increase in incidence rates from 2015 (6.8 per 1,000 p-yrs) to a high in 2017 (16.7 per 1,000 p-yrs) **(Figure 3)**.

There was distinct seasonality to plant dermatitis incidence; more than two-thirds of the cumulative cases (67%) occurred during the 5 months of May to September **(Figure 4)**. More cases were diagnosed among service members serving in Georgia (n=12,874), California (n=8,764), North Carolina (n=7,707) and Virginia (n=7,125) than any other states **(data not shown)**. While numbers of cases in California, North Carolina, and Virginia remained relatively stable during the period, cases in Georgia increased steadily from a low of 659 in 2013 to a high of 1,885 in 2017 **(data not shown)**. Of all military installations in the U.S. with cases, nearly one-third of all cases were diagnosed at 4 installations: Fort Benning, GA (n=11,257); Camp Pendleton, CA (n=5,399); Fort Bragg, NC (n=4,259), and Fort Campbell, KY (n=3,221) **(data not shown)**.

During the 11-year surveillance period, a total of 107 service members received a plant dermatitis diagnoses while deployed **(data not shown)**. Most cases were among soldiers, male and non-Hispanic White service members, service members aged 20–29, and those in repair/engineering occupations **(data not shown)**. Almost three-quarters (71.0%) of cases occurred during the 5 months of May to September **(data not shown)**.

EDITORIAL COMMENT

The crude incidence rates of plant dermatitis increased approximately 27% from 2010 to the peak annual incidence rate in 2017. This change was driven by increases among service members in the Army and Marine Corps **(data not shown)**, among those in combat-specific occupations, and among those under age 20. Furthermore, plant dermatitis cases were most numerous among those serving at installations that support extensive ground combat training in Georgia, California, and North Carolina. The relatively high rates among the youngest (and most junior and inexperienced) service members may be related to their relatively frequent and intensive exposures to field conditions during recruit and subsequent occupation-specific training.

It is estimated that 50% to 75% of U.S. adults are clinically sensitive to

Toxicodendron species.[1] This report documented that crude incidence rates of plant dermatitis were nearly 7 times higher among non-Hispanic White than non-Hispanic Black service members. This finding should be interpreted cautiously because the analysis did not account for potentially confounding differences between race/ethnicity groups of service members (e.g., occupational/leisure time activities, medical care seeking behaviors). There are no other studies or surveillance reports that confirm or indicate that there are strong demographic correlates of susceptibility to *Toxicodendron* species.

In light of the geographic distributions of *Toxicodendron* species in the U.S., cases in Georgia, North Carolina, and Virginia are most likely attributable to Eastern poison ivy, while cases in California are most likely due to poison oak.[2] Not surprisingly, summer months pose the greatest risk of exposure; however, plant dermatitis affects U.S. military members throughout the year and in every U.S. state as well as abroad. To some extent, plant dermatitis incidence may be related to weather patterns; for example, moderate drought tends to increase the growth of *Toxicodendron* species. During drought conditions, water sensitive trees, shrubs, and plants may be overrun by *Toxicodendron* species which are invasive and opportunistic.[4,5] *Toxicodendron* species have been shown to outgrow other woody species and produce more potent urushiol under higher levels of CO_2.[5] A previous *MSMR* article demonstrated an increase in cases of plant dermatitis at Fort Benning following reported drought conditions.[6] From 2014 through 2016, Georgia experienced moderate to extreme drought conditions followed by an overabundance of rain in 2017.[7,8] It is plausible that the dramatic increase in cases from 2014 and peak in 2017 may have been driven by the specific drought conditions in the state of Georgia causing an increase in poison ivy growth.

Although small in number, plant dermatitis cases do occur during deployment. In addition to animal and insect threats, service members should be advised of potential poisonous plant species that occur in foreign locations.

There are several limitations to this report that should be considered when interpreting the results. Cases presenting for care in health care facilities may represent more severe cases where the individuals were more motivated to seek treatment. Minor cases of poison ivy are most likely underreported as individuals may self-treat and not seek care. Additionally, it cannot be determined the extent to which cases may be exposed and aquire plant dermatitis during non-military activities (e.g., hiking, camping, lawn care).

In this report, hospitalized cases may include individuals who were not explicitly hospitalized for plant dermatitis. Approximately one-third of hospitalizations (n=35) had a case-defining code in the primary diagnostic position; an additional 29 cases (26.1%) and 19 cases (17.1%) had a case-defining code in the second and third diagnostic position, respectively **(data not shown)**. Future studies may consider refining the case definition for hospitalizations to be more restrictive and thus more likely to capture true hospitalizations for plant dermatitis.

Military members, particularly those in ground combat units, should be informed of the risks associated with exposures to toxic plants and personal protective measures. For example, awareness and concern should be heightened during summer months, particularly during/after periods of drought. Proper identification and avoidance of *Toxicodendron* plants, and use of protective clothing are effective preventive measures against plant dermatitis.

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REFERENCES

1. Gladman AC. *Toxicodendron* dermatitis: poison ivy, oak, and sumac. *Wilderness Environ Med*. 2006;17(2):120–128.
2. NIOSH Workplace Safety and Health Topics: Poisonous plants. Centers for Disease Control. Accessed July 20, 2011. http://www.cdc.gov/niosh/topics/plants/
3. National Oceanic and Atmospheric Administration, National Climatic Data Center: Historical Palmer Drought Indices. Accessed 20 July 2011. http://www.ncdc.noaa.gov/temp-and-precip/drought/historical-palmers/
4. Dickinson CC, Jelesko JG, Barney JN. Habitat Suitability and Establishment Limitations of a Problematic Liana. *Plants (Basel)*. 2021;10(2):263.
5. Schnitzer SA, Londré RA, Klironomos J, Reich PB. Biomass and toxicity responses of poison ivy (*Toxicodendron radicans*) to elevated atmospheric CO2: comment. *Ecology*. 2008;89(2):581–585.
6. Armed Forces Health Surveillance Center. Plant dermatitis, active component, 2001–2010. *MSMR*. 2011;18(7):19–21.
7. Pendered D. Georgia drought free, suffering from overabundance of rain. Saporta Report. Published August 11, 2017. Accessed 14 October 2021. https://saportareport.com/georgia-drought-free-suffering-overabundance-rain/sections/reports/david/
8. United States Department of Agriculture. 2016 Drought Map. Accessed 14 October 2021. https://www.nrcs.usda.gov/wps/portal/nrcs/detail/ga/technical/dma/?cid=nrcseprd1301268

Invitation to readers for manuscripts about injury for the July 2022 *MSMR*

The *Medical Surveillance Monthly Report (MSMR)* and the Armed Forces Health Surveillance Division (AFHSD) are planning a themed issue on the surveillance and epidemiology of injury (e.g., musculoskeletal injury, combat injury, traumatic brain injury) in military and military-associated populations to be published in July 2022.

This issue is intended to present timely articles on the surveillance and epidemiology of injury as well as programmatic and scientific interventions or strategies that have affected the burden, outcomes, or disparities associated with injuries in military and military-associated populations. Manuscripts examining risk factors and comorbidities associated with injuries in military populations are also suitable for this themed issue. Submissions focused on methodological issues will also be considered. Examples of methodology-related manuscripts include those focused on improving the collection and analysis of data related to injury and the development and validation of surveillance case definitions for these conditions.

The *MSMR*, in continuous publication since 1995, is a peer-reviewed journal indexed in PubMed, MEDLINE, and Scopus (CiteScore 1.4). The *MSMR* readership includes military and civilian public health professionals throughout the Military Health System, other federal government agencies (e.g., the Centers for Disease Control and Prevention, Department of Health and Human Services), and academia.

We are asking authors to submit their full manuscripts by April 1, 2022. For more details about specific article types and corresponding review criteria, please see the MSMR's instructions to authors at https://www.health.mil/Military-Health-Topics/Combat-Support/Armed-Forces-Health-Surveillance-Division/Reports-and-Publications/Medical-Surveillance-Monthly-Report/Instructions-for-Authors.

CPT Kelly Scott, a physical therapist with the 2nd Brigade Combat Team, 82nd Airborne Division, demonstrates a leg-flexing technique on CPT Kelly Lavallee during musculoskeletal care training for Fort Bragg and Womack Army Medical Center healthcare providers.

ATLANTIC OCEAN (Oct. 23, 2021) Aviation Support Equipment Technician 1st Class Anthony Watkins, right, and Hospitalman Marcus Wooten, assigned to the San Antonio-class amphibious transport dock ship USS Arlington (LPD 24), assess victim's injuries on the flight deck during a mass casualty drill, Oct. 23, 2021. Arlington is underway in the Atlantic Ocean to support Amphibious Squadron and Marine Expeditionary Unit Integration (PMINT). PMINT is an opportunity to train for amphibious and maritime operations with embarked Marines in an integrated environment. (U.S. Navy photo by Mass Communication Specialist 2nd Class John Bellino).

Medical Surveillance Monthly Report (MSMR)
Armed Forces Health Surveillance Division
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MEDICAL SURVEILLANCE MONTHLY REPORT (MSMR), in continuous publication since 1995, is produced by the Armed Forces Health Surveillance Division (AFHSD). AFHSD is a designated public health authority within the Defense Health Agency. The *MSMR* provides evidence-based estimates of the incidence, distribution, impact, and trends of illness and injuries among U.S. military members and associated populations. Most reports in the *MSMR* are based on summaries of medical administrative data that are routinely provided to the AFHSD and integrated into the Defense Medical Surveillance System for health surveillance purposes.

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